DIGITAL LITERACY EVALUATION MODEL DEVELOPMENT FOR TOURISM MANAGEMENT OF UNDERGRADUATE STUDENTS

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Thesis Title Digital Literacy Evaluation Model Development for Tourism Management of Undergraduate Students

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ABSTRACT

The title of this research is digital literacy evaluation model development for tourism management of undergraduate students. The purposes of this research are: 1) to extract the components of digital literacy of tourism management of undergraduate students, 2) to develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students, and 3) to verify the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students. The sample for this research includes 1,308 tourism management of undergraduate students in China, 21 teachers from 12 universities, 70 tourism management of undergraduate students at Leshan Normal University. The main research instruments include questionnaire, statistical software, DEL model, Microsoft excel, Super Decisions, training program, test paper, etc. The statistic to analyze the data were percentage, average value, and standard deviation.

The results were found that. 1) The overall level of digital literacy of tourism management of undergraduate students is not high and needs to be further improved. In terms of the difference in digital literacy levels, Students in the eastern region are higher than those in the western region. Students in the upper grades are taller than those in the lower grades. Boys are higher than girls. 2) The digital literacy of tourism management of undergraduate students includes first-level components such as digital awareness, digital knowledge, digital ability and digital responsibility, and 15 second-

level components. 3) The weights of the first-level components are digital ability (0.570), digital knowledge (0.215), digital awareness (0.161), digital responsibility (0.054). In terms of the weight of the second-level components, the top three are digital innovation and entrepreneurship (0.116), professional problem-solving (0.105), and digital security (0.091). The last three are digital willingness (0.016), digital determination (0.028), and digital understanding (0.033).

Keywords: Digital literacy evaluation model, Tourism management of undergraduate students

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Chapter 1
Introduction

Rationale

The digital age requires people with digital literacy. With the rapid development of Internet and information technology, today's society has already entered the digital age. Digital literacy has become a survival skill that everyone must possess in the digital era and a core requirement for individuals to cope with current challenges. Everyone should have good digital literacy. What kind of digital literacy should talents in the 21st century have in order to meet the needs of future social development and survive in the digital society? Countries and international organizations such as the United States, the European Union and the United Nations have given corresponding standards for talents with urgent needs or expectations. Chinese government departments have issued standards and documents such as "Core Literacy for Chinese Students", "Education Informatization 2.0 Action Plan" and "China's Education Modernization 2035" to guide and improve students' digital literacy. The new generation of information technologies, including 5G, big data, artificial intelligence, and the Web of Things, are changing people's life, study and work, and constantly redefining the standards of talent needed in a digital society. As one of the main forces in the era of digital innovation, digital literacy must be a necessary survival skill for college undergraduates to integrate into the society, and it is urgent to develop digital ability, skills and ethics to enhance their competitiveness.

The digital literacy of tourism management of undergraduate students (TMUS) needs to be improved. Tourism management of undergraduate students should master the basic theories, specialized knowledge and professional skills of tourism management, have an international perspective, management ability, technical potential, service awareness and innovative spirit, and be able to engage in management work in the tourism industry. Compared with students majoring in tourism management in secondary vocational education schools and vocational higher education schools, undergraduates have more time to contact digital media

and enrich their professional knowledge, so as to improve their professional skills. However, due to the large number of digital resources contained in the network, Tourism management of undergraduate students are more inclined to choose leisure and entertainment content and topics, which is not conducive to the growth of their knowledge, professional skills and quality improvement. They also find it difficult to distinguish the authenticity of digital resources and do not fully integrate professional use of digital resources. All these problems show that the digital literacy of tourism management of undergraduate students needs to be improved urgently.

Lack of digital literacy evaluation model for tourism management of undergraduate students. In the global wave of digital literacy education, scientific evaluation of students' digital literacy is an important means and measure to improve digital literacy, which is conducive to the scientific and standardized development of digital literacy education. With the in-depth development of the digitalization of the tourism industry, tourism management professional education needs to have professional, universal and systematic evaluation tools for students' digital literacy, so that students can identify their strengths and weaknesses in digital literacy, improve their digital literacy level, and adapt to the increasingly complex and deeply embedded digital life and work scenarios. Based on this, teachers can formulate and optimize the training objectives, training programs and teaching systems of digital literacy education, so as to improve the overall level of digital literacy education. However, the current research on digital literacy evaluation for undergraduates in China mainly focuses on students majoring in education and information, and lacks a standard system for digital literacy evaluation for tourism management majors, which is not conducive to teachers and students making clear the cultivation goals of digital literacy for tourism management majors and realizing the continuous improvement of digital literacy independently.

Research Question

The core question of this paper is how to develop a digital literacy evaluation model for tourism management of undergraduate students and reflect the characteristics of this group, and verify its scientificity and rationality? Based on this, the main research questions of this research include:

How to develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students?

Objectives

1. To extract the components of digital literacy of tourism management of undergraduate students.

2. To develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students.

3. To verify the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students.

Research Hypotheses

The digital literacy evaluation model for tourism management of undergraduate students is scientific and reasonable. This model can measure the digital literacy level of current tourism management of undergraduate students. Measures can be taken to improve the digital literacy level of tourism management of undergraduate students according to the measurement results.

Scope of the Research

Population and the Sample Group

Population

Phase 1: The tourism management of undergraduate students in China. According to incomplete statistics, there are approximately 156,000 tourism management of undergraduate students.

Phase 2: The full-time teachers of higher education in China. According to data from the Chinese Ministry of Education, there are 1,272,996 full-time teachers as of 2021.

Phase 3: The 493 tourism management of undergraduate students at Leshan Normal University.

The Sample Group

Phase 1: It will be used stratified sampling here. The sample group identified for this study was 1,308 students. There are 430 students from the east, 417 from the middle, 402 from the west, and 59 from the northeast. Two universities were selected in each region, one in the central city of the provincial capital and one in the central city of the non-provincial capital. There are 355 freshmen, 326 sophomores, 318 juniors, and 309 seniors. Such samples are more representative and have smaller sampling errors.

Phase 2: It will be used judgment sampling here, 21 teachers from 12 universities who are engaged in teaching and research in related fields such as university education, computer science, and tourism management. Eligible for the following conditions:

1. Work experience: Engaged in university education, computer science, tourism management and related work for at least 10 years.

2. Educational requirements: Master's degree or above.

3. Professional title requirements: associate professor and above.

4. Cooperation: interested in this research and able to actively participate in consultation.

Phase 3: It will be used cluster sampling here, select 70 tourism management of undergraduate students of Leshan Normal University who have similar levels of digital literacy and potential for improvement. They are from Class 1 and Class 2 of the 2022 grade. Class 1 (34 students) is the experimental group, and Class 2 (36 students) is the control group.

The Variable

Independent variable

1. Digital awareness
2. Digital knowledge
3. Digital ability
4. Digital responsibility

Dependent variable

The Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students.

Contents

First, investigate the digital literacy education needs of tourism management of undergraduate students, combine relevant literature and theory, and refer to existing digital literacy frameworks to initially extract the components of digital literacy for tourism management of undergraduate students; Second, Delphi method and Analytic Network Process were used to analyze the components, and finally formed a digital literacy evaluation model for tourism management of undergraduate students with different degrees of importance; Finally, a questionnaire is compiled based on the digital literacy evaluation model for tourism management of undergraduate students, and a questionnaire survey and data analysis were conducted on the digital literacy level of tourism management of undergraduate students to verify the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students.

Time

The research was conducted from September 2023 to August 2024.

Advantages

1. To understand the digital literacy needs of tourism management of undergraduate students.

2. To get the DLE model for to provide reference and guidance for the digital literacy education of tourism management of undergraduate students.

3. To improve the digital literacy level of tourism management of undergraduate students.

Definitions of Terms

1. Digital Literacy

Digital Literacy refers to a collection of qualities and abilities such as digital acquisition, production, use, evaluation, interaction, sharing, innovation, security, ethics, etc. that citizens in the digital society should have in their study, work and life.

2. Tourism management of undergraduate students

Tourism management of undergraduate students refers to those students majoring in tourism management at the undergraduate level. These students will gain professional knowledge and skills related to tourism and hospitality management to work in areas such as tourism and hospitality. Their studies typically include courses in the principles of tourism, marketing, operations management, hotel management, tourism planning, cultural heritage management, sustainable tourism and related fields. are students receiving undergraduate education in universities.

3. Digital literacy of tourism management of undergraduate students

Digital literacy of tourism management of undergraduate students refers to a special digital literacy formed based on the development of the tourism industry and tourism disciplines, it must also conform to a series of practical needs such as the needs of tourism industry development, the needs of tourism activities, the needs of tourism enterprise operations, and the needs of diversified tourist services.

4. Digital awareness

Digital awareness refers to the dynamic reflection of objectively existing digital-related activities in the mind, which mainly includes digital understanding, digital will, and digital determination.

5. Digital knowledge

Digital knowledge refers to the digital technology knowledge that should be understood in tourism major studies, including digital basic knowledge, digital professional knowledge, digital hardware knowledge, and digital software knowledge.

6. Digital ability

Digital ability refers to the ability to apply digital technology resources to carry out tourism professional learning, including data collection and processing, digital content creation, digital communication and cooperation, professional problem-solving, and digital innovation and entrepreneurship.

7. Digital responsibility

Digital responsibility refers to the responsibility for moral cultivation and behavioral norms in the digital society, including digital ethics, digital governance, and digital security.

8. Digital literacy evaluation model

Digital literacy evaluation model is a systematic framework for measuring and evaluating the skills, knowledge and abilities of individuals or groups in digital environments. These models are designed to evaluate individuals' proficiency in digital technologies and information processing in order to understand whether they are digitally literate enough to adapt and successfully meet the challenges of the digital age.

Research Framework

The research intends to follow the research idea of "theoretical research - model building - empirical application", and the entire research process is divided into three stages.

In the first stage, relevant literature and theories will be studied, with reference to the existing digital literacy framework, a questionnaire survey method will be used to understand the digital literacy needs of tourism management of undergraduate students (TMUS), and initially extract the components of digital literacy among tourism management of undergraduate students.

In the second stage, Delphi method will be used to determine the components of the model, and the Analytic Network Process will be used to determine the weights of the model's components to form the final digital literacy evaluation model for tourism management of undergraduate students.

In the third stage, a training program and test paper will be used to verify the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students.

The framework of this paper is shown in Figure 1.1.

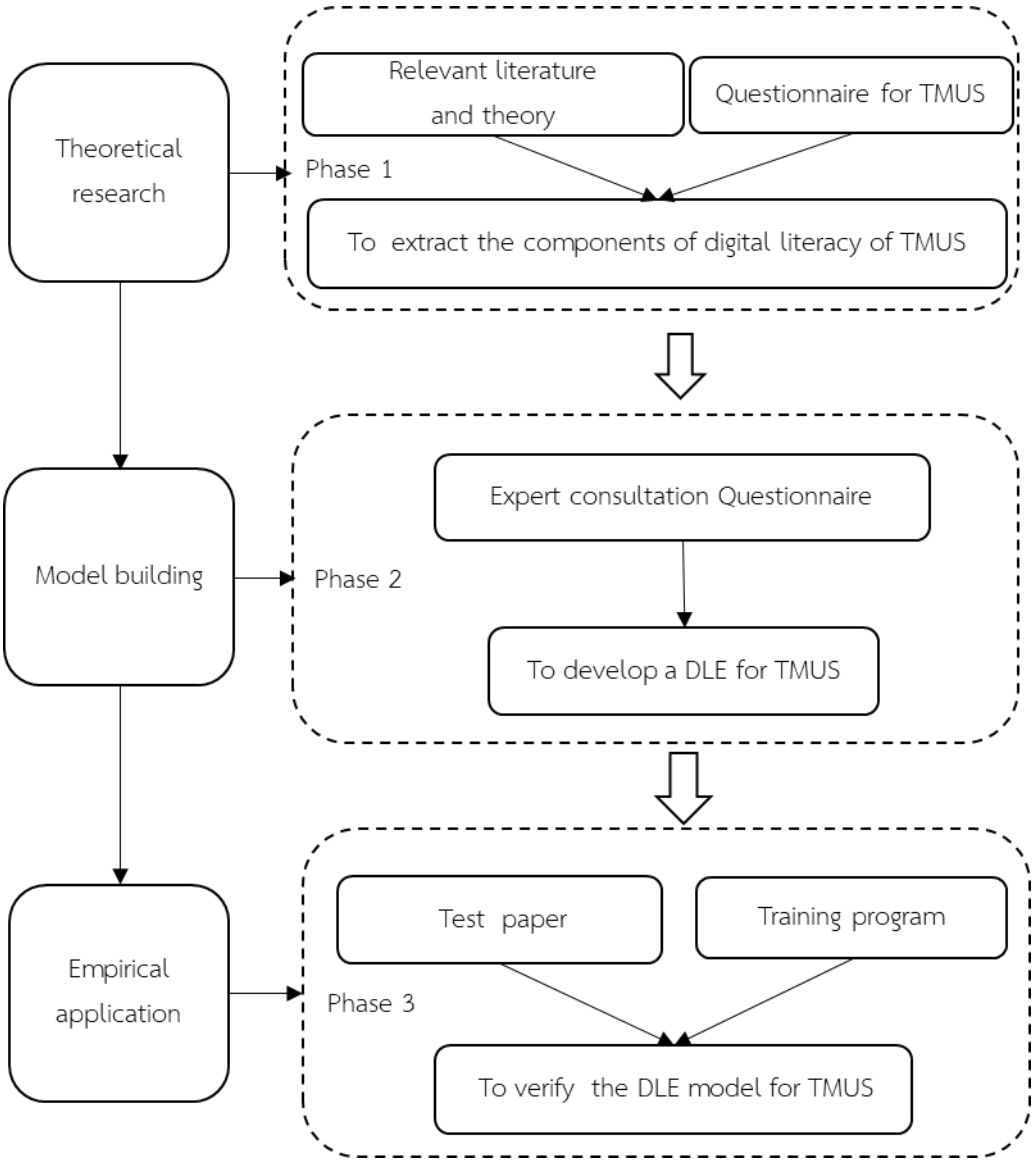

Figure 1.1 Research Framework

Chapter 2

Literature Review

To develop a digital literacy evaluation model for tourism management of undergraduate students, the researcher conducted the following related studies:

1. Complexity theory
2. Connotation of digital literacy
3. The relationship between digital literacy and related literacy
4. Digital literacy and educational practices
5. Digital literacy evaluation model
6. Techniques or methods for evaluating efficiency
7. Techniques or methods for developing general models
8. Tourism management of undergraduate students in China
9. Related research

The details are as follows.

Complexity theory

Edgar Morin, a prominent French thinker and philosopher, is a significant contributor to complexity theory, offering a thorough examination of the disorder, uncertainty, and intricacy found in complex systems. He defines complexity as something intertwined, deriving from the Latin word "complexus." This concept forms the foundation of the theory, which posits that human problems are multifaceted, diverse, and interconnected. In complex systems, numerous elements interact, provide feedback, and influence one another. Complexity theory is a multidisciplinary framework used to understand how complex systems and patterns arise from a series of relatively simple interactions. Its applications span various fields, including public health, social sciences, and economics, providing new insights into system operations and adaptation. The theory's relevance to organizational change, particularly in managing organizations, has also garnered attention (Burnes, 2005). Additionally, complexity theory is important in social sciences for analyzing

governance, social inequality, and the climate crisis (Byrne & Callaghan, 2022). Educators can apply complexity theory to understand evaluation models, helping them select appropriate models for program evaluation (Frye & Hemmer, 2012). This research views the digital literacy evaluation model for tourism management of undergraduate students as a complex system, requiring complex thinking methods to grasp its intricacies fully.

Connotation of digital literacy

There are numerous concepts and frameworks related to digital literacy, and the academic community has not yet reached a consensus. Terms like digital skills, digital fluency, digital capabilities, digital competency, and digital intelligence are often used interchangeably with digital literacy. Various scholars and institutions have contributed to defining and researching the concept and framework of digital literacy.

Eshet-Alkala (1994) was among the first to propose a conceptual framework for digital literacy, which includes picture literacy, re-creation literacy, branching literacy, information literacy, and social-emotional literacy. This framework, published in the Journal of Distance Education, is considered foundational in digital literacy research.

Gilster (1997) introduced the term "digital literacy" in the context of the Internet, defining it as the ability to acquire, comprehend, and use information through computers.

Allan and Jan (2006) described digital literacy as the understanding, attitude, and ability to identify, acquire, manage, integrate, evaluate, and create digital resources through media tools, and to communicate this new knowledge with others.

Wang (2012) emphasized that digital literacy requires developing technical, cognitive, and social-emotional skills. He identified essential skills for digitally literate individuals, such as basic computer operations, effective information search and evaluation, problem-solving using appropriate technological tools, and self-protection in digital environments.

EU defines digital literacy broadly as "the ability to use information technologies confidently, critically, and innovatively in various aspects of life." Since launching the digital literacy project in 2011, the EU has released several versions of the digital literacy framework, including DigComp1.0, DigComp2.0, DigComp2.1, and DigComp2.2 between 2014 and 2022.

The UK Joint Information Systems Committee (2014) views digital literacy as a necessary skill for thriving in a digital society, extending beyond basic IT skills.

UNESCO (2018) defines digital literacy as "the ability to use digital devices and network technologies to securely and effectively access, manage, understand, integrate, communicate, evaluate, and create information," incorporating competencies like computer literacy, ICT literacy, information literacy, and media literacy.

In China, scholars have also explored digital literacy, though much of their work is based on foreign research, and a definitive conclusion has not yet been reached.

Xiao (2006) was the first to introduce the concept of digital literacy in China, highlighting its inclusion of technical, cognitive, emotional, and social skills, based on Professor Yoram Eshet-Alkala's framework.

Wang et al. (2013) proposed that digital literacy builds upon and expands media literacy, computer literacy, network literacy, and information literacy, describing it as a "survival skill in the digital age" and an essential asset in the information society.

Ren et al. (2014) studied the EU Digital Literacy Framework (version 1.0) and introduced its five literacy indicators: information, communication, content creation, security awareness, and problem-solving, proposing implications for its application in China.

Zhao et al. (2019) analyzed over 100 existing models and frameworks, finding that they all focus on the ability to obtain, process, and evaluate data. They noted that digital literacy for college students emphasizes the methods, means, and content of development, as well as critical thinking.

Ling (2020) compared various definitions from scholars and institutions, concluding that digital literacy is a comprehensive concept evolved from computer literacy, data literacy, media literacy, information literacy, and network literacy.

Shi et al. (2021) integrated global digital development needs with China's current context, defining digital literacy through three core dimensions: ability, cognition, and participation, emphasizing its role as a comprehensive competency.

In conclusion, digital literacy is crucial for individuals in today's digital society. As digital technology continues to advance, the scope of digital literacy will expand, encompassing general literacy (use of digital tools and resource management), innovative literacy (problem-solving with critical and innovative thinking), and security and ethical literacy (understanding laws and maintaining online security).

The relationship between digital literacy and related literacy

Research on the relationship between digital literacy and other types of literacy by both domestic and foreign scholars primarily emphasizes the connections between digital literacy, media literacy, and information literacy.

The relationship between digital literacy and media literacy

Li (2012) argued that the current lag in media literacy education is insufficient to meet the needs of young people in the modern era. He suggested that digital literacy represents a new trend and a key objective in media literacy education, particularly in the context of the emerging digital divide.

A Canadian non-profit charitable organization specializing in digital media literacy (2010) explored the relationship between the two through in-depth research. Intersecting, in that digital and media literacy share critical thinking as a core skill; but there are important differences in how educational stances are approached: digital literacy is more concerned with engaging students in digital media in intelligent, safe, and ethical ways, while Media literacy generally focuses on students' critical engagement with media consumption.

In summary, the relationship between digital literacy and media literacy can generally be understood through two perspectives. The first view holds that digital

literacy encompasses media literacy, while the second suggests that digital literacy and media literacy are complementary, intertwined, and mutually evolving concepts.

The relationship between digital literacy and information literacy

Wang (2013) pointed out that information literacy is a kind element of literacy, which is the basis of many literacies such as digital literacy. Digital literacy includes the instrumental ability emphasized by information literacy and cannot be separated from the support of information literacy.

Zhang (2016) believe that information literacy is a sub-concept of digital literacy, and digital literacy has the functional characteristics of information literacy, including basic abilities such as searching, identifying, integrating, evaluating, and sharing information.

Zheng (2019) concluded from a relatively authoritative definition that digital literacy is a more complex literacy than information literacy and includes the content of information literacy.

In summary, with respect to the relationship between digital literacy and information literacy, most researchers agree that digital literacy is a broader, overarching concept that encompasses information literacy.

The relationship among digital literacy, media literacy and information literacy

In understanding the relationship between digital literacy, media literacy, and information literacy, it is generally accepted that digital literacy is the broader concept, encompassing the other two as subordinate components.

Tibor (2011) explored the similarities, differences, and interconnections among information literacy, media literacy, and digital literacy.

UNESCO (2018) identified digital literacy as a broad concept that includes computer literacy, ICT literacy, information literacy, and media literacy.

Marcus (2019) examined the evolution and practice of information and media literacy, emphasizing that information literacy focuses on users' engagement with information, while media literacy emphasizes critical thinking in the context of the humanities and social sciences. He argued that digital literacy, informed by both information and media literacy, is a more comprehensive framework.

Cheng et al. (2015) suggested that information literacy, originating from information science and library science, focuses on the ability to identify, evaluate, use, and disseminate information from various sources. Media literacy, on the other hand, comes from media studies and focuses on acquiring, analyzing, using, and expressing media content. Digital literacy, emerging from informatics and computer science, emphasizes the critical and innovative use of digital tools to understand, evaluate, integrate, and create information.

Zhang et al. (2019) argued that in the digital age, information literacy is better understood as "digital literacy," which encompasses digital technology literacy, digital information literacy, and media literacy.

Bao et al. (2020) posited that media literacy primarily focuses on critical thinking regarding media content in the age of popular culture. Information literacy emphasizes the ability to collect, filter, and effectively use information, while digital literacy emphasizes the use of digital tools, understanding multimedia digital information, and fostering innovative and critical thinking.

In summary, digital literacy is a comprehensive and advanced set of competencies that integrates key aspects of media literacy and information literacy. Media literacy deals with critically processing, analyzing, utilizing, and creating media content, while information literacy focuses on functional skills like retrieving, using, and evaluating information. Digital literacy builds on these foundations and extends them, emphasizing the effective use of digital devices and network technologies, critical thinking, creative learning, communication, and online social interaction in a digital environment.

Digital literacy and educational practices

In the digital age, countries are paying more attention to digital literacy education. The British government, foundation committees and higher education management institutions attach great importance to digital literacy education, and regard digital literacy as one of the important abilities for personal development. Japan advocates that digital literacy should be based on citizens' own practice, and avoid passive training and education. Citizens need to improve their digital literacy

through continuous improvement. Digital literacy education in the United States is mainly led by government agency services, education system training, and social forces involved in various forms of cooperation, showing socialization, universalization, various libraries performing their own duties, digitalization of educational methods, and openness specialty. Each province and territory in Canada have developed a localized digital literacy education policy, which can be summarized into four digital literacy education models: integration, cross-curricular competence, integration and decentralization. Australia's digital literacy education is led by the government, with the active participation of all sectors of society, and attaches great importance to the improvement of the digital literacy level of the whole people, especially the disadvantaged groups. Its digital literacy education forms are characterized by diversification and specialization.

Foreign countries have carried out research on the digital literacy of specific groups, and deeply explored the differences in the digital literacy of specific groups.

Marte (2017) utilized videotaped sessions and qualitative interviews to investigate the digital literacy practices of Norwegian students using personal laptops in school. The study found that teachers who consistently employed visual technologies, such as PowerPoint presentations, fostered a diverse range of personal digital literacy practices among students.

Srisuda (2019) pointed out that more digital literacy education is needed for students in order to equip them with the ability to enter the digital society and career when conducting digital literacy research on the first-year students of computer education in the School of Education of Zhonghong Fanan University.

Churchill (2020) developed digital literacy among elementary school students through digital storytelling using mobile technology tools (iPad and related apps), and the results showed that digital storytelling using mobile technology can help students develop digital literacy skills.

Ján et al. (2021) believes that with the development of society, the requirements for schools and the capabilities of teachers are also constantly changing. These continuously increasing requirements have led to the need for continuous innovation in pre-service teacher training, especially focusing on creating

professional digital literacy, Ján et al. integrated digital literacy into teacher preparation, conducted case studies, and analyzed participants by country and gender.

Savitri et al. (2021) believes that higher education graduates need good digital literacy when seeking and searching for knowledge. In order to improve students' digital literacy, "real science mask" products with QR codes are developed and tested in students' learning.

Sigit et al. (2021) explored how digital literacy affects online risk during the Covid-19 pandemic in Indonesia, using a quantitative approach to conduct a questionnaire survey of approximately 300 primary school students learning online.

Chinese scholars have increasingly recognized the necessity and urgency of digital literacy in the context of the digital age. Research on digital literacy education in China primarily builds on analyses of foreign digital literacy education models, with most studies originating from fields such as library science, information science, and pedagogy.

Niu and Lu (2015) used the EU digital literacy theoretical framework to conduct a case analysis of innovative foreign language teaching practices in Europe, they explained the inevitability of integrating digital literacy into foreign language teaching and proposed that China should cultivate digital literacy awareness and improve the digital literacy of foreign language teachers as a means to enhance digital literacy overall.

Xu and Shang (2017) and other scholars comprehensively compared the digital literacy development models of USA, EU, Japan and other countries or institutions from a horizontal perspective, and based on this, they put forward constructive suggestions for improving digital literacy education in my country.

Li and Sun (2017) discussed how to integrate digital literacy education into the field of art education, addressing aspects such as teaching content, instructional models, and the roles of teachers and students.

Zhang (2020) found through research that university libraries mainly carried out courses focusing on digital literacy to cultivate students' information retrieval and other application abilities, neglecting the cultivation of students' safety ethics and

thinking styles. Digital literacy courses should be enriched and expanded, and embedded with ways to expand the coverage of digital literacy courses.

Li et al. (2020) analyzed and explored the integration of digital literacy education into foreign language education from the perspectives of teaching content and instructional methods, based on the teaching practices of foreign language teachers.

Based on the global framework of digital literacy, Du (2021) proposed strategies to enhance the digital literacy of grassroots cadres, addressing seven areas: software and equipment operation skills, information and data literacy, communication and collaboration, digital content creation, security, problem-solving abilities, and career-related skills.

Liang and Yu (2021) analyzed the digital literacy competencies of accounting majors in independent colleges, exploring methods to improve these competencies within the context of big data.

Zhao and Huang (2021) took the professional curriculum system as the specific practical situation, integrated digital literacy into the construction of the professional curriculum system in colleges and universities, and formed a dynamic feedback chain of digital literacy education and professional curriculum systems. Based on this, they proposed digital literacy education as the Oriented professional curriculum system collaborative construction plan.

In comparison to international research on digital literacy education, China, despite national policies that mention digital literacy, still lacks sufficient attention to this area. Industry associations have yet to organize digital literacy-related projects, and universities and libraries have not universally implemented digital literacy curricula.

Digital literacy evaluation model

The primary foreign digital literacy evaluation models include the Horizon Report released by the American New Media Consortium, the "Seven-Component Model of Digital Literacy" proposed by the British Joint Information Systems Committee, the EU's Digital Literacy Framework, and the UNESCO's "Global Digital Literacy Framework". The specific details are as follows:

Zhang (2019) emphasized that the annual Horizon Report, co-published by the American New Media Consortium and the American Association of Higher Education Information Technology, has been a key trendsetter in international education information technology. From 2015 to 2018, digital literacy was consistently identified as one of the "solvable challenges" in the Higher Education Edition of the Horizon Report. In 2019, the concept of "digital fluency" was introduced to describe digital literacy as a "solvable challenge."

Mark and Xiao (2018) highlighted that the 2016 Horizon Report (Higher Education Edition) defined digital literacy through three dimensions: universal literacy, creative literacy, and literacy across disciplines. These dimensions not only include understanding how digital tools work but also recognize their value and appropriate use. Universal literacy provides foundational skills for all learners and creators in a digital world, while creative literacy builds on this foundation with advanced technical and cultural skills, defining modern digital creators. Interdisciplinary literacy focuses on integrating knowledge across different disciplines and contexts.

Table 2.1 Three models of digital literacy

Model	Description
General literacy	Proficiency in fundamental digital tools, including office software, image processing, cloud-based applications, and website content editing tools, is essential.
Creative literacy	This includes not just basic literacy, but also more advanced technical skills necessary for producing richer content. These skills encompass video and audio editing, animation, knowledge of computing hardware, programming, and an understanding of digital citizenship and copyright law.
Literacy that run through various disciplines	Digital literacy can be integrated into various courses based on their specific content. For instance, sociology classes can cover online interpersonal behavior, while psychology and business courses can focus on computer-mediated interactions.

The British Joint Information Systems Committee (JISC) has funded some digital literacy projects and published several reports in recent years. The comprehensive framework of digital literacy proposed by JISC is among the most frequently cited in the field. The organization initially introduced the "Seven Elements Model of Digital Literacies", which encompasses media literacy, communication and collaboration, career and identity management, ICT literacy, learning skills, digital scholarship, and information literacy. This model has since evolved into the Digital Capability Framework, which consists of six components(As shown in Figure 2.1): Information and communication technology level, information data and media literacy, digital production, problem-solving and innovation, digital communication, collaboration and engagement, digital learning and development, digital identity and health, these six components are subdivided into 15 categories, covering practical skills, critical use, creative production, participation, development and self-actualization.

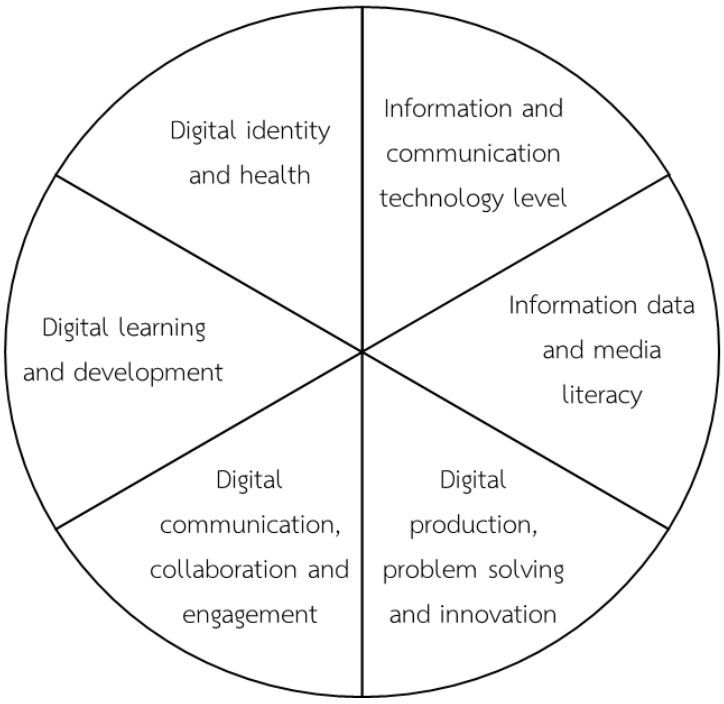

Figure 2.1 Digital Capabilities Framework

To address the increasing demand for digital literacy among European citizens in the digital age, the European Union has identified digital literacy as one of the eight core competencies for EU citizens. Since 2011, the EU has rolled out the "Digital Literacy Project," leading to the creation and evolution of several digital literacy frameworks. These have progressed from the initial Digital Literacy Framework version 1.0 in 2013 to DigComp version 2.0 in 2016, DigComp version 2.1 in 2017, and the most recent DigComp version 2.2 in 2022. Each version has introduced new elements, with DigComp 2.2 covering five domains: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, and Problem-Solving. Within these domains, 21 specific competencies are identified. DigComp 2.2 primarily builds upon and refines the earlier versions, while also updating the knowledge, skills, and attitudes initially presented in DigComp 1.0.

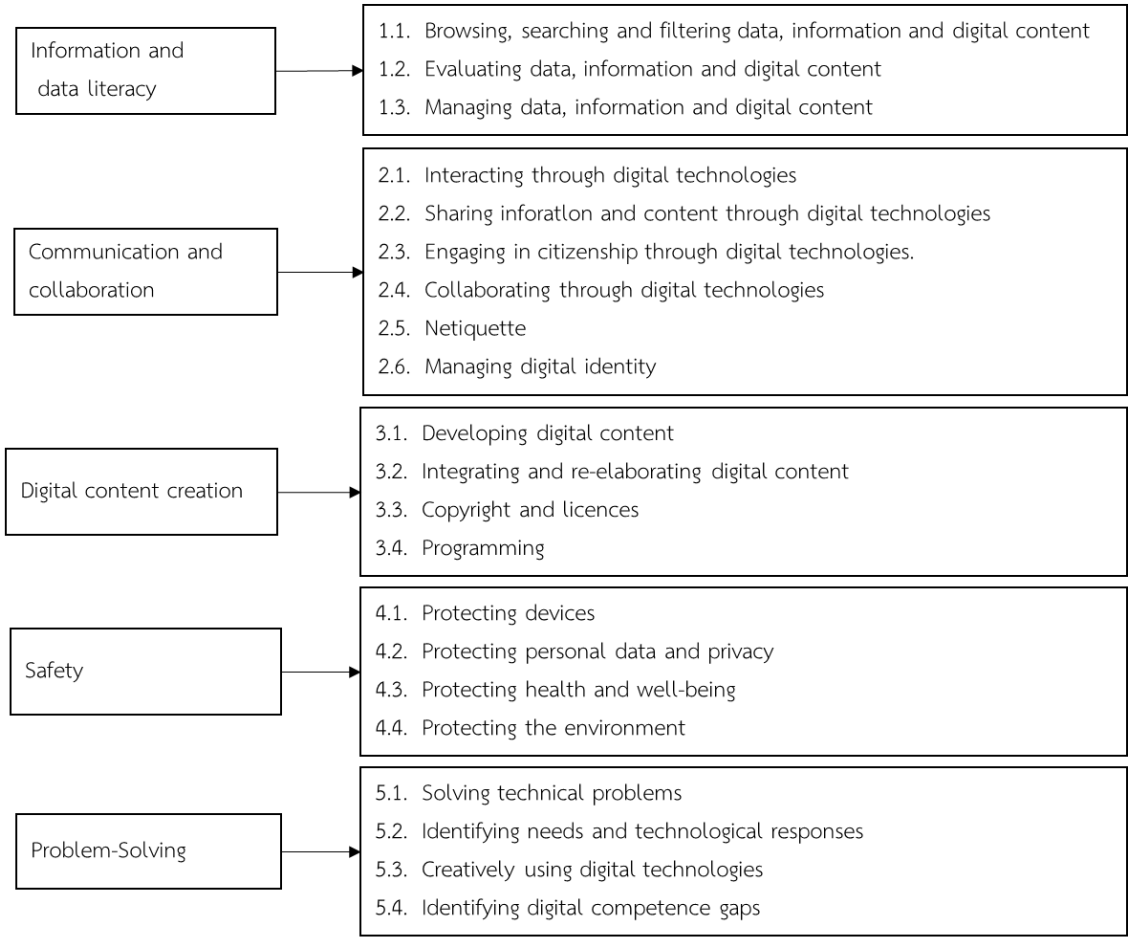

Figure 2.2 The DigComp conceptual reference model

The UNESCO released the Digital Literacy Global Framework (DLGF) in 2018, which mainly refers to the EU Digital Literacy Framework, by selecting countries and regions with different regions and income levels as research objects and framework mapping-Application mapping-In-depth consultation-Online consultation, the researchers finally formulated a global digital literacy framework, which made up for the shortcomings of the EU digital literacy framework's lack of representation and lack of reality, and finally formed 7 literacy domains and 26 specific literacy domain(As shown in Table 2.2), and the seven literacy domains are: operation domain, information domain, communication domain, content creation domain, safety ethics domain, problem-solving domain and career-related domain.

Table 2.2 UNESCO Global Framework for Digital Literacy

Literacy domain	Specific literacy
0. Operation domain	0.1 Physical operations of digital devices
	0.2 Software operations in digital devices
1. Information domain	1.1 Browsing, researching and filtering data, information and digital content
	1.2 Evaluating data, information and digital content
	1.3 Managing data, information and digital content
2. Communication domain	2.1 Interacting through digital technologies
	2.2 Sharing through digital technologies
	2.3 Engaging Citizenship through digital technologies
	2.4 Collaborating through digital technologies
	2.5 Netiquette
	2.6 Managing digital identities
3. Content creation domain	3.1 Developing digital content
	3.2 Integrating and reinterpreting digital content
	3.3 Copyright and Licensing
	3.4 Programming
4. Security ethics domain	4.1 Protecting devices
	4.2 Protecting of personal data and privacy
	4.3 Protecting health and well-being
	4.4 Protecting the environment
5. Problem-solving domain	5.1 Solving technical problems
	5.2 Identifying needs and technological responses
	5.3 Creative use of digital technologies
	5.4 Identify digital capability gaps
	5.5 Computational Thinking
6. Career-related domain	6.1 Operate specialized digital technologies for specific areas
	6.2 Interpret domain-specific data, information and digital content

Most domestic research on digital literacy evaluation models draws on foreign experience and constructs corresponding digital literacy evaluation models or index systems for different groups. The target groups studied are mainly teachers, college students, primary and secondary school students, government personnel, etc.

Based on the combing of existing concepts and theories, Ping (2018) summarized college students' digital literacy into four elements, namely digital attitude, digital thinking, digital knowledge and digital skills.

Yang and Zhou (2019) believed that digital literacy, from the perspective of college teachers, encompasses five key dimensions, each comprising various indicators. These dimensions are: the use of digital technology, management of digital information, creation of digital content, building of digital communities, and capabilities related to digital security. In total, there are 18 indicators spread across these five dimensions.

Liu (2019) conducted a thorough analysis of the EU's DigComp 2.1 digital literacy framework and adapted it to fit the specific needs of college undergraduates in China, particularly within the "Double First-Class" initiative. This resulted in a digital literacy framework that includes five literacy domains and 15 secondary indicators.

Zheng (2020), drawing from UNESCO and EU digital literacy frameworks, tailored these to the context of domestic primary and secondary school students. He categorized digital literacy into six domains: hardware and basic literacy, data literacy, social collaboration literacy, digital content creation literacy, security literacy, and digital problem-solving literacy, encompassing a total of 32 specific indicators.

Ding (2020), using competency theory and digital governance theory, as well as relevant domestic and international frameworks, developed a model suited to the needs of civil servants. This model comprises six primary domains: technology, information, communication, content creation, security, and problem-solving, along with 23 secondary indicators.

Tang (2021), employing competency model theory and complexity theory, conducted an in-depth examination of digital literacy among higher vocational students. Tang developed and validated an evaluation model of digital literacy for

these students through a questionnaire survey of 543 participants, using statistical software to verify the model's scientific rigor and accuracy.

To sum up, foreign digital literacy evaluation models are more authoritative and comprehensive, while domestic digital literacy evaluation models are fewer and there is no digital literacy evaluation model for tourism management of undergraduate students.

Techniques or methods for evaluating efficiency

To evaluate efficiency across various fields such as production, management, scientific research, and education, several methods are commonly employed, including performance indicators, cost-benefit analysis, productivity analysis, time management techniques, process optimization, quality management, data analytics, project management tools, education and training, continuous improvement, and comprehensive evaluation. This research focuses primarily on education and training methods. Relevant studies in this area include:

Sohail et al. (2000) investigated continuing education programs developed by the Penn State Altoona Office of Continuing & Distance Education, aimed at engineers and technicians in Central Pennsylvania. The programs include topics such as process control CAD, project management, information technology, and quality management. The study also discusses the Office's methods for evaluating the effectiveness of these training programs.

Todd et al. (2011) analyzed the economic costs and cost-effectiveness of three different strategies for training clinicians in motivational interviewing within community programs. Their findings provide valuable insights for decision-makers looking to implement addiction treatments that are both empirically supported and cost-efficient.

Gkioka et al. (2020) conducted a narrative synthesis to assess the effectiveness of dementia staff training programs in general hospital settings. The study used Holton's three-level model to evaluate outcomes at the learning, individual performance, and organizational levels.

Ozlem et al. (2021) adapted the Fresno Test for cross-cultural use, a tool widely recognized for evaluating Evidence-Based Medicine (EBM) training. The study measured responsiveness through changes in student scores, demonstrating a significant improvement with a Cohen's effect size of 3.04 (95% CI, 2.6–3.5).

Stacy et al. (2008) employed analyses of variance and independent t-tests to examine differences in athletic training education programs. Their study focused on identifying variations in barriers, methods, content areas, and settings associated with the evaluation of clinical proficiency.

Joseph et al. (2019) described the structure of the Student Curricular Board (SCB) at the University of Illinois College of Medicine-Chicago (UICOM-Chicago), aimed at enhancing student engagement. The study surveyed 563 medical students to assess the program's impact, identifying strengths and areas for improvement. The SCB is characterized by its highly structured, collaborative approach to program evaluation and curriculum design.

Zhang et al. (2021) presented a deep learning model for teaching quality analysis (DLM-TQA), which integrates subjective and empirical data to produce reports on teaching practices. This research offers insights into improving instructional methods and developing teacher education frameworks. Experimental results from student evaluations in political education highlighted various metrics, including a Student Efficiency Ratio of 93.80%.

Wu and Ma (2022) proposed an AdaBoost-Support Vector Machine (AdaBoost-SVM) algorithm, achieving a 91% accuracy rate using a small dataset from education fields. They also developed a human behavior recognition system to monitor students' learning status in ideological and political education courses using gravity sensors in smartphones.

In conclusion, evaluating efficiency in education typically involves assessing student performance, learning outcomes, and satisfaction. Pre- and post-tests are common methods for gauging the effectiveness of educational programs, while learning analytics are used to monitor student progress.

Techniques or methods for developing general models

The basic techniques or methods used by scholars to develop general models mainly include Delphi method, Analytic Network Process, etc.

Delphi method

The Delphi method, originally developed in the 1950s by the RAND Corporation of United States, has been extensively studied by scholars. Key research findings are as follows:

Murry et al. (1995) provided an in-depth overview of the Delphi method, covering its application, assumptions, strengths, limitations, and potential benefits in higher education research, along with key considerations for its implementation. They illustrated the method with a national study focused on developing management audit evaluation criteria, highlighting unique and often overlooked aspects of this qualitative research approach.

Rayens and Hahn (2000) explored the policy Delphi method's role in building consensus for public policy and proposed a technique to measure the degree of consensus. This method systematically gathers, exchanges, and develops informed opinions on a given issue, aiming to build consensus either in favor of or against policy matters. It involves multiple stages, beginning with an initial opinion measurement, followed by data analysis, a new questionnaire design, and a subsequent round of opinion measurement. Consensus is measured using interquartile deviation, while the McNemar test quantifies shifts in responses between stages. The method’s application is exemplified through a case study on state legislators’ views on tobacco policy.

Albert et al. (2001) utilized four rounds of Delphi surveys to develop a multi-attribute model, achieving significant consensus among eight experts on the weighting of utility factors for each procurement system. Their research underscores the Delphi method's efficacy in deriving objective opinions in subjective contexts, such as the selection of procurement systems using a multi-attribute model.

Marietjie et al. (2005) applied the Delphi technique to develop recommendations for the education and training of medical practitioners in South African district hospitals. Their goal was to reach a consensus on the content and

methods necessary to maintain these doctors' competence. The authors believe that their findings could benefit other health science education researchers interested in using the Delphi method.

Jharkharia and Shankar (2007) offered a detailed overview of the Classical Delphi method, emphasizing its adaptability as a research tool suitable for a range of information systems (IS) research projects. These include setting criteria for IS prototyping decisions, prioritizing technology management issues in new product development, and developing frameworks for knowledge manipulation activities. The authors demonstrated the method's versatility by summarizing various Delphi projects, both within and outside the IS field, including those conducted in graduate studies. They concluded by providing insights into design considerations and applications for researchers using the Delphi method in graduate-level studies.

Boulkedid et al. (2011) identified the Delphi technique as a structured process frequently employed in developing healthcare quality indicators but noted a lack of specific guidelines for researchers. They reviewed articles from three electronic databases over a 30-year period (1978–2009) that used the Delphi method for selecting quality indicators. The study assessed four domains: questionnaire preparation, expert panel selection, survey progression, and Delphi results.

In conclusion, the Delphi method is distinguished by three core features: the involvement of experts to leverage their knowledge in forecasting, the use of anonymous or sequential methods that allow experts to make independent judgments, and multiple rounds of feedback to converge expert opinions. As a subjective and qualitative method, the Delphi technique is versatile, serving not only in prediction but also in the development of evaluation index systems and the identification of specific indicators.

Analytic Network Process

It is a decision-making method proposed by American professor Saaty in 1996. Scholars have done relevant research on the Analytic Network Process. The details are as follows:

Mikhailov and Singh (2003) introduced a fuzzy extension to the Analytic Network Process (ANP), incorporating uncertain human preferences into decision-

making. Rather than relying on the classical Eigenvector prioritization method typically used in ANP, they implemented a fuzzy preference programming approach that derives precise priorities from inconsistent interval and fuzzy judgments. This fuzzy ANP enhances the original ANP's capacity to manage imprecise and uncertain human comparisons, allowing for multiple representations-crisp, interval, and fuzzy-and enabling decision-making from incomplete pairwise comparisons.

Niemira and Saaty (2004) developed a model to predict financial crises using the ANP framework. ANP is a comprehensive theory of relative measurement that derives composite-priority-ratio scales from individual-ratio scales, reflecting the relative influence of interacting factors under specific control criteria. The ANP framework uses a supermatrix, composed of matrices of column priorities, to capture the dependencies and feedback among clusters of factors.

Bernhard et al. (2005) conducted a comparative analysis of two multi-criteria decision-making methods: the Analytic Hierarchy Process (AHP), which utilizes a hierarchical structure, and the Analytic Network Process (ANP), which employs a network structure. They applied these techniques to evaluate sustainable management strategies within a forest management unit, using a Criteria and Indicators (C&I) framework aligned with Pan-European Sustainable Forest Management (SFM) guidelines. The study assessed four strategic management options against six criteria and 43 indicators, revealing differences in the evaluation outcomes. The authors discussed the respective strengths and limitations of AHP and ANP in the context of SFM, providing insights into their applicability for sustainable forest management.

Jharkharia & Shankar (2007) proposed a methodology for selecting a logistics service provider, consisting of two stages: (i) initial screening of providers and (ii) final selection using the ANP. They identified relevant criteria and constructed an ANP model for the final selection, demonstrated through an example. The findings showed that compatibility between the user and provider companies is a key determinant in the selection process.

Sipahi and Timor (2010) conducted a thorough review of recent applications of AHP and ANP in group decision-making. They selected 232 application articles from over 600 related papers published between 2005 and 2009 in well-regarded international academic journals.

In summary, ANP, compared to AHP, replaces the hierarchical structure with a network structure and considers the interrelationships between elements. It introduces a nonlinear structure, incorporates feedback mechanisms, and accounts for the influence of lower-level elements on higher-level ones. Consequently, ANP has gained prominence as a multi-criteria decision-making method, receiving significant academic interest and being widely used across various fields to address complex decision-making challenges.

Tourism management of undergraduate students in China

Scholars' main research on tourism management of undergraduate students in China is as follows:

Lu and Adler (2009) aimed to understand the career expectations of undergraduate students in hospitality and tourism management (HTM) programs in China. They surveyed 503 students from four universities, finding that most students were interested in careers in the hospitality and tourism industry and expressed a desire to pursue advanced degrees. The study highlighted valuable topics learned during their studies, such as management, marketing, economics, tourism psychology, and communication. The lack of interest in the industry was the primary reason cited by students not pursuing a career in this field. High salaries and opportunities for personal development were identified as the most important post-graduation goals. The study discusses implications for educators and industry employers.

Hu and Zhan (2009) used factor analysis and logistic regression to examine the factors influencing the employment intentions of tourism management of undergraduate students. They identified factors such as teaching and internships, training modes, and corporate reputation as promoting employment intentions, while the nature of the industry, family influences, and personal values acted as inhibitors. The study concluded that macro-employment policies had no significant impact and

proposed strategies to improve employment intentions from societal, corporate, academic, familial, and student perspectives.

Bi (2011) focused on hotel internships for tourism management of undergraduate students, conducting a survey on factors affecting internship satisfaction and their correlation with the willingness to stay in the industry. The study found that training opportunities, working conditions, development prospects, and attention from employers positively correlated with internship satisfaction and retention willingness, while unmet psychological expectations had a negative impact. The low willingness to remain in the hotel industry was primarily due to low internship satisfaction.

Liu (2016) investigated the professional identity of tourism management of undergraduate students at five universities, using questionnaires and interviews. The study found that overall professional identity was moderate to high, with significant differences based on gender, grade, preferences, and institution. Factors influencing professional identity included personal, professional, social, and industry factors. The study offered suggestions for enhancing professional identity, such as focusing on students' self-adjustment, strengthening professional programs, increasing social support, and promoting industry development.

Zhang et al. (2017) developed a preliminary competency model for tourism management of undergraduate students by combining literature review and survey data. They identified four main competency factors: physical and mental quality, character and morals, scientific knowledge, and professional qualities. Based on this model, they recommended that talent training should focus on innovative thinking, market-oriented construction, and practical applications such as virtual tourism enterprises.

Singh and Lepp (2019) explored the role of academic majors in identity development among undergraduate students. Their study found that students associate specific identity images with their chosen majors and that these images play a crucial role in the identity development process. The results suggested that academic majors serve as symbols of identity and that students' choice of major is closely tied to their desired self-image.

Huang and Li (2021) conducted a study on the effectiveness of hotel internships for tourism management of undergraduate students at Hezhou University. Using exploratory factor analysis, they identified three key components: major effect, industry effect, and occupation effect. Their findings revealed that male students perceived higher industry and occupational effects than female students, while significant differences in occupational effects were observed across different departments.

In summary, extensive research has been conducted on tourism management of undergraduate students in China, with studies focusing on various aspects such as professional cognition, employment intentions, corporate internships, practical teaching, talent cultivation, and course instruction.

Related Research

Relevant research here mainly includes aspects such as digital literacy, information literacy and media literacy. Scholars have linked them to tourism management of undergraduate students as follows:

Digital literacy and tourism management of undergraduate students

Caldevilla-Domínguez et al. (2021) conducted an analysis of scientific production related to digital literacy at the university level within the Scopus database, with a focus on tourism studies due to the growing importance of information and communication technology (ICT) in this sector. Their findings indicate a global and multidisciplinary interest in digital literacy, particularly among students. However, despite the increase in case studies paralleling the integration of ICT in society, there is a notable lack of research on its development within specific fields like tourism. The study suggests that this gap presents challenges and underscores the need for educational institutions to better equip future professionals with the necessary tools, especially in tourism, where ICT is critical.

Ambar et al. (2020) explored the impact of professional training on the digital competence of tourism students at a public university in Mexico. Through a quantitative study involving 400 students, they applied partial least squares structural equation modeling (PLS-SEM) and other multivariate techniques. The

results show that teaching methods, curriculum design, and student autonomy significantly influence digital competence, enhancing students' abilities in digital knowledge generation, information management, collaborative learning, and digital network leadership. The study highlights the importance of curriculum emphasis and teacher support in fostering digital competence, alongside encouraging student initiative and independence in utilizing digital media.

Adeyinka-Ojo et al. (2020) examined the intersection of digital literacy and employability skills in the hospitality and tourism sectors within an emerging digital economy. Their research identified three critical areas: industry practitioner perspectives, employability skills, and the experience economy. These insights were used to propose an innovative framework for technology-driven curriculum development in hospitality and tourism, addressing the disruptive impacts of digital advancements on the industry.

Information literacy and tourism management of undergraduate students

Fu et al. (2015) analyzed the concept and composition of information literacy on the basis of comprehensively sorting out the research results of information literacy at home and abroad, clarified the main information sources of tourism organizations, and analyzed the significance of information literacy education for tourism management majors, proposed an information literacy composition system and gave countermeasures and ways to improve information literacy.

Fu et al. (2018) used information theory, pedagogy, tourism and other multidisciplinary theories and methods to investigate students' cognition of information literacy, and carried out the evaluation of students' information literacy based on teachers, employers, parents and other subjects, and found that Hainan tourism management major Problems in information literacy and information literacy education of undergraduates; put forward information literacy education system and implementation countermeasures for tourism management of undergraduate students in Hainan.

Yi (2020) constructed an information literacy evaluation system for the tourism management major, including an information literacy evaluation model with 4 criterion layers and 14 evaluation indicators; through the analytic hierarchy process, it was obtained that the weights in the criterion layer from high to low are 4 information skills literacy, information awareness literacy, information affective literacy, and information delivery literacy.

Fu et al. (2021) emphasized that information literacy education for tourism majors should aim to develop students' proficiency in information knowledge, methods, abilities, ethics, and concepts. To cater to varying needs, education should be tailored to individual students. The education models should align with the specific requirements of information literacy and the unique features of tourism studies, utilizing approaches such as independent learning, embedded education, training programs, admission preparation, and extracurricular activities. Educational strategies might include seminar-based learning, inquiry-based approaches, project-based methods, game-based learning, and flipped classrooms. Additionally, an evaluation system oriented towards both the process and the outcome should be used to assess educational efforts.

Fu et al. (2021) conducted research on the development and changes, connotation composition, value implications and cultivation strategies of tourism professional information literacy under the background of omni-media integration through literature review and theoretical analysis. This paper proposes a structural model of tourism professional information literacy composed of dimensions and elements such as information awareness, information knowledge, information capabilities and information ethics, providing an analytical framework and solutions for information literacy education.

Fu et al. (2021) used literature research, expert consultation and other methods to construct an evaluation system and evaluation model for tourism undergraduates' information literacy, and used questionnaires to obtain data for empirical research. The results show that the overall information literacy of tourism undergraduates is good, with good information ethics and information awareness, but relatively weak information knowledge and information ability. In view of the

situation where the information awareness index has a high weight and performs well, the information capability index has a high weight and performs poorly, the information ethics index has a low weight and performs well, and the information knowledge index has a weak weight and performance, a differentiated improvement strategy is adopted.

Media literacy and tourism management of undergraduate students

Wang (2019) pointed out that under the background of the integration of culture and tourism, tourism colleges and universities that cultivate applied talents also urgently need to strengthen the media literacy of college students and improve their ability to obtain, understand, create, and disseminate information. In the process of constructing the development path of media literacy education in tourism colleges, efforts should be made to enhance students' subject awareness and achieve self-improvement of media literacy from three levels: self, school, and industry; give full play to the school's tourism characteristics and construct a media literacy education field; Innovate cooperation mechanisms in the tourism industry and enhance students' professional media literacy.

To sum up, scholars have done the most research on information literacy among tourism management of undergraduate students, followed by digital literacy, and then media literacy. Among them, research on the information literacy of tourism management of undergraduate students mainly focuses on current situation surveys, evaluation systems, training strategies, training models, etc.

In summary, the discussion of digital literacy at home and abroad is still a current research hotspot. Foreign research on digital literacy covers a wide range of areas, with diverse research objects, targeted and scientific research methods, and high authority of research institutions. Domestic research on digital literacy still needs to be strengthened. From the perspective of research objects, it is mostly concentrated on teachers, college students, librarians, etc., and has not yet involved students in a certain major. There are very few domestic research documents on the digital literacy of tourism management of undergraduate students. It can be seen that research on digital literacy in the field of tourism management is very scarce, and it is necessary to pay attention to the development of digital literacy among

tourism management of undergraduate students. Judging from the research content, it mainly focuses on the use of digital technology and the discussion of learning from foreign experience, and there is a lack of research on digital literacy evaluation. Based on existing research, the following implications can be drawn:

1. Digital literacy has become one of the essential skills for learners in the digital age. Digital literacy should be understood in depth from both practical and critical aspects.

2. Regarding the connotation of digital literacy for tourism management of undergraduate students, it should be based on the current social background and reasonable and feasible theoretical basis, and its inherent essence and connotation should be comprehensively analyzed from a multi-dimensional perspective.

3. It is necessary to study the digital literacy evaluation model for tourism management of undergraduate students, analyze its components and the internal logic between the components, develop and cultivate the digital literacy of tourism management of undergraduate students in a targeted manner, and apply it to the evaluation and education of digital literacy of tourism management of undergraduate students.

4. From the perspective of applied practice, test the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students, and reveal the current digital literacy level of tourism management of undergraduate students, so as to put forward targeted suggestions.

Chapter 3
Research Methodology

In order to develop a digital literacy evaluation model for tourism management of undergraduate students, the entire research was divided into three phases. Details are as follows:

The first phase is to answer research objective1: to extract the components of digital literacy of tourism management of undergraduate students.

The second phase is to answer research objective2: to develop a digital literacy evaluation model for tourism management of undergraduate students.

The third phase is to answer the research objective3: to verify the digital literacy evaluation model for tourism management of undergraduate students.

The first phase is to answer research objective 1: to extract the components of digital literacy of tourism management of undergraduate students

The research steps of the first phase are shown in Figure 3.1 below:

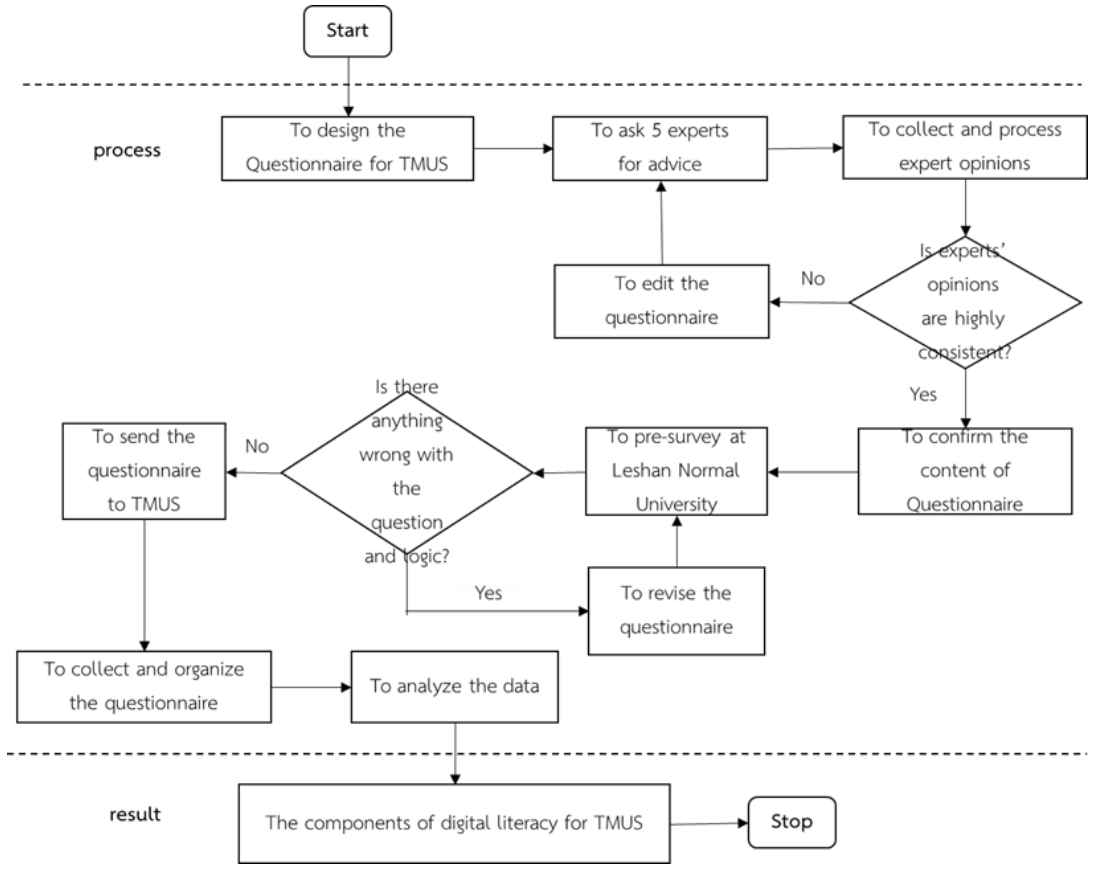

Figure 3.1 The process of extracting the components of digital literacy of tourism management of undergraduate students (TMUS)

Research Steps

1. To design a questionnaire on digital literacy for tourism management of undergraduate students.

2. To send the questionnaire to five experts to solicit their opinions.

3. To collect and process expert opinions using the Index of Item-Objective Congruence (IOC) and the rating scale. If the consistency of expert opinions is not high, the questionnaire will be modified and resent to the experts. If the consistency of expert opinions is high, the content of the questionnaire will be determined.

4. To conduct a pre-survey at Leshan Normal University and analyze the survey data. If there are errors in the questions and logic, revise them. If there are no questions, a formal questionnaire will be finalized.

5. To submit the formal questionnaire to Questionnaire Star on the internet, and send the address link of the questionnaire to 1,308 tourism management of undergraduate students via WeChat or QQ communication app.

6. To collect and process data.

7. To analyze the data using statistical software.

8. To extract the components of digital literacy of tourism management of undergraduate students.

The population / Sample Group

The population

The tourism management of undergraduate students in China. According to incomplete statistics, there are approximately 156,000 tourism management of undergraduate students.

The Sample Group

According to standard sample size formula $n = \frac{z^2(pq)}{e^2}$ (n=the sample size, z=standard error associated with the chosen level of confidence (typically, 1.96), p=estimated percent in the population, q=100-p, e=acceptable sample error expressed as a percent), If the size of the population is larger,385 respondents are needed. The sample group identified for this research was 1,308 students. It will be used Stratified Sampling here. There are 430 students in the eastern region, 417 students in the central region, 402 students in the western region, and 59 students in the north-east region. There are 536 students located in provincial capital cities and 772 students from non-provincial capital cities. There are 355 freshmen, 326 sophomores, 318 juniors, and 309 seniors. Such samples are more representative and have smaller sampling errors.

Research Instruments

1.The questionnaire on digital literacy for tourism management of undergraduate students

2. Statistical software

Designing instrument

The questionnaire on digital literacy for tourism management of undergraduate students

1. Study the literature related to the components of digital literacy of tourism management of undergraduate students.

2. Design a questionnaire on digital literacy of tourism management of undergraduate students.

3. Present the draft of questionnaire to the adviser for checking correctness and completion.

4. Assess the validity of questionnaire on digital literacy education needs for tourism management of undergraduate students by 5 experts through the Index of Item-Objective Congruence (IOC) according to the criteria shown below. (Phongsi, 2008, p.1951)

+1=Sure that the contents are related to the topic

0=Not Sure that the contents are related to the topic

-1=The contents are not related to the topic

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures.

The process of using the expert: determine the purpose and scope of the questionnaire, invite experts, provide questionnaires and guidance, collect feedback, analyze feedback, and revise the questionnaire.

Qualifications of the expert: Academic research experience and practical experience in the fields of university education, computer science, etc., preferably a PhD or equivalent, and at least 10 years of work experience. The detailed information of the five experts is shown in Appendix A.

5. Design Likert 5-points rating scale questionnaire on the following score rating criteria.

Score rating criteria

1 means completely inappropriate

2 means somewhat inappropriate

3 means neutral

4 means somewhat appropriate

5 means completely appropriate

6. The specific contents of the questionnaire are shown in Appendix C1.

Statistical Software

1. Analyze the questionnaire data through the KMO(Kaiser-Meyer-Olkin) value and Bartlett's sphericity test, and determine whether the questionnaire sample is suitable for factor analysis based on the analysis results.

2. The KMO value is used to judge the validity of the questionnaire: if the KMO value is higher than 0.8, the validity is high; between 0.7-0.8, the validity is good; between 0.6-0.7, the validity is acceptable; if it is less than 0.6 indicates poor validity; when the KMO value is <0.5, it indicates that the factor analysis method is not suitable.

3. Bartlett's sphericity test is used to determine whether each domain is suitable for factor analysis. If the indicators are independent of each other, the common factor cannot be extracted, and factor analysis cannot be performed. When the significance (p value) in Bartlett's sphericity test is <0.05, it means that the data is spherically distributed and has the quality for factor analysis.

Data Collection

1. Ask for permission for data collection.

2. Publish the questionnaire on the Questionnaire Star on the Internet.

3. Send the address link of the questionnaire to 1,308 students by WeChat or QQ communication app.

4. Collect data through the Questionnaire Star.

Data Analysis

Use statistical software to analyze the questionnaire. Data analysis is quantitative analysis plus content analysis, and the statistical values in data analysis are percentages.

The KMO test and Bartlett's sphericity test in statistical software were used to analyze the questionnaire data, and based on the analysis results, it was determined whether the questionnaire sample was suitable for factor analysis.

$$KMO = \frac{\sum\sum_{i \neq j} r_{ij}^2}{\sum\sum_{i \neq j} r_{ij}^2 + \sum\sum_{i \neq j} \alpha_{ij}^2} \quad (1)$$

In the formula, r_{ij} is the simple correlation coefficient between variable x_i and variable x_j and a_{ij} is the partial correlation coefficient between variable x_i and variable x_j after controlling the remaining variables.

$$Bartlett = (k-1)\, ln(S^2) - \sum \left[\frac{ln(S_i^2)}{n_i - 1} \right] \quad (2)$$

In the formula, k represents the number of populations, S^2 represents the combined variance of all samples (estimated variance of the population), S_i^2 represents the sample variance of each population, and n_i represents the sample size of each population.

Expected Output Phase1

The components of digital literacy of tourism management of undergraduate students.

The second phase is to answer research objective 2: to develop a digital literacy evaluation model (DLE) for tourism management of undergraduate students

The research steps of the second phase are shown in Figure 3.2 below:

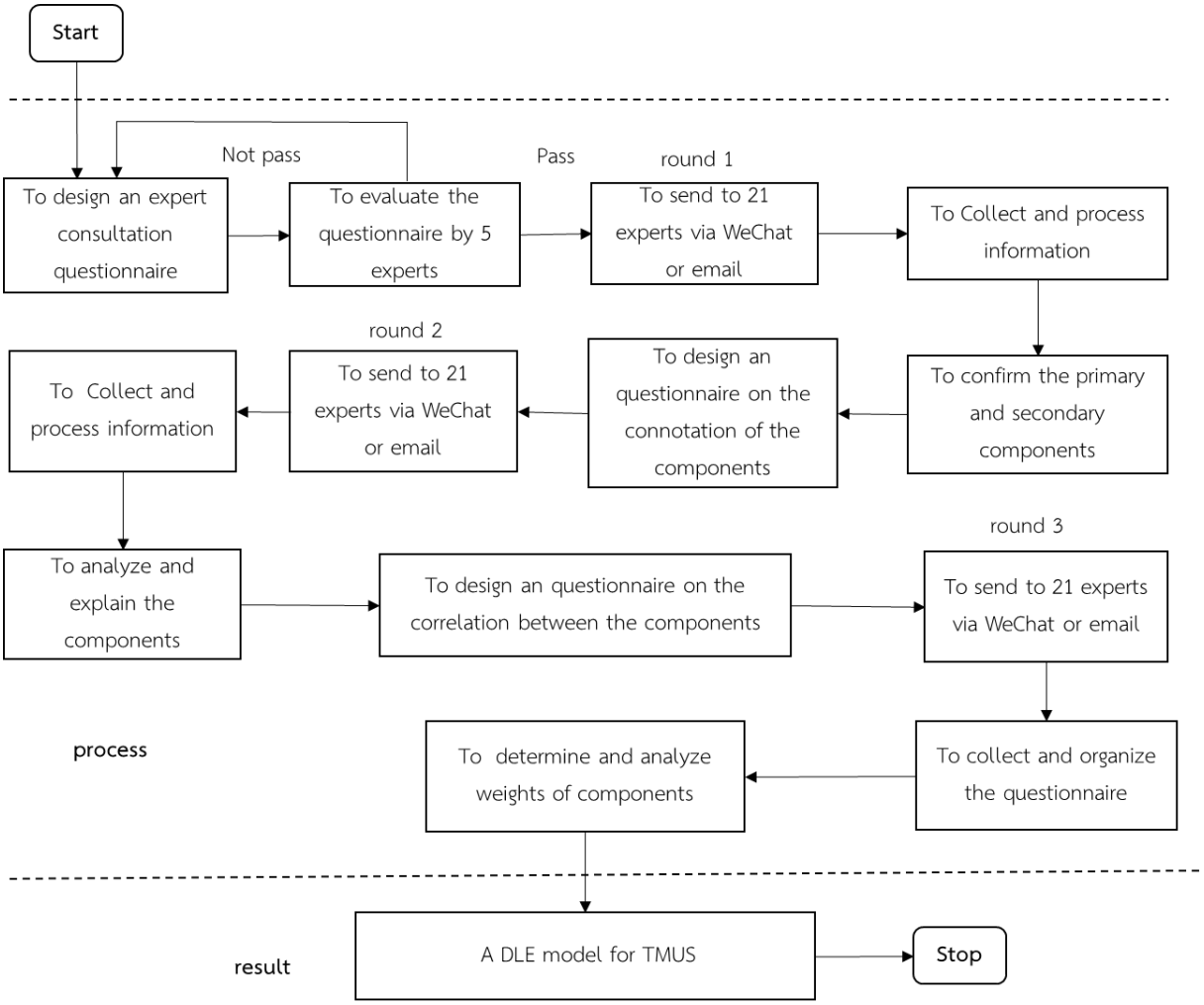

Figure 3.2 The process of developing a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students (TMUS)

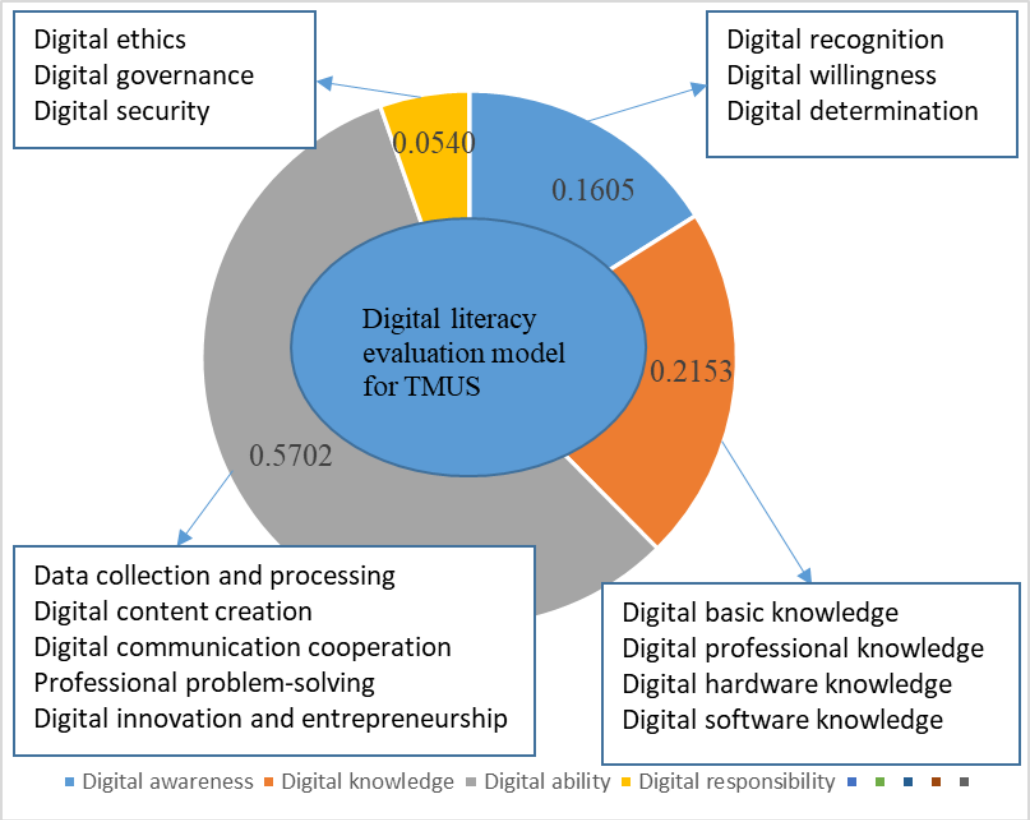

Figure 3.3 The Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students (TMUS)

As can be seen from the Figure 3.3, this model includes 4 first-level components and 15 second-level components. In this model, the first-level components reflect an independent but connected organic whole, while the second-level components are key capabilities for tourism management of undergraduate students learning and future career development, and have strong organizational logic. In addition, the model also shows the importance of each component, indicating which abilities and characteristics of tourism management of undergraduate students should be focused on in higher undergraduate education. Tourism management of undergraduate students can improve its digital literacy level in a sequential and focused manner based on actual needs and its own shortcomings to adapt to the development of the digital age.

How to use the Digital Literacy Evaluation (DLE) model:

1. Clearly define the aspects and objectives of digital literacy among tourism management of undergraduate students that you wish to evaluate.

2. Determine the evaluation method to be used based on the selected model and goals. Including methods such as questionnaires, tests, project evaluations, self-evaluations, and observations.

3. Develop specific evaluation tools based on the selected evaluation method. If you choose to use a questionnaire survey, you will need to design and compile the relevant questionnaire.

4. When conducting an evaluation, collect data and record relevant information.

5. Use statistical analysis tools and methods to process and analyze collected data.

6. Interpret evaluation results and compare them with pre-set goals and standards.

7. Provide feedback to the audience on evaluation results and provide suggestions for improvements as needed.

8. Develop specific training program of digital literacy based on evaluation results and feedback.

9. Regularly monitor and evaluate digital literacy levels to ensure the effectiveness of training program.

Research steps

1. To be based on the results of the first phase of the research, design an expert consultation questionnaire for teachers.

2. To send the questionnaire to five experts (professor, or PhD) to solicit their opinions.

3. To collect and process expert opinions. If the consistency of expert opinions is not high, the questionnaire will be modified and resent to the experts. If the consistency of expert opinions is high, the content of the questionnaire will be determined.

4. To send the questionnaire to 21 experts via email(round1).

5. To collect and process the information from the expert questionnaire, conduct consistency analysis, and determine the primary and second-level components if the expert consistency is relatively high.

6. To design an expert consultation questionnaire based on the content of the components and send it to 21 experts via email (round 2).

7. To collect and process information from expert questionnaires and conduct reliability analysis.

8. To analyze and explain the components and construct an evaluation model of digital literacy for tourism management of undergraduate students.

9. To be based on the components of the model, prepare an expert consultation questionnaire on the correlation between the components and send it to 21 experts via email (round 3).

10. To collect and process information from expert questionnaires, determine the weights of first-level and second-level components, and analyze the weights to form the final digital literacy evaluation model for tourism management of undergraduate students.

The population / Sample Group

The population

The full-time teachers of higher education institutions in China. According to data from the Chinese Ministry of Education, there are 1,272,996 full-time teachers as of 2021.

The Sample Group

It will be used judgment sampling here, 21 teachers from 12 universities who are engaged in teaching and research in related fields such as university education, computer science, and tourism management. Eligible for the following conditions:

1. Work experience: Engaged in university education, computer science, tourism management and related work for at least 10 years.

2. Educational requirements: Master's degree or above.

3. Professional title requirements: associate professor and above.

4. Cooperation: interested in this research and able to actively participate in consultation.

Research Instruments

1. Expert Consultation Questionnaire
2. DEL Model
3. Microsoft Excel
4. Statistical Software
5. Super Decisions

Designing instrument

Expert Consultation Questionnaire

1. Study the literature related to the digital literacy evaluation model for tourism management of undergraduate students.

2. Design three questionnaires:

Consultation on the components of digital literacy for tourism management of undergraduate students (round 1).

Consultation on the components of digital literacy for tourism management of undergraduate students (round 2).

Consultation on the weight of digital literacy components for tourism management of undergraduate students (round 3).

3. Present the draft of questionnaire to the adviser for checking correctness and completion.

4. Assess the validity of questionnaire on digital literacy for tourism management of undergraduate students by 5 experts (professor, or PhD) through the Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsi 2008, p.1951).

+1=Sure that the contents are related to the topic

0=Not Sure that the contents are related to the topic

-1=The contents are not related to the topic

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures.

5. Design Likert 5-points and 9-points rating scale questionnaire on the following score rating criteria.

Score rating criteria for consultation on the components of digital literacy for tourism management of undergraduate students.

1 means extremely unimportant

2 means not important

3 means important

4 means relatively important

5 means very important

Score rating criteria for consultation on the weight of digital literacy components for tourism management of undergraduate students. The analytic network process is used to determine the weight of each indicator, and experts are invited to compare the importance of indicators at all levels developed by this research in pairs. They make judgments based on their actual experience and unique opinions. The more it is to the left, the indicator on the left is more important, and the more it is to the right, the indicator on the right is more important.

6.The specific contents of the expert consult questionnaire are shown in Appendix C2, C3, C4, andC5.

DEL Model

1. Conducted a needs analysis on digital literacy of tourism management of undergraduate students, and based on the highly authoritative digital literacy competency framework at home and abroad, and based on the principles of building a digital literacy evaluation model, initially extracted the components and descriptions of TMUS digital literacy.

2. Two rounds of questionnaire-style expert consultation were carried out using the Delphi method. On the premise of ensuring the reliability and consistency of the expert consultation questionnaire, the preliminary constituent elements and their descriptions were repeatedly deleted and improved to obtain the first-level constituent elements. and second-level components.

3. The components of digital literacy of tourism management of undergraduate students were explained in detail, and a digital literacy evaluation

model for tourism management of undergraduate students with high credibility and authority that was oriented towards the development of the digital era was constructed.

4. The Analytic Network Process was used to determine the weight values of the components of digital literacy for higher vocational students, and the digital literacy evaluation model for tourism management of undergraduate students was further revised and improved to obtain the final digital literacy evaluation model for higher vocational students.

Microsoft Excel

Use the Microsoft Excel to perform basic analysis and processing on the data from the expert consultation questionnaires collected twice, and calculate the average, full score rate, standard deviation, median, mode, upper quartile (Q+), and lower quartile (Q-) and four-point difference (Q+-Q-) are used to analyze the degree of concentration of opinions in expert consultation.

The average value reflects the importance of each component. The larger the average value M, the more important the component is. The importance percentage of the component must reach 75% or above, meaning that M is greater than or equal to 3.75. Standard deviation (S. D) and four-point difference (Q+ - Q-) determine the degree of consistency. The higher the standard deviation, the lower the degree of consistency of expert opinions. If it is less than 1, it means that the component is consistent; the four-point difference is the difference between the upper quartile and the lower quartile of each component. The larger the value, the more dispersed the expert opinions are, and the opposite means the more concentrated the expert opinions are. The questionnaire is a 5-point scale, so when the four-point difference of the defined component is less than or equal to 1, it means that the expert group's opinions are highly consistent; if the four-point difference is between 1 and 2, it is judged that the expert group's opinions are moderately consistent. The full score rate, median and mode can also reflect the degree of consistency of experts' opinions on the constituent elements to a certain extent.

Statistical Software

After non-parametric testing in statistical software, the coordination coefficient table of the two rounds of expert consultation opinions was calculated. The value range of Kendall's coordination coefficient (W) is between 0 and 1. The closer the value is to 1, the higher the degree of expert consistency. Here it is necessary to compare the expert coordination coefficient of the second round with the expert coordination coefficient of the first round, and then determine whether the results of the two rounds of surveys are highly consistent and whether the survey results are desirable.

It is also necessary to judge the expert's authority coefficient. The expert's authority coefficient (Cr) is the arithmetic average of the expert's basis for judging the content to be evaluated (Ca) and the expert's familiarity with the problem (Cs), that is, Cr = (Ca + Cs)/2.

Super Decisions

The Analytical Network Process (ANP) was used to construct the correlation structure and hierarchy among the components of digital literacy for tourism management of undergraduate students, and the relative weight of each element of digital literacy for tourism management of undergraduate students was determined with the help of Super Decisions software.

1. Enter the first-level component (Cluster) and the second-level component (Node) into the Super Decisions software, and edit the network layer indicators based on the association of digital literacy components for tourism management of undergraduate students to form a relationship between elements and element sets as shown in the figure. association diagram.

2. By sorting out the weighted consultation data of 21 experts, 4 judgment matrices (4 first-level components) were obtained. Input the obtained judgment matrix data into the software and conduct a consistency check. When the consistency C.R. is less than 0.1, it means that the consistency of the judgment matrix is acceptable.

3. After all judgment matrices are constructed, the unweighted supermatrix and weighted supermatrix are calculated directly by the software.

4. In order to further understand the influence relationship between elements, perform stability processing on the matrix and calculate the limit matrix of the weighted matrix.

5. Derive the weight values of the second-level components in the Super Decisions software, calculate the weights of the first-level components from the weights of the second-level components, and obtain the final weights of the digital literacy components for tourism management of undergraduate students.

Data Collection

1. Seek consent from 21 experts.

2. Send the expert consultation questionnaire to 21 experts via email.

3. Collect data via email.

Data Analysis

Data analysis is quantitative analysis plus content analysis, and the statistical values in data analysis are percentages.

The consistency index in the Analytical Network Process (ANP) is used to measure the consistency in the judgment matrix. The formula for calculating CI is as follows:

$$CI = \frac{\lambda - n}{n-1} \quad (3)$$

Among them, λ is the maximum eigenvalue of the judgment matrix, and n is the order of the judgment matrix (that is, the number of factors). The consistency ratio is used to compare the CI with the random consistency index (RI) to determine whether the judgment matrix is consistent enough. CR is calculated as follows:

$$CR = \frac{CI}{RI} \quad (4)$$

RI can be searched in predefined tables based on problem size.

If CR is less than a certain preset threshold (usually 0.10), the pairwise comparison matrix is considered to have reasonable consistency, otherwise the pairwise comparison needs to be reexamined and modified.

Expected Output Phase2

The digital literacy evaluation model for tourism management of undergraduate students.

The third phase is to answer the research objective 3: to verify the digital literacy evaluation model (DLE) for tourism management of undergraduate students

The research steps of the third phase are shown in Figure 3.4 below:

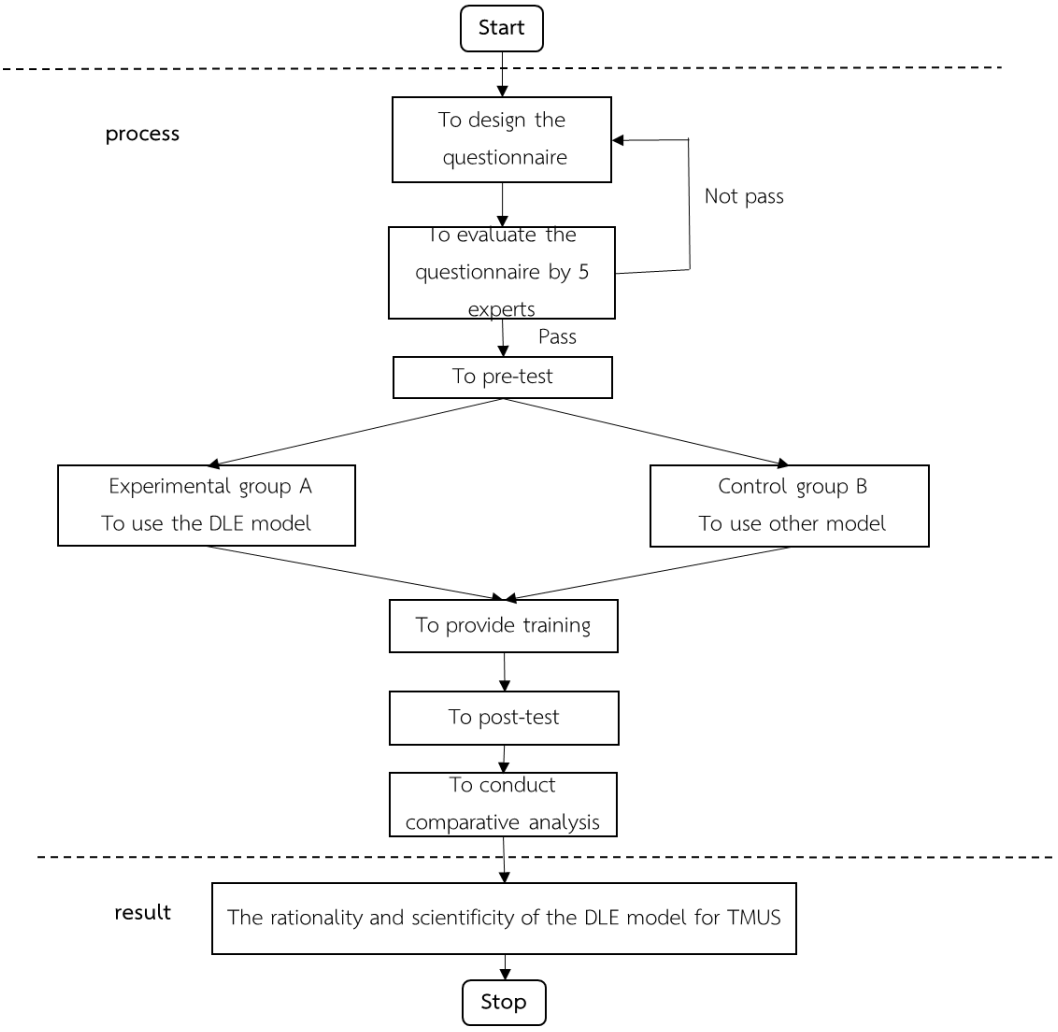

Figure 3.4 The process of verifying the components of digital literacy of tourism management of undergraduate students

Research steps

1. To design a digital literacy evaluation questionnaire for tourism management of undergraduate students.

2. To send the questionnaire to five experts to solicit their opinions.

3. To collect and process expert opinions using the Index of Item-Objective Congruence (IOC) and the rating scale. If the consistency of expert opinions is not high, the questionnaire will be modified and resent to the experts. If the consistency of expert opinions is high, the content of the questionnaire will be determined.

4. To select the tourism management of undergraduate students from Class 1 and Class 2, Grade of 2022, at Leshan Normal University and to measure the digital literacy levels of these two classes.

5. To select Class 1 as the experimental group and will use the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students. To Select Class 2 is the control group and will use another model. To provide digital literacy training to the experimental group and control group.

6. After the training, a test paper is to be conducted on the experimental group and the control group. Then to compare the mean scores of the two groups.

7. To measure the digital literacy levels of the two groups of students using a digital literacy evaluation questionnaire for tourism management of undergraduate students.

8. To use statistical methods to compare the digital literacy evaluation results of the experimental group and the control group to determine the effect of digital literacy training.

9. To verify the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students.

The population / Sample Group

The population

The 493 undergraduate students of tourism management at Leshan Normal University.

The Sample Group

It will be used cluster sampling here, select 70 tourism management of undergraduate students of Leshan Normal University who have similar levels of digital literacy and potential for improvement. They are from Class 1 and Class 2 of the 2022 grade. Class 1 (34 students) is the experimental group, and Class 2 (36 students) is the control group.

Research Instruments

1. Digital Literacy Questionnaire for Tourism Management of Undergraduate Students

2. Training Program

3. Test Paper

Designing instrument

Digital Literacy Questionnaire for Tourism Management of Undergraduate Students

1. Study the digital literacy evaluation model for tourism management of undergraduate students.

2. Design a digital literacy questionnaire for tourism management of undergraduate students.

3. Present the draft of questionnaire to the adviser for checking correctness and completion.

4. Assess the validity of questionnaire on digital literacy education needs for tourism management of undergraduate students by 5 experts through the Index of Item-Objective Congruence (IOC) according to the criteria shown below. (Phongsi 2008, p.1951)

+1=Sure that the contents are related to the topic

0=Not Sure that the contents are related to the topic

-1=The contents are not related to the topic

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures.

5. Design Likert 5-points rating scale questionnaire on the following score rating criteria.

Score rating criteria

1 means completely inappropriate

2 means somewhat inappropriate

3 means neutral

4 means somewhat appropriate

5 means completely appropriate

6. The specific contents of the questionnaire are shown in Appendix C6.

Training Program

1. Research training programs for relevant digital literacy.

2. Design two training programs, one for the experimental group and the other for the control group. The main contents include training objectives, training outline, training methods and evaluation methods.

3. Present the training programs to 5 experts (professor or PhD.) for checking correctness and completion.

4. Assess the validity of the training programs by 5 experts (professor or PhD.) through the Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsi 2008, p.1951).

+1=Sure that the contents are related to the topic

0=Not Sure that the contents are related to the topic

-1=The contents are not related to the topic

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures.

5. Conduct a try-out of the training programs in the experimental group and the control group respectively. For details, see the experiment section in Chapter 4.

6. The specific contents of the training program for the experimental group and the control group are shown in Table 4.47 and Table4.49.

Test Paper

1. Study standards for relevant test paper.

2. Design a test paper for tourism management of undergraduate students.

3. Present the draft of test paper to 5 experts (professor or PhD.) for checking correctness and completion.

4. Assess the validity of test form by 5 experts through the Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsi 2008, p.1951).

+1=Sure that the contents are related to the topic

0=Not Sure that the contents are related to the topic

-1=The contents are not related to the topic

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures.

5. The specific contents of the test paper are shown in Appendix C10.

Data Collection

1. Ask for permission for data collection.

2. Collect students' data by using the DLE model.

Data Analysis

1. Categorize students' performance according to test paper.

2. Use the statistical software for relevant statistical analysis. First, the one-sample t-test is performed, and the mean value after the test is compared with the test value before the experiment to see if there is a significant difference. Then independent sample t-test is performed. Compare group A with group B and group A with group C. Determine if there is a significant difference in their means. The formula for the t-test is as follows:

$$T = \frac{(\bar{X}_1 - \bar{X}_2)}{SE} \quad (5)$$

$$SE = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}} \quad (6)$$

Among them, n_1 and n_2 are the sample sizes of sample 1 and sample 2 respectively.

The means of the two samples are $\bar{X}_1$ and $\bar{X}_2$ respectively.

The standard deviations of the two samples are S_1 and S_2 respectively.

Expected Output Phase3

The rationality and scientificity of the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate student.

Chapter 4

Result of Analysis

This research was to study the digital literacy evaluation model for tourism management of undergraduate students. The objectives of this research were as follows: 1) to extract the components of digital literacy of tourism management of undergraduate students, 2) to develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students, and 3) to verify the of the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students. This chapter describes and analyzes the research results in detail. The data analysis result can be presented as follows:

1. Symbol and abbreviations
2. Presentation of data analysis
3. Results of data analysis

The details are as follows.

Symbol of Abbreviations

N	refers to population
$\overline{X}$	refers to mean
S.D.	refers to standard deviation
χ^2	refers to chi-square value
α	refers to significance level

Presentation of data analysis

This research mainly uses quantitative and qualitative research methods to analyze data, including questionnaire method, Delphi method, and experimental method. The research includes the following three main parts:

Part 1: Analysis results serving objective 1-To extract the components of digital literacy of tourism management of undergraduate students.

Part 2: Analysis results serving objective 2-To develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students.

Part 3: Analysis results serving objective 3-To verify the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students.

Results of data analysis

Analysis results serving objective 1-To extract the components of digital literacy of tourism management of undergraduate students

This section presents analysis results serving objective 1 using tables, figures, and description in terms of mean, standard deviation, significance level, etc. After that, items of all factors are presented likewise.

Basic information of tourism management of undergraduate students

A questionnaire method was utilized in this section, The name of the questionnaire is “Questionnaire on digital literacy for tourism management of undergraduate students” (see Appendix C1 for details). with the assistance of social tools such as WeChat and QQ communication app. Questionnaires were distributed to some universities through Questionnaire Star (A very famous online questionnaire website) in China, with a total of 1324 copies distributed. The collected questionnaires were screened, and 16 invalid questionnaires were removed. Invalid questionnaires were identified based on duplicate questionnaires or filling time less than 60 seconds. Ultimately, 1,308 valid responses were obtained. Table 4.1 displays the demographic variables of the survey respondents. The results present fundamental information about the survey sample in this research.

Table 4.1 Sample basic information distribution table (N=1,308)

Statistical factors	Options	Number of students	Percentage
Gender	Male	627	47.94
	Female	681	52.06
Nationality	Han nationality	1152	88.07
	Ethnic minority	156	11.93
Place of birth	Rural area	692	52.91
	Town	616	47.09
Grade	Freshman year	355	27.14
	Sophomore year	326	24.92
	Junior year	318	24.31
	Senior year	309	23.63
The university is	Double first-class university	60	4.59
	Ordinary university	1248	95.41
The university is located in	Provincial capital city	536	40.98
	Non-provincial capital city	772	59.02
The university is located in China	East	430	32.87
	Central	417	31.88
	West	402	30.73
	North-east area	59	4. 52
Personal computer	Have	1225	93.65
	None	83	6.35

Regarding gender, there are 627 boys and 687 girls. There is not much difference in the number. In terms of ethnic groups, there are 1,152 Han students and only 156 ethnic minorities. There is a big difference in numbers. From the perspective of students' place of origin, there are 692 students in rural areas, accounting for 52.91%; and 616 students in urban areas, accounting for 47.09%. There is not much difference in the number. In terms of grades, freshmen have the largest number of students (355), followed by sophomores (326), juniors (318), and seniors (309), with four grades. The number of students is close. Judging from the universities where they are located, there are only 60 students in “double first-class” universities and 1,248 students in ordinary universities. There is a big difference in the number of students. Judging from the city where the university is located, there are 536 students located in provincial capital cities, accounting for 772 students from non-provincial capital cities, accounting for 59.02%.Looking at which region of China the university is located in, there are the most students from the east, with 430 students, followed by students from the central region, with 417 students, followed by students from the west, with 402 students, and the smallest number is from the northeastern region, with 76 students. The number of students in the eastern, central and western regions is similar, allowing for comparative analysis. There are too few students in the Northeast region to conduct comparative analysis. In terms of having a computer, only 83 students accounting for 6.35%, do not have a personal computer.

Analysis of reliability and validity

Reliability is the reliability of measurement data and is used to detect whether the indicators of the items in the scale can reflect a certain characteristic of the respondent. In this stage of the research, the more common Cronbach 's Alpha coefficient was used, and statistical software was used to measure the reliability of the questionnaire. Here we mainly analyze the reliability and validity of questions 14-31 (18 questions in total), because these questions are scale questions.

The interval value of Cronbach's Alpha is 0-1. It is generally considered that the coefficient is excellent when it is above 0.8, the reliability is good when it is 0.7-0.8, the reliability is acceptable when it is 0.6-0.7, and the reliability is poor when it is

less than 0.6. The reliability analysis result of this questionnaire, Cronbach's Alpha, is 0.982 (see Table 4.2), which shows excellent reliability, indicating that the results measured using this questionnaire have very high reliability.

Table 4.2 Reliability statistics

Cronbach Alpha	Based on standardized terms Cronbach Alpha	Number of items
.981	.982	18

This research used KMO and Bartlett's test of sphericity (Bartlett) to test the validity of the questionnaire. The KMO index value is between 0 and 1. The KMO value must be at least 0.6 for data analysis. A value above 0.8 indicates the quantity. Tables are very suitable for data analysis, and Bartlett's test of sphericity can be used for data analysis as long as the significance level is less than 0.05. According to Table 4.3, it can be seen that the KMO value is 0.972, the Bartlett sphericity test statistic is 35898.736 (degrees of freedom is 153), and the corresponding significance probability is 0.000. The questionnaire has good validity and is suitable for data analysis.

Table 4.3 KMO and Bartlett test

KMO sampling suitability quantity		**.972**
Bartlett's test of sphericity	Approximate chi-square	35898.736
	Degrees of freedom	153
	Significance	.000

Analysis of the current situation of digital literacy of tourism management of undergraduate students

Table 4.4 Average daily usage time of digital media

Options	Frequency	Percentage
A. 0 ≤ X < 3 hours	151	11.54
B.3 ≤ X<6 hours	548	41.90
C.6 ≤ X<9 hours	410	31.35
D. ≥ 9 hours	199	15.21
Total	**1308**	**100.00**

As can be seen from Table 4.4, Among tourism management of undergraduate students, 548 students use digital media for more than 3 hours and less than 6 hours per day, accounting for 41.90%, the largest proportion. The least is 0≤X<3 hours, accounting for 11.54%.

Table 4.5 The main purpose for using digital media

Options	Response		Cases of Percentage
	Number of cases	Percentage	
A. Academic needs	1045	24.35	79.89
B. Social interaction	1091	25.43	83.41
C. Recreation and entertainment	1160	27.03	88.69
D. to kill time	711	16.57	54.36
E. Others	284	6.62	21.71
Total	**4291**	**100.00**	**328.06**

As can be seen from Table 4.5, tourism management of undergraduate students accounted for the highest proportion of using digital media for recreation and entertainment, with 1,160 students, and the cumulative proportion reached 88.69%, followed by social interaction, and then academic needs.

Table 4.6 The preference when retrieving information

Options	Response		Cases of Percentage
	Number of cases	Percentage	
A. Search engines such as Baidu, Sogou, and Microsoft Bing	1224	35.40	93.58
B. China National Knowledge Infrastructure and websites in library	612	17.70	46.79
C. Social platforms such as WeChat, Weibo, and Xiaohongshu	1087	31.43	83.10
D. Professional forum	282	8.16	21.56
E. Others	253	7.32	19.34
Total	**3458**	**100.00**	**264.37**

As can be seen from Table 4.6, 1,224 tourism management of undergraduate students use search engines such as Baidu, Sogou, and Microsoft Bing to retrieve information, with the cumulative proportion reaching 93.58 %, followed by WeChat, Weibo, and Xiaohongshu.

Table 4.7 The main functions for social media

Options	Response		Cases of Percentage
	Number of cases	Percentage	
A. Browse	1233	31.17	94.27
B. Praise	863	21.81	65.98
C. Comments	656	16.58	50.15
D. Forward	441	11.15	33.72
E. Original creation	398	10.06	30.43
F. Others	365	9.23	27.91
Total	**3956**	**100.0**	**302.4**

As can be seen from Table 4.7, 1,233 tourism management of undergraduate students use social media. In addition to communication, they mainly use the browsing function, and the cumulative proportion is 94.27%.

Table 4.8 Ways to improve digital literacy

Options	Response		Cases of Percentage
	Number of cases	Percentage	
A. Official school curriculum	1009	25.35	77.14
B. Training	468	11.76	35.78
C. Lecture	592	14.87	45.26
D. Ask others for advice	746	18.74	57.03
E. Self-study	888	22.31	67.89
F. Others	277	6.96	21.18
Total	**3980**	**100.0**	**304.28**

It can be seen from Table 4.8 that 1,009 tourism management of undergraduate students improved their digital literacy through the formal courses while in university, with the cumulative proportion reaching 77.14%.

Analysis of digital literacy education for tourism management of undergraduate students

Table 4.9 Provide information application technology courses

Options	Frequency	Percentage
A. Have opened	1212	92.66
B. Not opened	34	2.60
C. Not sure	62	4.74
Total	**1308**	**100.00**

It can be seen from Table 4.9, 92.66% of students said that they have had information courses in university.

Table 4.10 Nature of information application technology courses

Options	Frequency	Percentage
A. Compulsory courses	1030	78.75
B. Elective courses	252	19.27
C. Lecture format	15	1.15
D. Not opened	11	0.84
Total	**1308**	**100.00**

As can be seen from Table 4.10, 78.75% of students pointed out that the information courses offered are compulsory courses, and 19.27% of students pointed out that the information courses offered are elective courses.

Table 4.11 Information application technology courses help professional learning or life

Options	Frequency	Percentage
A. Very helpful	742	56.73
B. It's helpful to a certain extent	511	39.07
C. Not very helpful	46	3.52
D. Not helpful	9	0.69
Total	**1308**	**100.00**

It can be seen from Table 4.11 that when asked whether the basic information courses offered are helpful to professional study or work life, 56.73 % of students thought it was very helpful, 39.07 % thought it was somewhat helpful, and thought it was not very helpful or not helpful at all. Only 3.52% and 0.69% helped.

Table 4.12 The teacher will interestingly guide you in the course to use online information to serve your learning

Options	Frequency	Percentage
A. Often	831	63.53
B. Occasionally	437	33.41
C. Rarely	31	2.37
D. Never	9	.69
Total	**1308**	**100.00**

As can be seen from Table 4.12, when asked about teachers' conscious guidance to use online information to serve learning in class, 63.53% of students chose often, but 33.41% chose occasionally. It seems that the teacher needs to provide more guidance.

Table 4.13 It is necessary to carry out digital literacy education

Options	Frequency	Percentage
A. Very necessary	1203	91.97
B. Dispensable	93	7.11
C. No need	12	.92
total	**1308**	**100.00**

As can be seen from Table 4.13, 91.97 % of students hope that university and relevant department will carry out digital literacy education to improve their professional and future employment competitiveness.

When asked about the content that should be added to information courses to prepare for future studies and work, students have varying opinions. However, a word cloud diagram (Figure 4.1) shows that certain words such as 'course', 'computer', 'major', and 'information' appear most frequently. This suggests that most students hope to enhance their knowledge of information technology, computer applications, and majors through courses. Secondly, students often prioritize words such as 'practice', 'technology', and 'skills'. They hope to take courses that align with future employment in the tourism industry and develop the ability to adapt to their jobs. The knowledge and skills that are highly relevant to work and office software are what most students hope to acquire.

Figure 4.1 Word cloud diagram of digital literacy education needs for tourism management of undergraduate students

Analysis of the digital literacy needs of tourism management of undergraduate students

Descriptive statistical analysis

Table 4.14 Descriptive statistics of means

	N	$\overline{X}$	S.D.	Skewness		Kurtosis	
				statistics	standard error	statistics	standard error
Average value	1308	3.6780	.86437	.420	.068	.041	.135
Valid cases	1308						

The mean score of digital literacy of 1,308 tourism management of undergraduate students is $\overline{X}$=3.678, and the standard deviation S.D.=0. 864. It can be seen from Table 4.14 that the skewness of the data obtained in this research is -0.420 and the kurtosis is 0.041. It is generally believed that the absolute value of skewness is less than 3 and the absolute value of kurtosis is less than 10, indicating that the sample basically belongs to a normal distribution and can be analyzed in the next step. Therefore, the data in this research basically conform to the overall distribution.

Table 4.15 The score ranking of digital literacy level among tourism management of undergraduate students

Question	N	$\overline{X}$	S. D	Ranking
Q29	1308	3.93	1.069	1
Q28	1308	3.91	1.064	2
Q31	1308	3.86	1.053	3
Q30	1308	3.84	1.040	4
Q15	1308	3.78	1.003	5
Q14	1308	3.77	0.980	6
Q16	1308	3.73	0.976	7
Q17	1308	3.72	0.959	8
Q18	1308	3.71	0.961	9
Q24	1308	3.63	0.960	10
Q25	1308	3.62	0.959	11
Q23	1308	3.56	0.957	12
Q19	1308	3.54	0.976	13
Q26	1308	3.54	0.965	14
Q27	1308	3.54	0.974	15
Q20	1308	3.53	0.970	16
Q21	1308	3.53	0.972	17
Q26	1308	3.54	0.965	14

The average level of digital literacy of 1,308 tourism management of undergraduate students ranges from 3.46 to 3.93. Sorting from high to low according to the mean score, as shown in Table 4.15, the top three are Q29, Q28, and Q31, and the bottom three are Q22, Q21, and Q20. The top three questions are related to digital social responsibility, which shows that tourism management of undergraduate students can abide by Internet laws and regulations, regulate online behavior, and use the Internet to spread positive energy. The bottom three questions are related to digital technology knowledge and skills, indicating that tourism management of

undergraduate students still need to improve their mastery of the use of digital learning-related equipment, systems, and software in the field of tourism management.

Table 4.16 Average correlation analysis

	Options	$\bar{X}$	N	S.D.	α	Eta
Gender	Male	4.0887	627	.80735	.000	.456
	Female	3.3000	681	.73304		
Nationality	Han nationality	3.6810	1152	.86555	.734	.009
	Ethnic minority	3.6560	156	.85809		
Place of birth	Rural area	3.1589	692	.71568	.000	.637
	Town	4.2613	616	.60692		
Grade	Freshman	3.1532	355	.67269	.000	.558
	Sophomore	3.3551	326	.70228		
	Junior	3.9057	318	.88282		
	Senior	4.3875	309	.58449		
The university where I am located is	Double first-class university	3.9417	60	.71953	.016	.067
	Ordinary University	3.6654	1248	.86896		
The university is located in	Provincial capital City	3.7786	536	.87115	.000	.097
	Non-provincial capital city	3.6082	772	.85325		
The university is	East	4.2717	430	.73849	.000	.485
	Central	3.4444	417	.79054		
	West	3.3141	402	.68378		

Table 4.16 (Continued)

	Options	$\bar{X}$	N	S.D.	α	Eta
located in China	Northeast Area	3.4821	59	1.06086		
Personal computer	Have	3.6932	1225	.85547		
	None	3.4545	83	.96480	.015	.067
	Total	**3.678**	**1308**			

As can be seen from Table 4.16, the significance levels of ethnicity, university, and personal computer are 0.734, 0.016, and 0.015 respectively, all greater than >0.05, indicating that the difference between them and the average value of digital literacy level is not statistically significant. meaning, so no data analysis is required. In addition, the Eta coefficient of whether the university is located in a provincial capital city is only 0.097. It shows that the high correlation between the two is not significant.

In terms of gender, the average digital literacy level of boys is higher than that of girls. From the perspective of student origin, the average level of digital literacy in urban areas is higher than that in rural areas. In terms of grade, freshman students have the lowest digital literacy level, only 3.1532, while senior students have the highest digital literacy level, reaching 4.3875. The digital literacy level of freshmen and sophomore students is lower than the overall average of 3.678, which indicates that their digital literacy level needs to be improved.

From the perspective of distribution area, because the number of people in the Northeast is small, it is not included in the comparative analysis. The digital literacy level of tourism management of undergraduate students in the western region is the lowest, only 3.3141, which does not reach the overall average of 3.678. The digital literacy level of tourism management of undergraduate students in Central China is close to the overall average. Tourism management of undergraduate students have the highest level of digital literacy, reaching 4.2717. This shows that

the digital literacy level of tourism management of undergraduate students in the western region needs to be improved.

Exploratory factor analysis

From the data in Table 4.3, it can be seen that the structural validity of the questionnaire is good, and the data is suitable for the next step of exploratory factor analysis. Due to the correlation between the items in Q14-Q31, the maximum variance method was chosen based on the use of principal component analysis. As shown in Table 4.17, a total of four common factors were extracted, and a total of 4 abilities with factor loadings greater than 0.45 were obtained, and the cumulative explanatory variables were 76.388 %.

In addition, since "common factor one" includes Q14, Q15, Q16, Q17, and Q18. Through the explanation of these questions in the questionnaire, it can be found that these jointly reflect the dynamic reflection of objectively existing digital-related activities in the mind, so the "Common factor one" is named " digitalization awareness."

"Common factor two" includes Q19, Q20, Q21, andQ22. Through the explanations of these questions in the questionnaire, it can be found that these jointly reflect the digital technology knowledge that should be understood in daily study and life, so the "Common factor two" is named “digital technology knowledge and capabilities”.

"Common factor three" includes Q23, Q24, Q25, Q26, and Q27. Through the explanation of these questions in the questionnaire, it can be found that these questions jointly reflect the ability to use digital technology resources to carry out learning activities. Therefore, the “Common factor three” is named “digitalization application”.

"Common factor four" includes Q28, Q29, Q30, and Q31. Through the explanation of these questions in the questionnaire, it can be found that these questions jointly reflect the responsibility for moral cultivation and behavioral norms in digital activities, so the “Common factor four” is named “Digital Social Responsibility”.

Table 4.17 Summary table of factor analysis results

Digital literacy variables	Common factor				Commonality
	One	Two	Three	Four	
Q14	0.741				0.755
Q15	0.733				0.795
Q16	0.636				0.792
Q17	0.632				0.835
Q18	0.539				0.826
Q19		0.785			0.825
Q20		0.824			0.866
Q21		0.839			0.861
Q22		0.876			0.861
Q23			0.803		0.861
Q24			0.695		0.848
Q25			0.713		0.847
Q26			0.782		0.832
Q27			0.785		0.832
Q28				0.851	0.892
Q29				0.871	0.912
Q30				0.833	0.879
Q31				0.852	0.885
Eigenvalues	**13.75**	**4.452**	**2.565**	**1.344**	
Variance percentage	**76.388**	**84.454**	**87.593**	**89.503**	
cumulative					

By analyzing the valid data from the digital literacy questionnaire for tourism management of undergraduate students, it can be found that the digital literacy recognized by tourism management of undergraduate students consists of four factors. As shown in Table 4.18, the Cronbach's alpha of the four common factors

above is all above 0.90, indicating that these common factors have very high internal consistency reliability. This also shows that the respondents believe that the digital literacy of tourism management of undergraduate students is divided into the above four categories, which has a certain degree of reliability.

Table 4.18 Scale reliability and descriptive statistics

Factor	N	Cronbach's alpha	$\overline{X}$	S. D
Digitalization awareness	5	.962	3.743	4.548
Digital technology knowledge and skills	4	.958	3.515	3.681
Digitalization applications	5	.967	3.580	4.525
Digital social responsibility	4	.972	3.884	4.062

In addition, based on the mean values of the four common factors, it can be judged that the mean values of "Digital Technology Knowledge and Skills" and "Digitalization Application" are relatively low, while the mean values of " Digitalization Awareness" and "Digital Social Responsibility" are relatively high. This generally shows that compared with the other two aspects, the demand recognition of digital technology knowledge and skills and digital application among tourism management of undergraduate students is relatively low.

To extract the components of digital literacy for tourism management of undergraduate students

Combining the domestic and foreign digital literacy frameworks, as well as the previous analysis of the current situation, education situation, needs and other aspects of digital literacy for tourism management of undergraduate students, we initially extracted the components of digital literacy for tourism management of

undergraduate students, including a total of 4 first-level components and 13 second-level components are shown in Table 4.19. The description of the constituent elements draws on relevant domestic and foreign standards and the research results of other scholars.

Table 4.19 Components and descriptions of digital literacy among tourism management of undergraduate students

First-level components	Second-level components	Description
Digitalization awareness	Digitalization understanding	Understand the value of digital technology in economic, social and tourism development, and understand the opportunities and challenges that the development of digital technology brings to the tourism industry.
	Digitalization willingness	To actively learn and use tourism management professional digital technology resources.
	Digitalization determination	Have the belief to actively overcome difficulties and solve problems when facing digital problems in tourism management majors.
Digital technology knowledge and skills	Digital technology knowledge	Understand common digital technology knowledge, including the concepts and basic principles of common digital technologies.
	Digital technology skills	Master the selection strategies and usage methods of digital technology resources.
Digitalization applications	Data analysis and processing	Ability to use digital tools for data wrangling, statistical analysis and data visualization.
	Digital content creation and sharing	Ability to create and edit different digital content, share and publish via online platforms.

Table 4.19 (continued)

First-level components	Second-level components	Description
Digitalization applications	Digital Communication and collaboration	information and digital content with others using appropriate digital communication and collaboration tools.
	Digital continuous learning	Ability to utilize digital technology resources for continuous learning.
	Digital innovation and entrepreneurship	Leverage digital technologies to innovate, start a business or improve existing business models.
Digital social responsibility	Digital Ethics	Comply with ethics and ethics related to digital activities.
	Digital laws and regulations	Comply with laws and regulations related to digital activities.
	Digital security protection	Protect personal information and privacy and pay attention to network security protection.

It should be noted that the above is only a preliminary summary of the components of digital literacy for tourism management of undergraduate students. However, its rationality and whether the description of the components is appropriate and accurate still needs to be further verified, revised and improved by experts.

Analysis results serving objective 2-To develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

In order to serve objective 2, this part collects data from experts to prove the appropriateness of the model, and also determines the weights of the model's components. The specific tables, figures and descriptions are as follows.

Basic information of experts

The list of consulting experts initially formulated for this research includes 21 people, all of whom are engaged in teaching and research in related fields such as university education, computer science, and tourism management. These 21 experts come from domestic universities such as Leshan Normal University, Northwest Normal University, Chongqing Second Normal University, Huangshan University, Shanxi Normal University, Taishan University, Hezhou University, Hainan Normal University, etc. The source distribution of the experts is shown in Table 4.20.

Table 4.20 Consulting expert source distribution table

The university to which the expert belongs	Number of experts
Leshan Normal University	3
Chongqing Second Normal University	3
Northwest normal university	2
Taishan University	2
Shanxi Normal University	2
Huangshan University	2
Sichuan Normal University	2
Hezhou University	1
Hainan Normal University	1
Hebei University of Economics	1
Huaqiao University	1
Ningbo University	1

Among these 21 experts, 12 have the title of professor and 9 have the title of associate professor. 21 experts effectively participated in the two rounds of expert opinion consultation, 21 experts have teaching experience of more than 10 years, indicating that they have relatively rich time research experience. The distribution of

experience and teaching years is shown in Figure 4.2. Among them, the male and female genders of the 21 experts accounted for 12 and 9 respectively.

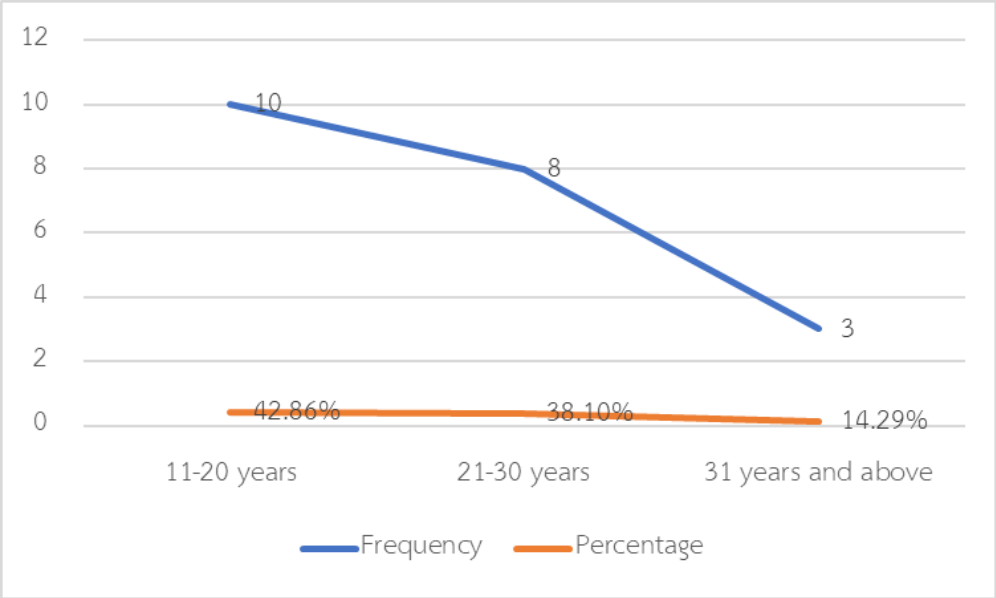

Figure 4.2 Distribution of experts teaching experience

The first round of expert consultation process and analysis

In the first round of expert consultation, the author distributed the first round of expert consultation questionnaires (see Appendix C2 for details) to all experts in the expert list via email, a total of 25 copies. Within the specified time, a total of 23 pieces of expert feedback were collected, of which 23 pieces were complete and valid expert suggestions. Therefore, the expert positivity coefficient is 23 /25≈92%, indicating that experts have a strong interest in the tourism management undergraduate program. Students' digital literacy teachers are more concerned about the topic of digital literacy and have relatively high enthusiasm for participation. In addition, 2 expert consultation questionnaires were incomplete, so the revised opinions of 21 experts were mainly used.

Concentration of expert opinions

In the process of using the Delphi method, the software EXCEL was used to analyze and process the recovered expert consultation questionnaires, and the average value, full score rate, standard deviation, median, mode, upper quartile (**Q+**), The lower quartile (**Q-**) and quartile difference (**Q+-Q-**) are used to analyze the degree of concentration of expert consultation opinions. The average value reflects the importance of each component. The larger the average value $\overline{X}$, the more

important the component is. The percentage of importance of the component must reach 75% or above, that is, $\bar{X}$ is greater than or equal to 3.75. Standard deviation and four-point difference (**Q+-Q-**) determine the degree of consistency. The higher the standard deviation, the lower the degree of consistency of expert opinions. If it is less than 1, it means that the component is consistent; the four-point difference is the difference between the upper quartile and the lower quartile of each component. The larger the value, the more dispersed the expert opinions are, and the opposite means the more concentrated the expert opinions are. The expert consultation questionnaire of this research is a 5-point scale. Therefore, when the four-point difference in defining this component is less than or equal to 1, it means that the expert group has a high degree of agreement; when the four-point difference is between 1 and 2, it means that the expert group Moderate agreement. The full score, median and mode can also reflect the degree of consistency of experts' opinions on the constituent elements to a certain extent.

The degree of consistency of the first round of expert consultation opinions is shown in Table 4.21. The average value of the 4 first-level elements and 13 second-level elements of digital literacy for tourism management of undergraduate students is 3.75 points and above, as can be seen from Table 4.21. The following results are produced:

First, in the two dimensions of the first-level components "digital technology knowledge and ability" and "digital application", experts have the highest degree of consistency and the highest full score rate, respectively. and, it can be reflected that experts highly recognize these two first-level components as the two most important elements of digital literacy for tourism management of undergraduate students.

Second, there are two first-level components such as "digital awareness" and "digital social responsibility" and "digital will", "digital content creation and sharing", "digital communication and collaboration", "digital innovation and entrepreneurship", "digital laws and regulations" and "digital the consistency level of the six second-level components such as "security protection" is moderately consistent, but acceptable. If the four-point differences of the remaining components are less than or equal to 1,

it means that the expert group has a high degree of consensus on these components.

The analysis of the above data does not mean that the components and descriptions of the digital literacy of tourism management of undergraduate students can be directly deleted and modified. Therefore, further adjustments and modifications still need to be made based on the specific opinions given by 21 experts.

Table 4.21 Consistency reflection form for the first round of expert consultation opinion

Components	$\overline{X}$	K	Middle number	Mode	S.D.	Q+	Q-	Q+ - Q-	Degree of consistency
First-level components									
Digitizing awareness	3.81	76.19	4.00	4	.981	5.00	3.00	2.00	Moderate
Digital technology knowledge and skills	4.29	85.71	4.00	4	.784	5.00	4.00	1.00	High
Digital applications	4.62	92.38	5.00	5	.740	5.00	4.00	1.00	High
Digital social responsibility	4.00	80.00	4.00	4	.894	5.00	3.00	2.00	Moderate
Second-level components									
Digitizing understanding	4.05	80.95	4.00	4	0.805	5.00	4.00	1.00	High
Digitizing willingness	4.00	80.00	4.00	4	0.632	4.00	4.00	0.00	High

Table 4.21 (Continued)

Components	$\bar{X}$	K	Middle number	Mode	S. D	Q+	Q-	Q+ - Q-	Degree of consistency
Digitizing determination	3.95	79.05	4.00	4	0.740	4.50	3.00	1.50	Moderate
Digital technology knowledge	4.10	81.90	4.00	4	0.768	5.00	4.00	1.00	High
Digital technology skills	4.24	84.76	4.00	4	0.768	5.00	4.00	1.00	High
Data analysis and processing	4.29	85.71	5.00	5	0.845	5.00	4.00	1.00	High
Digital content creation and sharing	4.05	80.95	4.00	4	0.865	5.00	3.50	1.50	Moderate
Digital communication and collaboration	4.05	80.95	4.00	4	0.921	5.00	3.00	2.00	Moderate
Digital continuous learning	3.95	79.05	4.00	4	0.805	4.50	3.50	1.00	High
Digital Innovation and Entrepreneurship	3.86	77.14	4.00	4	0.910	5.00	3.00	2.00	Moderate
Digital Ethics	4.10	81.90	4.00	4	0.700	5.00	4.00	1.00	High
Digital laws and regulations	3.90	78.10	4.00	4	0.768	4.50	3.00	1.50	Moderate
Digital security protection	4.14	82.86	4.00	5	0.793	5.00	3.50	1.50	Moderate

Collation of expert opinions and revision of components

Revision of second-level components

In terms of "digitizing understanding", expert E5 proposed "modifying digitizing understanding to digital awareness", and E13 proposed "professional learning should be considered". Therefore, this point is revised to "understand the value of digital technology in tourism development and professional learning, and recognize the opportunities and challenges that the development of digital technology brings to tourism and professional learning."

In terms of "digitizing awareness", expert E5 proposed "modifying digital awareness to digital awareness", E14 proposed "increasing the initiative to learn digitalization", and E20 proposed "increasing students' initiative to practice, explore and innovate". Therefore, this point was modified to "the willingness to actively learn and use digital technology resources in tourism management majors, and the initiative to carry out professional learning digital practice, exploration, and innovation."

In terms of "digitizing determination", expert E5 proposed "modifying digital will to digital will", and E7, E8 and E10 proposed "having the confidence and determination to overcome difficulties and solve problems". Therefore, this point was modified to "the confidence and determination to overcome the difficulties and challenges encountered in the digital practice of professional learning".

It should be pointed out that E12 proposed that "digital willingness and digital will are merged into digital attitude, which refers to the emotions, attitudes and motivations towards digital, the willingness to actively participate in digital socialization, learning and work, and to learn and accept new technologies." This opinion the number of second-level components has been reduced, so this opinion is not adopted.

In terms of "digital technology knowledge", expert E1 proposed that "to increase the knowledge of lifelong learning, students need to have the ability to self-study and the awareness of lifelong learning", and expert E12 proposed that "digital technology knowledge is revised to digital knowledge, which refers to digital information, Conceptual knowledge, factual knowledge and procedural knowledge of

digital resources, digital applications, etc." As for the first suggestion, it belongs to consciousness, so I will not adopt it. As for the second suggestion, adopt it.

In terms of "digital technology skills", expert E12 proposed that "digital technology skills are revised to digital skills, which refers to the ability to master and use digital technology and data information, including basic digital skills (data storage technology, game development technology, image design technology, etc.) and disruptive digital skills (artificial intelligence, robotics, data science, etc.).The transformation of digital knowledge into digital skills is a learning process. It is recommended that digital applications and digital skills be merged." Adopting experts' suggestions, the specific second-level components need to be recombined with the five second-level components of "digital application".

In terms of "data analysis and processing", expert E9 proposed "modify it to data collection and processing. Data must be collected first before data can be processed. This process needs to be described clearly." This is a good suggestion, consider adopting it.

In terms of "digital content creation and sharing", expert E16 proposed that "modify it to digital content creation, which is easier to share but more difficult to create." This belongs to the category of digital utilization skills and can be considered for adoption.

In terms of "digital continuous learning", expert E18 suggested "delete this article. Continuous learning is an attitude, not an ability. Modify it to professional problem-solving." In addition, the consistency level of this item is moderate, so this suggestion is adopted.

In terms of "digital application", expert E11 proposed "adding a secondary component: data mining and application decision-making. The specific description is that it can be combined with big data analysis technology to integrate data mining into the tourism industry and apply it to relevant links in the tourism industry. ". This suggestion is designed in "Data Analysis and Processing" and "Digital Content Creation and Sharing", so it will not be adopted.

In terms of "digital ethics", expert E12 proposed "modification to digital ethics." To express more concisely, adopt this suggestion.

In terms of "digital laws and regulations", expert E12 proposed "modification to digital governance". To express more concisely, adopt this suggestion.

In terms of "digital security protection", expert E12 proposed "modification to digital protection". To express more concisely, adopt this suggestion.

Expert E2 pointed out that "the professional features of tourism management are relatively weak and it is recommended to increase tourism content." Adopt this point and highlight the characteristics of the tourism management major in subsequent revisions.

Revision of first-level components

Referring to "digitizing awareness", expert E12 proposed "modifying digitizing awareness to digital awareness". "Digitizing awareness" focuses more on transformation and adaptation at the organizational and social levels, while "digital awareness" focuses more on individuals and groups' ability to recognize and use digital technology and digital information. This suggestion is adopted based on the research object.

In terms of "knowledge and skills in digital technology", experts E5, E8, E10, and E16 proposed “modifying digital technology knowledge into digital technology and upgrading it to a first-level component.” This suggestion is adopted, and four second-level components such as digital basic knowledge, digital professional knowledge, digital hardware knowledge, and digital software knowledge are set up under this first-level element.

In terms of "digital application", experts E1 and E12 proposed "modifying digital application into digital capabilities or digital skills" and adopted this suggestion.

In terms of "digital social responsibility", Expert E12 proposed "changing digital social responsibility to digital ethics". Ethics does not include laws and regulations, so it is not adopted.

The second round of expert consultation process and analysis

Based on the analysis of the results of the first round of expert surveys, and after revising the components and descriptions of digital literacy among tourism management of undergraduate students, this research compiled a second round of expert questionnaires (see Appendix C3 for details). The second round of expert

questionnaires was also distributed to the 21 experts who completed the first round. Judging from the recovered expert questionnaires, a total of 21 completed questionnaires were recovered. Therefore, the positive coefficient of expert consultation in this round is 100 %, which is also This shows that the experts surveyed are concerned about this field and strongly support this research.

The second round of experts' consistent reflections on the components of digital literacy for tourism management of undergraduate students is shown in Table 4.22. It can be seen from the second round of expert consultation questionnaires that the average scores (M) of the 4 first-level components and 15 second-level components of digital literacy for tourism management of undergraduate students are all above 4 points, accounting for 100%, the full score rate is also higher than that of the previous round. In addition, it can be seen from the four-point difference (Q+-Q-) that the four-point difference of all components is less than 1, indicating that experts have a high degree of consistency in the second round of consultation. In terms of the consistency of expert opinions reflected by the standard deviation S. D, the overall S. D values are less than 1, indicating that all components are consistent. The above data can show that in the second round of consultation questionnaires for 21 experts, the opinions obtained are highly consistent.

Table 4.22 Consistency reflection form for the second round of expert consultation opinions

Components	$\overline{X}$	K	Middle number	Mode	S. D	Q+	Q-	Q+ - Q-	Degree of consistency
First-level components									
Digital awareness	4.00	80.00	4.00	4	0.548	4.00	4.00	0.00	High
Digital knowledge	4.43	88.57	4.00	4	0.507	5.00	4.00	1.00	High
Digital ability	4.71	94.29	5.00	5	0.463	5.00	4.00	0.00	High
Digital responsibility	4.29	85.71	4.00	4	0.561	5.00	4.00	0.00	High
Second-level components									
Digital understanding	4.19	83.81	4.00	4	0.602	5.00	4.00	1.00	High
Digital willingness	4.10	81.90	4.00	4	0.539	4.00	4.00	0.00	High
Digital determination	4.10	81.90	4.00	4	0.539	4.00	4.00	0.00	High
Digital basic knowledge	4.24	84.76	4.00	4	0.700	5.00	4.00	1.00	High
Digital professional knowledge	4.38	87.62	4.00	4	0.498	5.00	4.00	1.00	High
Digital hardware knowledge	4.29	85.71	4.00	4	0.561	5.00	4.00	1.00	High
Digital software knowledge	4.57	91.43	5.00	5	0.507	5.00	4.00	1.00	High
Data collection and processing	4.38	87.62	4.00	5	0.669	5.00	4.00	1.00	High
Digital content creation	4.19	83.81	4.00	4	0.680	5.00	4.00	1.00	High

Table 4.22 (Continued)

Components	$\bar{X}$	K	Middle number	Mode	S. D	Q+	Q-	Q+ - Q-	Degree of consistency
Digital communication cooperation	4.29	85.71	4.00	4	0.644	5.00	4.00	1.00	High
Professional problem-solving	4.33	86.67	4.00	4	0.483	5.00	4.00	1.00	High
Digital innovation and entrepreneurship	4.29	85.71	4.00	4	0.561	5.00	4.00	1.00	High
Digital ethics	4.19	83.81	4.00	4	0.602	5.00	4.00	1.00	High
Digital governance	4.24	84.76	4.00	4	0.539	5.00	4.00	1.00	High
Digital security	4.24	84.76	4.00	4	0.700	5.00	4.00	1.00	High

In addition, for the degree of consistency of the opinions of 21 experts, in addition to the analysis of the above basic data, it is still necessary to calculate the coordination coefficient of expert consultation opinions to further determine the degree of consistency. The value range of Kendall's coordination coefficient (W) is between 0 and 1. The closer the value is to 1, the higher the degree of expert consistency. After non-parametric testing in statistical software, the calculation is as shown in Table 4.23. The table of coordination coefficients for the two rounds of expert consultations shown in. The coordination coefficients of the first round of expert consultation questionnaires were 0.298 and 0.036 respectively for the first-level and second-level components; compared with the first round, the expert coordination coefficients of the second round were for the first - level and second-level components respectively. The second-level components reached 0.34 0 and 0. 052 respectively, which were both higher than the coordination coefficients of the first round of expert consultation opinions, and the difference in the results of the

two rounds of expert consultation opinions was extremely significant. It can be seen that the results of the first and second rounds of expert consultation are highly consistent, and the results of the two rounds of surveys are advisable.

Table 4.23 Coordination of the two-round expert consultation questionnaires

Index	First round			Second round		
	Kendall's Harmony Coefficient	Chi-square value	Significance	Kendall's Harmony Coefficient	Chi-square value	Significance
	W	χ^2	α	W	χ^2	α
First-level components	0.298	1 8.796	0.000	0.340	2 1.449	. 000
Second-level components	0.036	9.096	0.003	0.052	1 5.255	. 000

Reliability analysis of expert consultation results

In addition to the basic identity information of experts, the degree of authority of consulting experts (**Cr**) is also an important basis for measuring the reliability of expert consultation in the Delphi method. The expert's authority is calculated by the formula **Cr** = (**Cs**+**Ca**)/2. Among them, **Cs** is the expert's familiarity with the consulting problem, and different familiarity levels are assigned different quantitative values, as shown in Table 4.24; **Ca** is the basis for the expert's judgment on the consulting problem, and different quantitative values should be given based on the judgment basis that affects the degree of expert judgment (high, medium, small), as shown in Table 4.25.

Table 4.24 Coefficient of experts' familiarity with consulting issues

Familiarity	Quantized value tized value
Very familiar	1
Familiar	0.8
Generally familiar with	0.5
Unfamiliar	0.2
Very unfamiliar	0

Table 4.25 Basis for expert judgment and assignment of degree of influence

Basis for judgment	Degree of influence on expert judgment (Ca)		
	High	Medium	Low
Theoretical analysis	0.3	0.2	0.1
Work/practical experience	0.5	0.4	0.3
Learn from colleagues at home and abroad	0.1	0.1	0.1
Personal intuition	0.1	0.1	0.1

Combining the distribution of expert familiarity and the frequency distribution of expert judgments shown in Figures 4.3 and 4.4, it can be calculated that the familiarity (**Cs**) of 21 experts with the digital literacy of tourism management of undergraduate students is about 0.857, the judgment basis (**Ca**) is about 0.833, and then it can be concluded that the authority coefficient (**Cr**) of the experts is 0.845,

indicating that the 21 experts have a high degree of authority and overall good reliability.

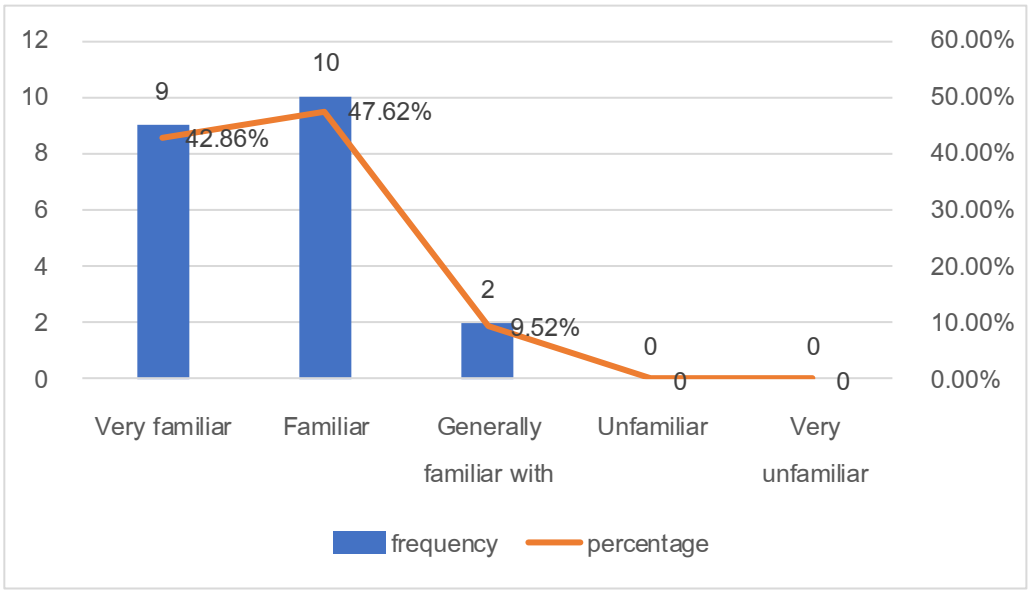

Figure 4.3 Distribution of expert familiarity

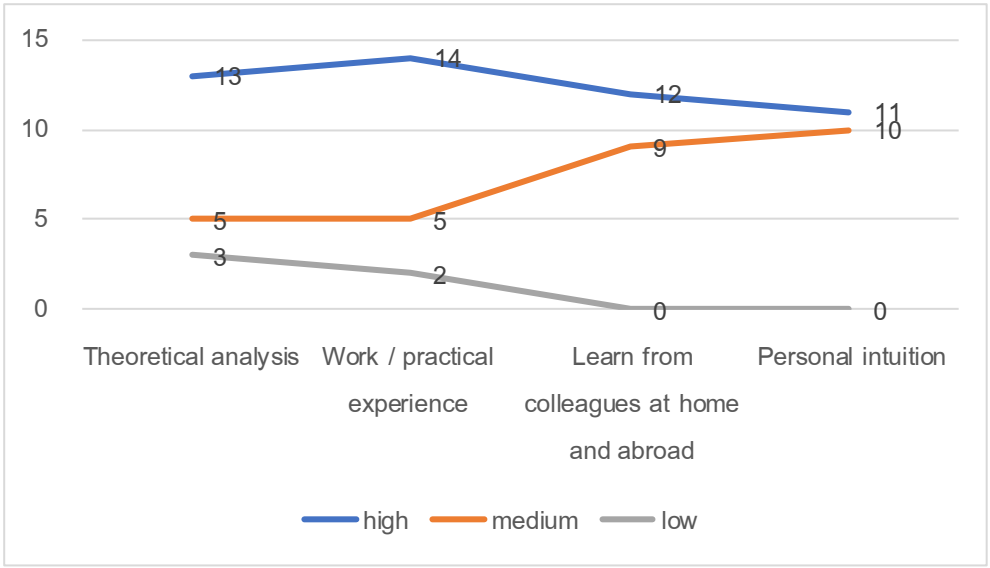

Figure 4.4 Expert judgment based on frequency distribution

Explanation of the components of digital literacy for tourism management of undergraduate students

After the Delphi method, the components and descriptions of digital literacy for tourism management of undergraduate students were repeatedly deleted and verified, and finally the components of digital literacy for tourism management of undergraduate students with high consistency and credibility of expert opinions were obtained, such as shown in Table 4.26, the following will analyze and explain the components of digital literacy for tourism management of undergraduate students.

Table4.26 Components and descriptions of digital literacy for tourism management of undergraduate students

First-level components	Second-level components	Description
Digital awareness	Digital understanding	Understand the value of digital technology in tourism development and professional learning, and understand the opportunities and challenges that the development of digital technology brings to tourism and professional learning
	Digital willingness	Willingness to actively learn and use tourism professional digital technology resources, and the initiative to carry out professional learning digital practice, exploration, and innovation
	Digital determination	Confidence and determination to overcome the difficulties and challenges encountered in the digital practice of tourism major learning

Table 4.26 (Continued)

First-level components	Second-level components	Description
Digital knowledge	Digital basic knowledge	Understand the conceptual connotation, basic theories, principles and methods of common digital technologies, including cutting-edge knowledge such as big data, virtual reality, and artificial intelligence.
	Digital professional knowledge	Understand the basic theories and research methods of tourism as well as cutting-edge knowledge related to tourism and digital technology
	Digital hardware knowledge	Understand the working principles, system composition and operating skills of computers, smart terminals, hotel robots, etc.
	Digital software knowledge	Understand the principles, composition and operating skills of application software and system software related to tourism majors
Digital ability	Data collection and processing	Ability to browse, search, filter, rate and manage tourism professional data, information and digital content
	Digital content creation	Ability to create and edit travel-specific digital content and express oneself through digital means
	Digital communication cooperation	Ability to interact and collaborate using digital technologies to share tourism professional information and content with others

Table 4.26 (Continued)

First-level components	Second-level components	Description
	Professional problem-solving	Ability to creatively use digital technologies to solve tourism professional problems
	Digital innovation and entrepreneurship	Use digital technologies to innovate, start a business or improve existing business models in the tourism profession
Digital responsibility	Digital ethics	Comply with ethical codes and ethics related to digital activities in the tourism profession
	Digital governance	Comply with laws and regulations related to digital activities in the tourism industry
	Digital security	Protect personal information and privacy and pay attention to network security protection

Digital Awareness

Digital awareness is the dynamic reflection of objectively existing digital-related activities in the mind, which mainly includes digital understanding, digital will, and digital determination. Digital understanding is to understand the value of digital technology in tourism development and professional learning, and to understand the opportunities and challenges that the development of digital technology brings to tourism and professional learning. Digital willingness is the willingness to actively learn and use tourism professional digital technology resources, and the initiative to carry out professional learning digital practice, exploration, and innovation. Digital determination is the confidence and determination to overcome the difficulties and challenges encountered in the digital practice of tourism major learning. The three of them are interrelated. On the basis of understanding, they are one from realizing will to will, and finally rise to will.

Digital knowledge

Digital knowledge is the digital technology knowledge that should be understood in tourism major studies, including digital basic knowledge, digital professional knowledge, digital hardware knowledge, and digital software knowledge. Digital basic knowledge refers to the conceptual connotation, basic theories, principles and methods of common digital technologies, including cutting-edge knowledge such as big data, virtual reality, and artificial intelligence. Digital professional knowledge refers to the basic theories and research methods of the tourism discipline as well as cutting-edge knowledge related to tourism and digital technology. Digital hardware knowledge refers to the working principles, system composition and operating skills of computers, intelligent terminals, hotel robots, etc. Digital software knowledge is related to tourism majors. Knowledge of the principles, composition and operating skills of relevant application software and system software.

Digital ability

Digital capabilities are the ability to apply digital technology resources to carry out tourism professional learning, including data collection and processing, digital content creation, digital communication and cooperation, professional problem-solving, and digital innovation and entrepreneurship. Data collection processing is the ability to browse, search, filter, evaluate and manage tourism professional data, information and digital content. Digital content creation is the ability to create and edit tourism professional digital content and express one's ideas through digital means. Digital communication and collaboration ability to interact and collaborate using digital technologies to share tourism professional information and content with others. Professional problem-solving ability to creatively use digital technologies to solve travel professional problems. Digital innovation and entrepreneurship are the use of digital technology to innovate, start a business or improve existing business models in the tourism industry.

Digital responsibility

Digital responsibility is the responsibility for moral cultivation and behavioral norms in the digital society, including digital ethics, digital governance, and digital security. Digital ethics is the observance of moral codes and ethics related to the digital activities of the tourism profession. Digital governance is compliance with laws and regulations related to digital activities in the tourism profession. Digital security is the protection of personal information and privacy, focusing on network security protection.

Through the above research and analysis, this research constructed a digital literacy evaluation model for tourism management of undergraduate students in the digital era, as shown in Figure 4.5. It can be seen from this model that there are 4 first-level components of digital literacy for tourism management of undergraduate students, namely digital awareness, digital knowledge, digital ability, and digital responsibility; there are 15 second-level components, each of which is included in the current in the context of the digital age, tourism management of undergraduate students should focus on developing essential survival skills and key abilities. Each element is dynamic and developing, not static and unchangeable. Its dynamic and developing nature is reflected in the needs of the development of the times, changes in job positions, etc.

This evaluation model has not yet shown the importance of each element of digital literacy for tourism management of undergraduate students, and will be further improved in the next step.

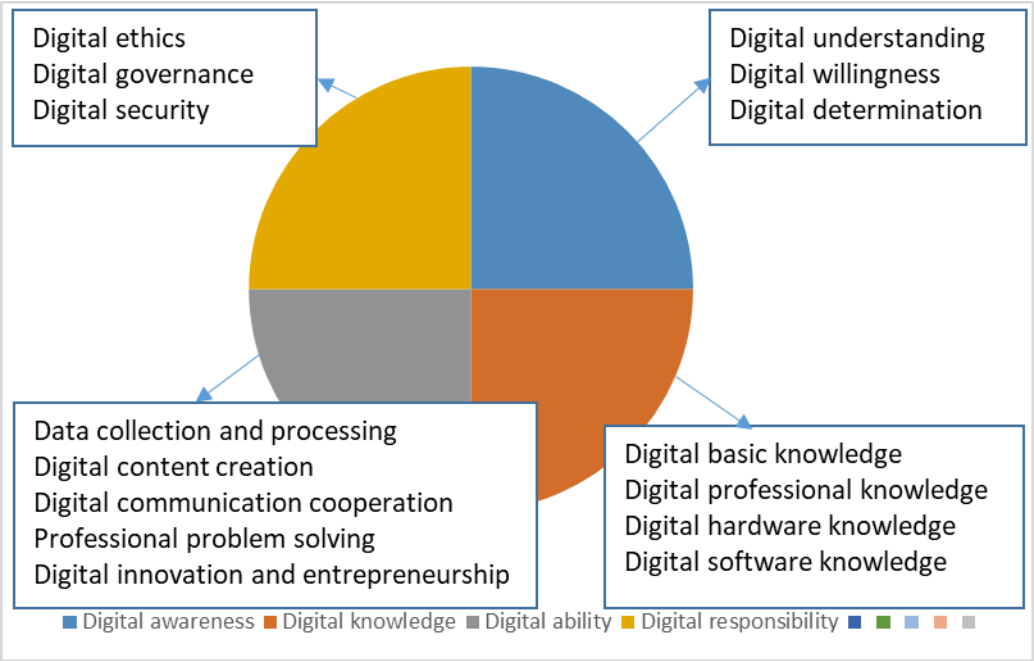

Figure 4.5 Digital literacy evaluation model for tourism management of undergraduate students

Determination and analysis of the weight of the digital literacy evaluation model for tourism management of undergraduate students

The Analytical Network Process (ANP) was used to construct the correlation structure and hierarchy among the elements of digital literacy for tourism management of undergraduate students, and the relative weight of each element of digital literacy for tourism management of undergraduate students was determined with the help of Super Decisions software.

The steps of Analytic Network Process

The Analytical Network Process (ANP) is a further extension of the Analytical Hierarchy Process (AHP), which makes up for the problems of independence and feedback mechanism between the assumed elements of the AHP, making it more practical, flexible and reliable to deal with decision-making problems. From the perspective of complexity theory, systems influence and interact with each other, and are related rather than independent. In reality, there are certain connections

between the various elements of digital literacy for tourism management of undergraduate students. ANP is in line with the perspective of complexity theory and can explain the complex relationships between the elements. Its structural form includes a network control layer and an influence network layer. The control layer is the highest level and the highest criterion in the network hierarchical system structure; the network layer is composed of several element sets, which are not subordinate to each other or independent of each other.

Analyze the problem

Sort out the issues to be analyzed and determine whether the element levels are internally independent and whether there are internal dependencies and feedback. This requires combining expert opinions to determine the correlation between elements. Then determine which are the criteria and which are the elements, and conduct pairwise comparisons through expert questionnaire consultation to obtain the judgment matrix. Generally, the Satty1-9 scaling method is used for questionnaire design. In this part, two expert consultation questionnaires need to be distributed, one is about the relationship between elements, and the other is about the weight consultation of elements.

Construct the ANP structure

Based on the results obtained in the previous steps, construct an ANP model with a control layer and a network layer, use goals and criteria to construct the control layer, and then analyze the network structure and mutual influence between elements. In actual decision-making problems, there is no completely internal independent hierarchical structure. In fact, there should be an internal network hierarchy that is interconnected and interdependent.

Construct the super matrix of ANP to calculate the weight

This part is a very complex calculation process, and the entire process can be calculated with the help of Super Decisions software. First, based on the pairwise comparison of the judgment matrix, use the eigenvector method to obtain the normalized eigenvector value, fill in the super matrix column vector, and construct the ANP unweighted super matrix; then determine the weight of each element group

in the super matrix; again, Calculate the weighted supermatrix; finally, use the power method to calculate the limit supermatrix to obtain the final weight.

Construction of ANP network analysis model for digital literacy of tourism management of undergraduate students

This research needs to refer to the components of digital literacy for tourism management of undergraduate students identified in Chapter 3 to form various elements and element sets. The control layer consists of "digital literacy for tourism management of undergraduate students " and the first-level components, including digital Awareness, digital knowledge, digital ability, digital responsibility, the network layer is composed of 15 second-level components.

According to the components of digital literacy for tourism management of undergraduate students, this research first designed an expert consultation questionnaire on the correlation between the components of digital literacy for tourism management of undergraduate students (see Appendix C4 for details). After recycling, we obtained the results of each element and element set. the relationship between. Secondly, based on the correlation of each element, a consultation questionnaire on the weight of digital literacy components for tourism management of undergraduate students was designed (see Appendix C5 for details), in which the Satty1-9 scaling method was used. The corresponding relationship between the importance and the quantitative value is shown in Table 4.27 shown. The results obtained in this round of expert consultation are used in the subsequent calculation process of Super Decisions software.

Table 4.27 Satty 1-9 Scale Chart

Quantized value	Importance
1	Indicates that indicator x is equally important as indicatory
3	Indicates that indicator x is slightly more important than indicatory
5	Indicates that indicator x is more important than indicatory
7	Indicates that indicator x is more important than indicatory
9	Indicates that indicator x is extremely important than indicatory
2, 4, 6, 8	The compromise value of the above adjacent importance levels

Ten copies of the above two expert consultation questionnaires were distributed and collected respectively. The experts surveyed were all experts from the first and second rounds. Through the sorting and analysis of the questionnaire, it was found that all elements (First-level components) and element set (second-level components) are not independent of each other, that is to say, there is mutual influence and interdependence within them, as shown in Table 4. 28 shown. Therefore, based on the interaction between each element and element set, an ANP network analysis model of digital literacy for tourism management of undergraduate students is formed, as shown in Figure 4.6.

Table 4.28 Correlation of digital literacy components for tourism management of undergraduate students

	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3
A1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
A2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
A3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
B1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
B2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
B3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
B4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
C1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
C2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
C3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
C4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
C5	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
D1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
D2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
D3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

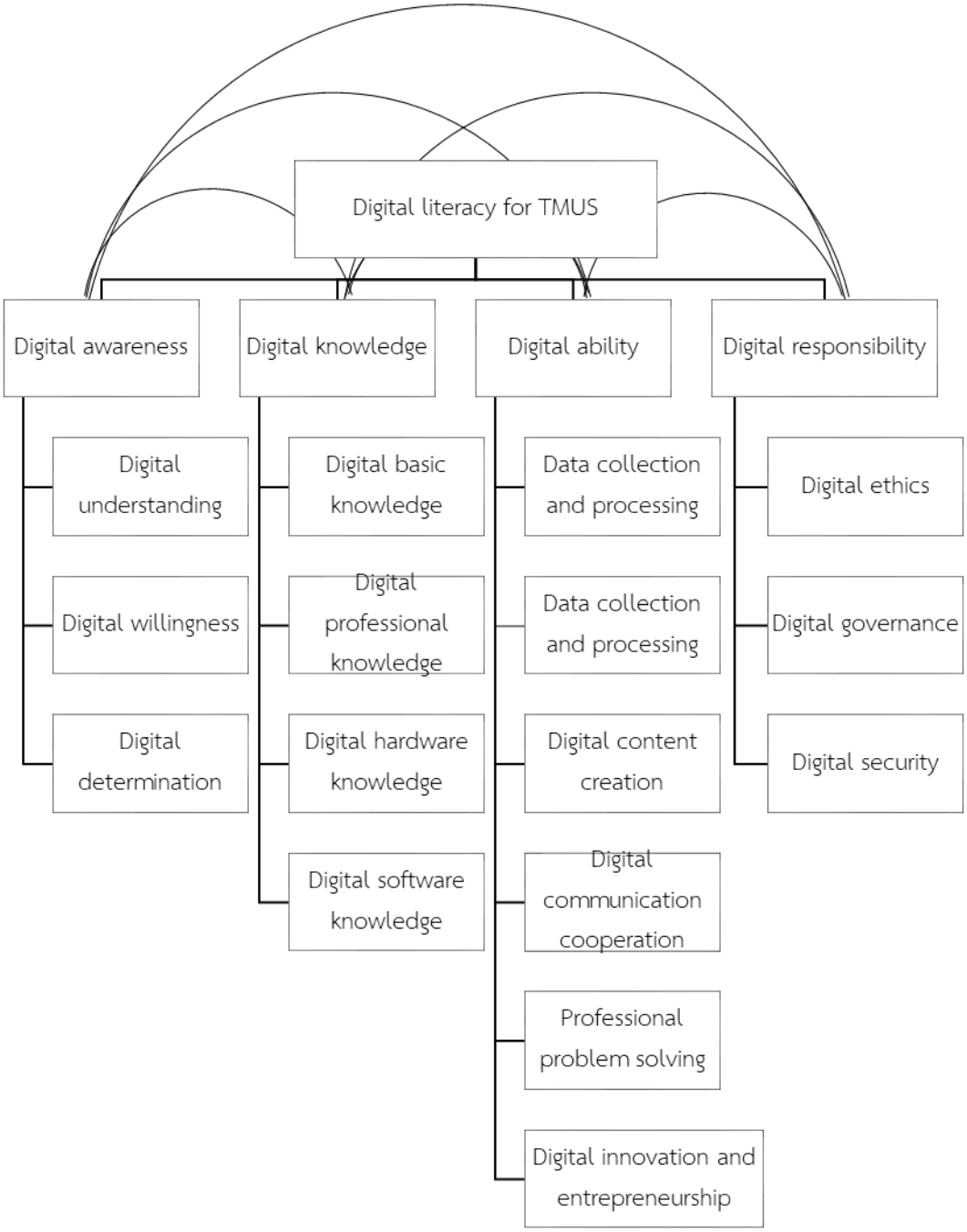

Figure 4.6 ANP network analysis model of digital literacy for tourism management of undergraduate students

Calculation of the weight of digital literacy components for tourism management of undergraduate students

Construct a network structure diagram

Input the first-level component (Cluster) and the second-level component (Node) into the Super Decisions software, and edit the network layer indicators based on the association of digital literacy components for tourism management of undergraduate students, forming the elements and element sets shown in Figure 4.7. relationship diagram between them.

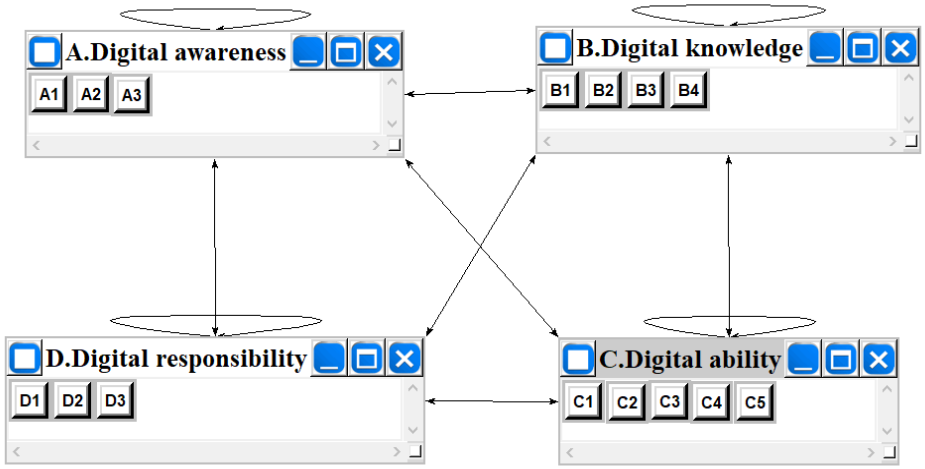

Figure 4.7 Network analysis structure diagram of the components of digital literacy for tourism management of undergraduate students

It can be seen that the network analysis structure diagram of digital literacy for tourism management of undergraduate students contains a total of 4 major categories, each of which contains 3-5 elements, and ultimately there are 15 elements in total. From the correlation between the components given by experts, there are interdependencies between elements and between element sets, so there are two-way arrows and circular arrows for the element sets themselves.

Establish a judgment matrix and assign values

By sorting out the weighted consultation data of 21 experts, the judgment matrices shown in Table 4.29, Table 4.30, Table 4.31, and Table 4.32 were obtained. In this research, the obtained judgment matrix data was input into the software using the input method of questionnaire form, and the consistency test was performed. When the consistency CR is less than 0.1, it means that the consistency of the judgment matrix is acceptable. Through software calculations, the consistency test results of the digital literacy components of tourism management of undergraduate students shown in Table 4.33 are all less than 0.1, indicating that the research results are consistent.

Table 4.29 Element Judgment Matrix under the " Digital awareness" Criterion

	A1 Digital understandin	**A2 Digital willingness**	**A3 Digital determination**
A1 Digital understanding	1	1.309	0.913
A2 Digital willingness	0.764	1	0.697
A3 Digital determination	1.095	1.434	1

Table 4.30 Element Judgment Matrix under the “Digital Knowledge” Criterion

	B1 Digital basic knowledge	**B2 Digital professional knowledge**	**B3 Digital hardware knowledge**	**B4 Digital software knowledge**
B1 Digital basic knowledge	1	0.855	0.897	1.103
B2 Digital professional knowledge	1.169	1	1.049	1.290
B3 Digital hardware knowledge	1.115	0.954	1	1.230
B4 Digital software knowledge	0.907	0.775	0.813	1

Table 4.31 Element judgment matrix under the “Digital ability” criterion

	C1 Data collection and processing	**C2 Digital content creation**	**C3 Digital communication cooperation**	**C4 Professional problem-solving**	**C5 Digital innovation and entrepreneurship**
C1 Data collection and processing	1	0.865	0.883	0.689	0.625
C2 Digital content creation	1.157	1	1.021	0.797	0.724
C3 Digital communication cooperation	1.133	0.979	1	0.780	0.708
C4 Professional problem-solving	1.452	1.255	1.282	1	0.908
C5 Digital innovation and entrepreneurship	1.599	1.382	1.412	1.101	1

Table 4.32 Element judgment matrix under the "Digital Responsibility" criterion

	A1 Digital Ethics	A2 Digital Governance	A3 Digital Security
A1 Digital Ethics	1	1.036	0.328
A2 Digital Governance	0.965	1	0.316
A3 Digital Security	3.053	3.164	1

Table 4.33 Consistency test results

First-level components	Second-level components	Consistency value
A Digital awareness	A1, A2, A3	0.026
B Digital knowledge	B1, B2, B3, B4	0.035
C Digital ability	C1, C2, C3, C4, C5	0.045
D Digital responsibility	D1, D2, D3	0.058

Calculate After all judgment matrices are constructed, the unweighted supermatrix and weighted supermatrix are calculated directly by the software, as shown in Table 4.34 and Table 4.35 respectively.

Table 4.34 Unweighted supermatrix (part)

	A1	A2	A3	...	D1	D2	D3
A1	0.0366	0.0366	0.0366	...	0.0366	0.0366	0.0366
A2	0.0155	0.0155	0.0155	...	0.0155	0.0155	0.0155
A3	0.0187	0.0187	0.0187	...	0.0187	0.0187	0.0187
...	...	...	...	...	...	...	...
D1	0.0388	0.0388	0.0388	...	0.0388	0.0388	0.0388
D2	0.0329	0.0329	0.0329	...	0.0329	0.0329	0.0329
D3	0.1039	0.1039	0.1039	...	0.1039	0.1039	0.1039

Table 4.35 Weighted supermatrix (part)

	A1	**A2**	**A3**	**...**	**D1**	**D2**	**D3**
A1	0.0211	0.0211	0.0211	...	0.0211	0.0211	0.0211
A2	0.0161	0.0161	0.0161	...	0.0161	0.0161	0.0161
A3	0.0232	0.0232	0.0232	...	0.0232	0.0232	0.0232
...	...	...	...	...	...	...	...
D1	0.0415	0.0415	0.0415	...	0.0415	0.0415	0.0415
D2	0.0435	0.0435	0.0435	...	0.0435	0.0435	0.0435
D3	0.0899	0.0899	0.0899	...	0.0899	0.0899	0.0899

Calculate the limit matrix

In order to further understand the influence relationship between elements, it is still necessary to perform stability processing on the matrix and calculate the limit matrix of the weighted matrix, as shown in Table 4.36. Due to the corresponding limit calculation, the values in each row of the limit matrix are the same, and the data on the column is the priority of the element on the left.

Table 4.36 Limit matrix (part)

	A1	A2	A3	...	D1	D2	D3
A1	0.0320	0.0320	0.0320	...	0.0320	0.0320	0.0320
A2	0.0156	0.0156	0.0156	...	0.0156	0.0156	0.0156
A3	0.0429	0.0429	0.0429	...	0.0429	0.0429	0.0429
...	...	...	...	...	...	...	...
D1	0.0375	0.0375	0.0375	...	0.0375	0.0375	0.0375
D2	0.0362	0.0362	0.0362	...	0.0362	0.0362	0.0362
D3	0.1145	0.1145	0.1145	...	0.1145	0.1145	0.1145

Determine the comprehensive ordering of elements

Through the previous analysis steps, the weight values of the second-level components are derived in the Super Decisions software. The weights of the first-level components are calculated from the weights of the second-level components. The final weights of the digital literacy components for tourism management of undergraduate students are as follows shown in Table 4.37.

Table 4.37 Weight distribution of digital literacy components among tourism management of undergraduate students

First-level components and their weights	Ranking of importance of first-level components	Second-level components and their weights	Ranking of importance of second-level components
Digital awareness (0.161)	3	Digital understanding (0.033)	1
		Digital willingness (0.016)	3
		Digital determination (0.028)	2
Digital knowledge (0.215)	2	Digital basics knowledge (0.070)	4
		Digital professional knowledge (0.077)	1
		Digital hardware knowledge (0.074)	3
		Digital software knowledge (0.076)	2
Digital ability (0.570)	1	Data collection and processing (0.072)	5
		Digital content creation (0.084)	3
		Digital communication cooperation (0.078)	4
		Professional problem-solving (0.105)	2
		Digital innovation and entrepreneurship (0.116)	1
Digital responsibility (0.054)	4	Digital ethics (0.042)	2
		Digital governance (0.038)	3
		Digital security (0.091)	1

Analysis of the weight of digital literacy components for tourism management of undergraduate students

First-level components

From Table 4.42 that the weight values of the first-level components of digital literacy for tourism management of undergraduate students are ranked as follows: digital ability (0.5702) > digital knowledge (0.2153) > digital awareness (0.1605 > digital responsibility (0.0540), from the ranking of the above weight values, we can find that: first, digital ability has the highest weight value. The current development of educational information technology and the digital living environment have a multi-dimensional impact on students, so they need to have corresponding abilities so that they can Adapt to social development. This shows that it is reasonable for experts to assign the highest weight value to it. Secondly, digital responsibility has the lowest weight value. Possible reasons: Compared with other components, digital responsibility is the most basic requirement. The focus gradually shifts to knowledge and abilities.

Second-level components

Weight analysis of second-level components. Judging from the total weight value, the top three are digital innovation and entrepreneurship, professional problem-solving, and digital security. Digital innovation, entrepreneurship and professional problem-solving are relatively high and difficult abilities for students to master. Digital security has now become a focus of attention in the digital society. The last three are digital understanding, digital willingness, and digital determination, all of which belong to digital awareness.

Analysis of the weight of components under the dimension of digital awareness

In terms of digital awareness, the weight values of the three second-level components are ranked from large to small as: digital understanding (0.033) > digital determination (0.028) > digital willingness (0.16). Digital understanding has the highest weight value, which reflects that tourism management of undergraduate students understand the value of digital technology in tourism development and professional learning. Digital willingness has the smallest weight value.

Analysis of the weight of components under the digital knowledge dimension

In terms of digital knowledge, the weight values of the four second-level components are ranked from large to small as follows: digital professional knowledge (0.077) > digital software knowledge (0.076) > digital hardware knowledge (0.074) > digital basic knowledge (0.070). From the weight values of these four second-level components, it can be seen that the weight value of digital professional knowledge is the largest, but it is not much different from the weight values of digital software knowledge and digital hardware knowledge, and the weight value of digital basic knowledge is the smallest.

Analysis of the weight of components under the digital capability dimension

In terms of digital capabilities, the weight values of the five second-level components are ranked from large to small: digital innovation and entrepreneurship (0.116) > professional problem-solving (0.105) > digital content creation (0.084) > digital communication and cooperation (0.078) > Data collection and processing (0.072). It can be seen that digital innovation and entrepreneurship has the highest weight value, followed by professional problem-solving, which is in line with the current requirements of university education and tourism industry development for tourism management of undergraduate students. The data collection process has the lowest weight.

Analysis of the weight of components under the digital responsibility dimension

In terms of digital responsibility, the weight values of the three second-level components are ranked from large to small: digital security (0.091) > digital ethics (0.042) > digital governance (0.038). Among them, digital security has the highest weight value, followed by digital ethics, and the lowest weight value is digital governance.

Improvement and analysis of the digital literacy evaluation model for tourism management of undergraduate students

The components of digital literacy for tourism management of undergraduate students are relatively comprehensive and complex, but it does not mean that all components are equally important to the learning and future employment

development of tourism management of undergraduate students. Therefore, this section will further revise and improve the digital literacy evaluation model for tourism management of undergraduate students based on the weight values of the components of digital literacy for tourism management of undergraduate students, and analyze its advantages.

Revision and improvement of the digital literacy evaluation model for tourism management of undergraduate students

The digital literacy components for tourism management of undergraduate students are relatively complex. The abilities represented by different components have varying levels of demand and importance in current learning and practical activities. Based on the analysis and results, the relative importance (i.e., weight) of the first-level components of digital literacy for tourism management of undergraduate students has been incorporated into the previously constructed evaluation model. The resulting digital literacy evaluation model for tourism management of undergraduate students is shown in Figure 4.8. The model aims to promote the sequential and focused development of digital literacy among students.

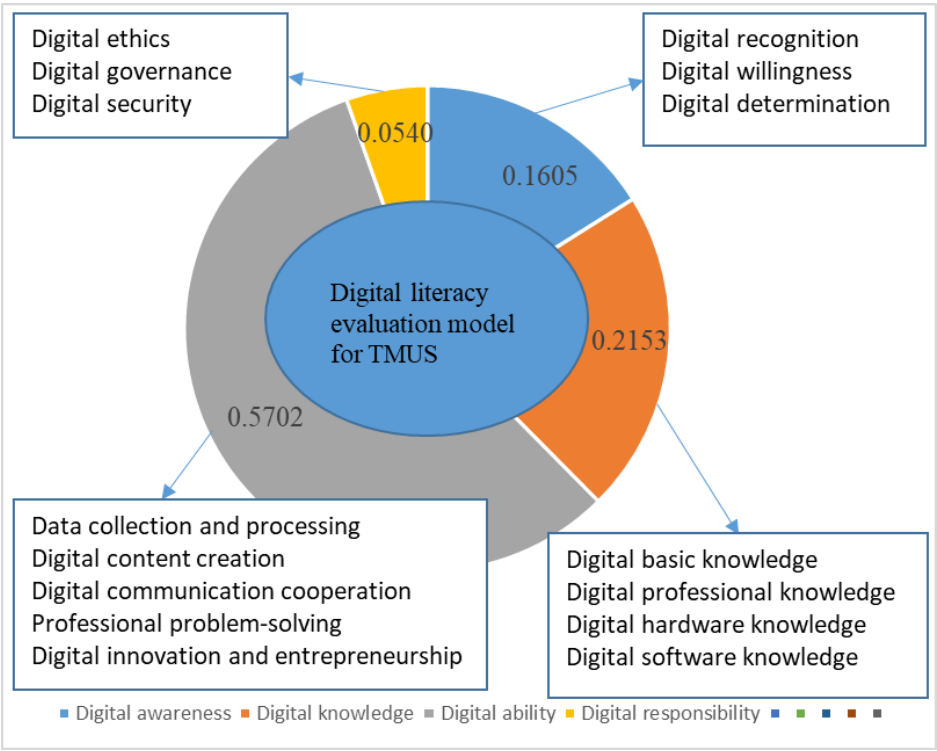

Figure 4.8 Digital literacy evaluation model for tourism management of undergraduate students

Analysis of the advantages of the digital literacy evaluation model for tourism management of undergraduate students

Compared to other evaluation models, this research's digital literacy evaluation model for tourism management of undergraduate students has several advantages.

Firstly, the model's construction is primarily guided by complexity theory. The characteristics of complexity theory include correlation and complexity. These characteristics highlight the importance of using appropriate research methods to construct digital literacy components for tourism management of undergraduate students. The Analytic Network Process is recommended for this purpose, as it makes the evaluation model more effective. It is important to maintain high levels of rationality and scientific rigor.

The model demonstrates the relationships and relative importance of the components of digital literacy among tourism management of undergraduate students. The first-level components are independent but connected, while the second-level components are key capabilities for the study and future career development of tourism management students. The model has strong organizational logic. Additionally, the model demonstrates the significance of each component, highlighting the abilities and characteristics that higher education should prioritize in developing undergraduate students' tourism management skills. Students can enhance their skills in a targeted and sequential manner based on their individual needs and areas for improvement, including their digital literacy level to adapt to the demands of the digital age.

This model fulfills the current capacity development needs of tourism management of undergraduate students. The digital literacy of tourism management of undergraduate students is closely related to their personal development and has a significant impact on their academic and career growth. The program aligns with the fundamental concept of cultivating individuals with moral integrity, adapts to the current times, and meets the diverse learning needs of tourism management of undergraduate students. It has undergone revision and verification by 21 experts in university education, computer science, tourism management and related fields.

Analysis results serving objective 3 – To verify the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

In order to serve objective 3, this part will collect data from students through experiments to prove the appropriateness (or effectiveness and rationality) of the model. The specific tables, figures and descriptions are as follows.

Pre-test

Respondents

There are 34 and 36 students in classes 1 and 2, respectively, of the 2022 tourism management of undergraduate students, making a total of 70 students. The questionnaires were distributed to students through the Questionnaire Star platform using online platforms such as WeChat and QQ communication app. Detailed explanations were provided to the students in advance to ensure that there were no invalid questionnaires. In total, 70 valid questionnaires were obtained, resulting in an effective recovery rate of 100%.

Quality inspection of questionnaires

Based on the components and descriptive items of digital literacy for tourism management of undergraduate students revised by experts, this research compiled a " Digital Literacy Questionnaire for Tourism management of undergraduate students" (see Appendix C6 for details), which consists of "Basic Information of Survey Objects" and " Digital Literacy for Tourism Management Undergraduate Students " consists of two parts. The first part has 5 questions, and the second part has 15 questions, for a total of 20 questions. This effectively reduces the time for tourism management of undergraduate students to fill out questionnaires and ensures the validity of students' self-evaluation. The second part of the questionnaire is a five-point measurement method, and each item is scored as an integer between 1 and 5. Although this questionnaire was developed using expert-revised components of digital literacy for tourism management of undergraduate students, further quality testing of the questionnaire is needed.

Item analysis of questionnaire

The extreme group test and homogeneity test were used. The extreme group test method is also called the critical ratio method. Its main purpose is to find the

decisive value of each item, that is, the CR value. Its procedure is to distinguish the high group (top 27%) and the low group (bottom 27%) based on the total test score, and then find the significance of the difference in the average number of each item between the high and low groups. If not, Items that reach the significant level α<0.05 and the absolute value of the decision value CR>3 will be considered for deletion. After processing the self-evaluation data of digital literacy for tourism management of undergraduate students according to the above ideas, the independent sample T test was further used to analyze the significant differences of the survey data. As shown in Table 4.38, the significance level of all items was α=0.000, the absolute value of the decision value CR>3, indicating that all items of digital literacy for tourism management of undergraduate students do not need to be revised or deleted.

Table 4.38 Extreme group test results

Question	Decision value CR	Significance level α
A1 Digital understanding	- 20.603	0.000
A2 Digital willingness	- 20.032	0.000
A3 Digital determination	- 2 0.352	0.000
B1 Digital basic knowledge	- 22.574	0.000
B2 Digital professional knowledge	- 22.453	0.000
B3 Digital Hardware Knowledge	- 23.178	0.000
B4 Digital software knowledge	- 23.376	0.000
C1 Data collection and processing	- 25.851	0.000
C2 Digital Content Creation	- 26.462	0.000
C3 Digital communication cooperation	- 24.351	0.000

Table 4.38 (Continued)

Question	Decision value CR	Significance level α
C4 Professional Problem-solving	- 23.472	0.000
C5 Digital Innovation and Entrepreneurship	- 22.439	0.000
D1 Digital Ethics	- 21.354	0.000
D2 Digital Governance	- 22.654	0.000
D3 Digital Security	- 22.735	0.000

The homogeneity test is to find the correlation coefficient between the item and the total score. If the correlation coefficient between an item and the total score is higher, it means that the item is more consistent with the homogeneity of the entire scale, and the measured content is the more reasonable it is; if the absolute value of the correlation coefficient r between an item and the total score is lower than 0.4 and the significance α<0.05, it means that the homogeneity of the item and the overall scale is not high, then it will be considered for deletion. As shown in Table 4.39, the significance level of each item has reached a significant level, and the correlation coefficient **r** value is between 0.702 and 0.864, which are all much greater than 0.4, indicating that the items are relatively homogeneous with the overall scale. High, all items can be retained, with good distinction and appropriateness.

Table 4.39 Homogeneity test results

Question	Correlation coefficient r	Significance level α
A1 Digital understanding	0.702	0.000
A2 Digital willingness	0.732	0.000
A3 Digital determination	0.724	0.000
B1 Digital basics knowledge	0.815	0.000
B2 Digital professional knowledge	0.842	0.000
B3 Digital hardware knowledge	0.839	0.000
B4 Digital software knowledge	0.833	0.000
C1 Data collection and processing	0.864	0.000
C2 Digital content creation	0.836	0.000
C3 Digital communication cooperation	0.845	0.000
C4 Professional problem-solving	0.827	0.000
C5 Digital innovation and entrepreneurship	0.818	0.000
D1 Digital ethics	0.803	0.000
D2 Digital governance	0.825	0.000
D3 Digital security	0.843	0.000

Reliability and validity test of questionnaire

Reliability analysis

This research used Cronbach's Alpha coefficient for reliability testing. It is generally believed that if the Cronbach's Alpha coefficient is greater than 0.7, the questionnaire is considered to have high stability and consistency. The Statistical Package for the statistical software was used to conduct a reliability test on the questionnaire. The results are shown in Table 4.40. The overall reliability of the

second part of the digital literacy questionnaire for tourism management of undergraduate students is 0.907, and the Cronbach's Alpha coefficient of the first-level component is 0. 853 -0.902, thus indicating that the questionnaire has high internal stability and consistency.

Table 4.40 Reliability of the questionnaire

First-level components	Cronbach Alpha	Number of questions α
Digital awareness	0.853	3
Digital knowledge	0.892	4
Digital ability	0.902	5
Digital responsibility	0.901	3
Questionnaire as a whole	0.907	15

Validity analysis

Questionnaire content validity

In this research, the components and descriptions of digital literacy for tourism management of undergraduate students were formed based on relevant domestic and foreign experiences, the needs of tourism management of undergraduate students, and after multiple rounds of verification and revision by experts in related fields. The above shows that, the digital literacy questionnaire for tourism management of undergraduate students compiled this time has good content validity.

Questionnaire structural validity

In order to test the structural validity of the components, this part further uses exploratory factor analysis to test the structural validity of the valid data. The analysis results show that: the KMO value is 0.855, the approximate chi-square value of Bartlett's sphericity test is 841. 812 (the degree of freedom is 105), α=0.000, indicating that there is a significant difference at the confidence level of α<0.05, the

research data is suitable for the next step of factor analysis. Set the "Number of extracted factors" to "4", which is the same number as the number of first-level components in this research, and use the Promax oblique rotation in the oblique rotation axis method to obtain the analysis results shown in Table 4.41. Among the four extracted common factors, the factor loadings of all 15 factors (i.e., second-level components) are greater than 0.50. The cumulative explanatory variable is 79.991 %, which is much higher than 60%.

In addition, "common factor one" is consistent with the first-level component "digital awareness"; "common factor two" is consistent with "digital knowledge"; "common factor three" is consistent with "digital ability"; "common factor four" is consistent with "digital responsibility" is consistent. The above analysis shows that the questionnaire has very high structural validity and can be analyzed in the next step.

Table 4.41 Summary table of factor analysis results

Digital literacy variables	Common factor			
	One	Two	Three	Four
Digital understanding	0.815			
Digital willingness	0.871			
Digital determination	0.766			
Digital basic knowledge		0.824		
Digital hardware knowledge		0.833		
Digital hardware knowledge		0.893		
Digital software knowledge		0.806		
Data collection and processing			0.753	
Digital content creation			0.872	
Digital communication cooperation			0.838	

Table 4.41 (Continued)

Digital literacy variables	Common factor			
	One	Two	Three	Four
Professional problem-solving			0.817	
Digital innovation and entrepreneurship			0.835	
Digital ethics				0.884
Digital governance				0.940

Weighted description of statistical analysis of survey data

In the scoring of the components of digital literacy for tourism management of undergraduate students, due to the different weight distribution between the first-level components and the different number of second-level components included, the total score of the student questionnaire is based on the first-level components. The scores are distributed unevenly. Table 4.42 presents the score distribution of the four first-level components of the unweighted questionnaire.

Table 4.42 Total score of the questionnaire and distribution of scores in terms of components

First-level components	Second-level components	Lowest score	Highest score
Digital awareness	3	3	15
Digital knowledge	4	4	20
Digital ability	5	5	25
Digital responsibility	3	3	15
Total	**15**	**15**	**75**

Since the components of digital literacy for tourism management of undergraduate students have different functional roles, this also determines the weight of different components in the entire self-evaluation paper. Therefore, when analyzing the self-evaluation data of digital literacy among tourism management of undergraduate students, we cannot simply sum up the scores of each component to measure the digital literacy score of tourism management of undergraduate students. Instead, it is necessary to weight the data of different components according to the weight values calculated in the above study, and then calculate an accurate and reasonable digital literacy score for tourism management of undergraduate students. Table 4.43 presents the weighted scores of digital literacies for tourism management of undergraduate students.

Table 4.43 Weighted score table for self-evaluation of digital literacy among tourism management of undergraduate students (part)

Second-level components	S1	S2	S3	S4	S5
Digital understanding	0.132	0.132	0.099	0.132	0.165
Digital willingness	0.064	0.064	0.064	0.064	0.080
Digital determination	0.112	0.112	0.112	0.140	0.112
Digital basics knowledge	0.210	0.210	0.280	0.210	0.280
Digital professional knowledge	0.280	0.280	0.280	0.280	0.280
Digital hardware knowledge	0.222	0.222	0.296	0.222	0.222
Digital software knowledge	0.304	0.304	0.304	0.228	0.228
Data collection and processing	0.288	0.360	0.288	0.360	0.288
Digital content creation	0.336	0.420	0.336	0.336	0.252
Digital communication cooperation	0.390	0.234	0.312	0.234	0.312
Professional problem-solving	0.420	0.315	0.420	0.315	0.420

Table 4.43 (Continued)

Second-level components	S1	S2	S3	S4	S5
Digital innovation and entrepreneurship	0.464	0.348	0.464	0.464	0.348
Digital ethics	0.210	0.210	0.168	0.210	0.168
Digital governance	0.190	0.190	0.152	0.114	0.114
Digital security	0.455	0.455	0.364	0.455	0.455
Weighted total score	4.077	3.856	3.939	3.764	3.724

Analysis of the overall level of digital literacy among tourism management of undergraduate students

At the population level of student sample data, the average digital literacy score of 70 students was $\bar{X}$=2.82, S.D.= 0.716. Among them, the number of students who scored above the average score was 31, accounting for 44.3 %, and the number of students who scored below the average score was 39, accounting for 55.7 %. The average score $\bar{X}$, the standard deviation S.D., the number of students who scored higher than the average score N1, and the number of students who scored lower than the average score N2 in terms of the first-level components of digital literacy are shown in Table 4.44.

Table 4.44 Descriptive statistical analysis of the overall level of digital literacy in tourism management majors

First-level components	$\bar{X}$	S.D.	N1 (above average)	N2 (below average)
Digital awareness	3.09	0.877	40	30
Digital knowledge	2.63	0 .850	33	37
Digital ability	2.65	0.861	29	41
Digital responsibility	3.64	0 .989	43	27

It is worth noting that since each first-level component has a different weight value, it is not possible to compare students score levels among different first-level components based on their mean values. However, we can compare the number of people above and below the mean respectively. Through the comparison of this figure, we can intuitively find that in addition to digital awareness and digital responsibility, there are more people who are below the average in digital knowledge and digital ability, which shows that their digital literacy level needs to be improved urgently.

Comparison of the average digital literacy between the experimental group and the control group

Using the independent sample t-test, it is found from Table 4.45 that the mean value of the experimental group is 2.87, and the mean value of the control group is 2.76. The mean values of the two groups are not much different. Through Table 4.46, it is found that the value of Sig. (two-tailed) is 0.516, and its value is greater than 0.05, so there is no significant difference between the two sets of data. This ensures that the digital literacy levels of students in the experimental group and the control group are similar, so that the experiment can be carried out.

Table 4.45 Group Statistics

	Class	Number of cases	Average value	Standard deviation	Standard error of the mean
Average value	Class 1	34	2.87391	.618573	.106084
	Class 2	36	2.76239	.802238	.133706

Table 4.46 Independent samples test

		Levine 's test for equality of variances		**t-test for equality of means**						
		F	Significance	t	degrees of freedom	Sig. (two-tailed)	mean difference	standard error difference	95% confidence interval of difference lower limit	95% confidence interval of difference upper limit
Mean	Assuming equal variances	4.387	.040	.649	68	.519	.111523	.171942	-.231582	.454627
	Does not assume equal variances			.653	65.434	.516	.111523	.170679	-.229304	.452349

Experiment

A total of 70 students from Class 1 and Class 2 of the 2022 tourism management of undergraduate students of Leshan Normal University were selected as the experimental group and control group respectively. Reason for selection: The freshmen are not familiar with the major yet. The seniors are already doing internships abroad. The Juniors take more courses and are less motivated to study. Therefore, sophomores are considered.

The teachers in the experimental group and the control group were the same teachers and used the same teaching resources. The difference is that the experimental group uses the digital literacy evaluation model for tourism management of undergraduate students, and the control group uses the digital literacy evaluation model for college students (Ping, 2018). Since there is no other digital literacy evaluation model specifically targeted at tourism management of undergraduate students, the digital literacy evaluation model targeted at undergraduates is chosen here. The first-level components of the digital literacy evaluation model for the control group include digital attitudes, digital thinking, digital knowledge, and digital skills. Among them, digital attitude includes subjective initiative, self-respect, positive awareness, and curiosity; digital thinking includes dialectical thinking and innovative thinking; digital knowledge includes method principles, scope of application, laws and norms, principles and policies; digital skills include identifying digital information, Communication and collaboration, digital content creation, digital security awareness.

Taking the 2022 tourism management undergraduate class 1 as the experimental group, a relevant training plan was set up based on the digital literacy evaluation model for tourism management of undergraduate students and the results of the previous questionnaire assessment. The specific content is shown in Table 4.47. Because the training plan includes a lot of content, the digital tools and applications are selected for training here. The detailed teaching plan is shown in Table 4.48.

Table 4.47 Digital literacy training plan for tourism management of undergraduate students

Elements	Content	
Training objectives	Through this training course, tourism management of undergraduate students will be able to: 1. Understand the importance and impact of digital technology on the tourism industry. 2. Master digital tools and applications related to tourism management. 3. Improve information sketching and critical thinking skills to better analyze market trends and customer needs. 4. Learn to effectively use digital media and social media to promote tourism products and services. 5. Develop skills in digital project management and data analysis. 6. Understand the application of digital ethics and privacy protection principles in the tourism industry.	
Training content (48 hours)	Module 1: Introduction to Digital Literacy (2 hours)	1. What is digital literacy? 2. The application and importance of digital technology in tourism management. 3. Assess your current level of digital literacy.
	Module 2 Digital Tools and Applications (16 hours)	1. Operate commonly used digital tools and applications, such as web design, online booking systems, customer relationship management software, etc. 2. Understand how to use these tools to manage travel products and services.
	Module 3 Information Sketching and Market Analysis (4 hours)	1. Identify and analyze tourism market trends. 2. Use data and information to anticipate customer needs and behaviors. Critical thinking and information evaluation skills.

Table 4.47 (continued)

Elements		Content
	Module 4 Digital Marketing and social media (4 hours)	1. Develop digital marketing strategies, including search engine optimization (SEO) and social media marketing. 2. How to use social media platforms to promote tourism products and services.
	Module 5 Digital Project Management (4 hours)	1. Learn the basic principles and tools of digital project management. 2. How to effectively plan, execute and monitor tourism projects.
	Module 6 Data Analysis and Decision Support (4 hours)	1. Master basic data analysis skills, including data collection, cleaning and visualization. 2. How to use data to make strategic decisions.
	Module 7 Digital Ethics and Privacy Protection (4 hours)	1. Basic principles of digital ethics, especially their application when handling customer information. 2. How to protect customer privacy and data security.
	Module 8 Comprehensive Project and Practice (6 credit hours)	1. Apply acquired knowledge to real tourism management situations through integrated projects and real-life case studies.
	Module 9 Summary and Future Outlook (2 hours)	1. Review the entire training program and the progress made. 2. Explore the trends and development opportunities of digital literacy in the future tourism industry.

Table 4.47 (continued)

Elements	Content
Training methods	Lectures and demonstrations Online Learning Group discussion and interaction Practical operations and exercises Projects and case studies Regular tests and assessments
Assessment method	Class participation and interaction Coursework take an exam
Training period	September 1, 2023 - December 31, 2023
Training location	Leshan Teachers College, Leshan City, Sichuan Province, China
Training target	34 sophomore tourism management of undergraduate students
Training expert	Teachers of computer science, university education, tourism management, etc.

Table 4.48 Teaching Plan

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental Hours
Web design basics	1. Basic knowledge of network 2. Web pages and websites 3. Web Design Rules 4. Commonly used software for web design 5. Dreamweaver's interface 6. How to establish a local site 7. Create HTML files	1. Let students understand the basic knowledge of the Web, including network basics, websites and web pages, and web page design rules. 2. Be familiar with the Dreamweaver CS6 interface. 3. Master the methods of creating and managing sites based on the Dreamweaver platform. 4. Master the creation and saving of new web pages, and be able to insert simple text information.	1	1
Create a web page with pictures and text	1. Inserting and editing images 2. Text formatting: paragraphs, titles, lists 3. HTML Basics 4. CSS Basics	1. Master the image insertion method. 2. Master text formatting operations to achieve paragraph, title and list formats of text. 3. Understand the basic syntax of HTML, master the top-level structural tags of HTML, as well as the image and text tag elements involved.	1	2

Table 4.48 (Continued)

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental Hours
		4. Master CSS style settings, and implement the settings and applications of tags, class names, and ID selectors based on embedded CSS styles.		
Integrated web design	1. Table Basics and Layout 2. DIV+CSS layout 3. Multimedia material insertion 4. Hyperlink Application 5. External CSS Application 6. Complete the table layout 7. Complete DIV+CSS layout 8.Complete the hyperlink application	1. Master the table layout tools. 2. Master the basics of DIV, including how to insert DIV, box model and box floating. 3.Master DIV+CSS page layout. 4. Master the setting and application of hyperlinks. The main types include internal, external, text, pictures and anchors. 5. Understand how to set up external CSS files and distinguish the application scope of internal CSS and external CSS.	1	3

Table 4.48 (Continued)

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental Hours
Advanced web design applications	1. Form 2. Embedded Framework 3.CSS3 Basics and Applications 4. JavaScript Basics and Applications 5. Complete the creation of page effects using CSS3 6. Complete the display and hiding effects of elements using JavaScript	1.Understand forms and common control insertion. 2.Learn how to insert and edit inline frames. 3.Master the production of practical special effects with CSS3. 4.Master the three important elements of JavaScript language: objects, events and actions. 5.Be able to skillfully use the behavior panel to set the display and hiding of elements.	1	2

Table 4.48 (Continued)

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental Hours
Create web page image material	1. Photoshop CS6 interface 2. Basic operations of Photoshop CS6 files 3. Common tools of Photoshop 4. The concept and basic usage of layers 5. Use of path and text tools 6. Adjust the color and tone of the image 7. How to use the mask 8. How to use filters 9. Complete Photoshop CS6 web image production	1. Understand the theoretical knowledge of image processing, including pixels and image resolution, bitmap and vector graphics, image color mode, and image file format. 2. Familiar with Photoshop CS6 working environment. 3. Be familiar with the basic operations of Photoshop CS6, including basic file operations, image display, and the use of auxiliary tools. 4. Be able to skillfully use the basic tools of Photoshop, including creation and editing of selections, image drawing, retouching and editing. 5. Master the creation and application of layers, including the basic concepts of layers, basic operations of layers, editing layers, layer effects and styles.	1	1

Table 4.48 (Continued)

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental Hours
		6. Master the application of path and text tools, including creating paths, editing paths, inputting text, editing and converting text. 7 Master the application of layer masks to achieve image fusion. 8. Understand the use of filters.		
Tourism website	Organize website documents (classify and store related documents), test pages to ensure they can display normally, test hyperlinks to ensure that pages can jump normally and accurately.	1. Master the entire design process of tourism websites, including site planning, homepage production, and template production. 2. Submit the final assessment work (website production). 3. Including document organization (classification and storage of related documents), normal display of pages, testing of normal hyperlinks, and normal and accurate page jumps.	1	1
Total			**6**	**10**

The 2022 tourism management undergraduate class 2 was used as the control group. The control group used the Digital Literacy Evaluation Model for College Students (Ping Yue, 2017). According to the Digital Literacy Evaluation Model for College Students and the results of the previous questionnaire assessment, a related training plan was set up. The specific content is shown in Table 4.49. Then the data processing and analysis part was selected for training. The detailed teaching plan is shown in Table 4.50.

Table 4.49 Digital literacy training program for tourism management of undergraduate students

Elements	**Content**	
Training objectives	Through this training course, undergraduates will be able to: 1. Enable students to master basic digital skills, including basic information technology, network applications, data processing and analysis, etc. 2. Cultivate students' digital thinking, including information awareness, critical thinking and innovative thinking. 3. Improve students' digital ethics and legal awareness, and ensure that they abide by laws and regulations and respect intellectual property rights in the online environment. 4. Encourage students to apply digital skills to real life and future work to improve their overall competitiveness.	
Training content (48 hours)	Module 1 Basics of Information Technology (8 credit hours)	1. Basic computer knowledge 2. Operating system introduction and basic operations 3. Basic application of office software

Table 4.49 (continued)

Elements	Content	
	Module 2 Network Application (8 hours)	1. Basic knowledge of the Internet and safe Internet access 2. Web search skills and advanced search 3. Application and management of social media 4. Download and share network resources
	Module 3 Data Processing and Analysis (12 credit hours)	1.Excel advanced applications (such as pivot tables, chart making, etc.) 2. Introduction to SPSS software and data analysis 3. Introduction and application of data visualization tools 4.Case analysis and project practice
	Module 4 Digital Media Production (8 credit hours)	1. Image editing and processing (such as Photoshop basics) 2. Video editing and production (such as Premiere basics) 3. Audio editing and processing (such as Audacity basics) 4.Creative design and project practice
	Module Five Digital thinking training (6 hours)	1. Information awareness and critical thinking 2. Innovative thinking methods and practices 3.Teamwork and project management 4. Case analysis and discussion
	Module 6 Digital Ethics and Law (6 credit hours)	1. Cybersecurity Laws and Regulations 2. Intellectual property protection and infringement risks 3. Digital Ethics and Code of Conduct 4. Case analysis and discussion

Table 4.49 (continued)

Elements	Content
Training methods	Lectures and demonstrations Online Learning Group discussion and interaction Practical operations and exercises Projects and case studies Regular tests and assessments
Assessment method	Class participation and interaction Coursework take an exam
Training period	September 1, 2023 - December 31, 2023
Training location	Leshan Teachers College, Leshan, Sichuan, China
Training target	36 sophomore tourism management of undergraduate students
Training expert	Teachers of computer science, university education, tourism management, etc.

Table 4.50 Teaching plan

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental hours
Excel advanced applications	1. Pivot table 2. Chart creation	1. Learn how to create pivot tables, layout fields, and perform dynamic analysis. 2. Learn how to create various charts and understand the applicable scenarios of different chart types.	2	2
Introduction to SPSS Software and data analysis	1. SPSS software basics 2. Data management 3. Descriptive statistical analysis 4. Basics of inferential statistical analysis	1. Understand the SPSS software interface, menus and toolbars, and master the import and export of data files. 2. Learn data management skills such as data encoding, variable setting, and data conversion. 3. Calculate descriptive statistics such as mean, standard deviation, and frequency distribution. 4. Understand the basic concepts of statistical methods such as independent sample T test and variance analysis.	2	2

Table 4.50 (continued)

Teaching Modules	Course content	Teaching requirements	Teaching hours	Experimental hours
Introduction and application of data visualization tools	1. Data visualization overview 2. Introduction to static chart tools 3. Overview of interactive charting tools	1. Understand the importance, principles, and common types of data visualization. 2. Introduce the basic operations of static chart creation tools such as Tableau and Power BI. 3. Understand the basic concepts of interactive chart making tools such as D3.js.	1	1
Case analysis and project practice	1. Case Analysis 2. Project Practice	1.By analyzing classic data processing and analysis cases, we can understand the practical applications of data processing and analysis. 2.Carry out simplified project practice and apply Excel, SPSS and data visualization tools for data processing and analysis.	0	2
	Total		**5**	**7**

Among them, the training method for online learning is to build online learning resources on Chaoxing Learning. Chaoxing Learning is a mobile APP that integrates resources, courses, learning, evaluation, and interaction. It is a mobile online teaching platform for mobile terminals. Teachers create courses, publish tasks, and organize teaching activities on the teacher side of the platform. Students complete teaching tasks independently on the student side of the platform in order to carry out interactive activities. Teachers can check students' learning situation in real time and make timely adjustments. Chaoxing Learning also has a corresponding computer side, and teachers can use the computer side to conduct big data analysis on students' learning situation on the platform.

The website address for online learning resources is: https://mooc1-1.chaoxing.com/moocans/course/232956892.html. The cover of the online course is shown in Figure 4.9.

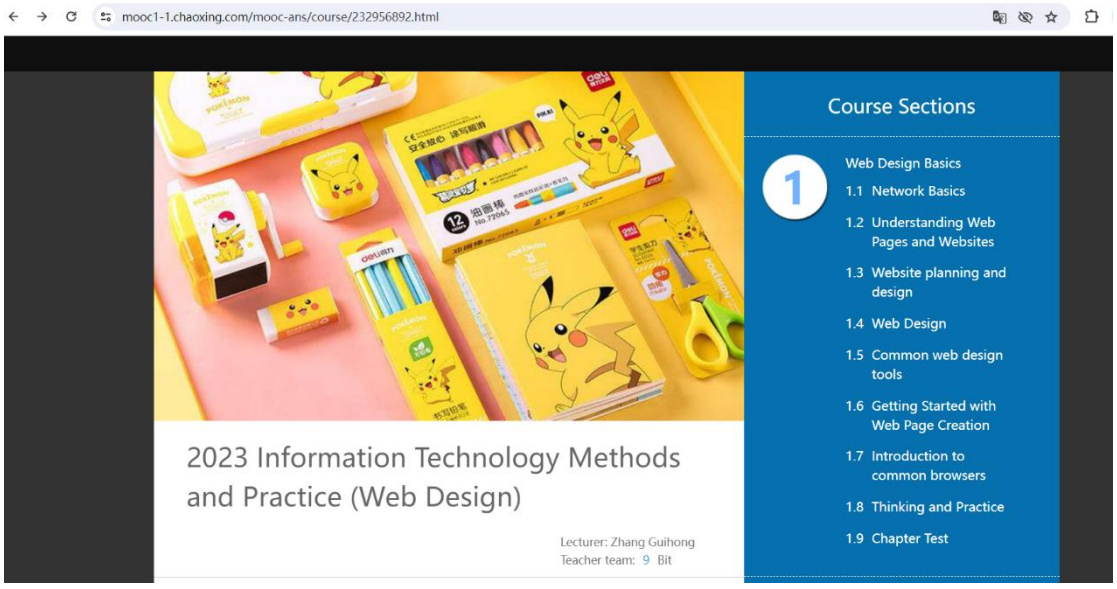

Figure 4.9 The cover of the online course

The content of online learning resources mainly includes micro-course videos, electronic courseware, course materials, question banks, homework banks, test paper banks, etc. See Figure 4.10 to for details.

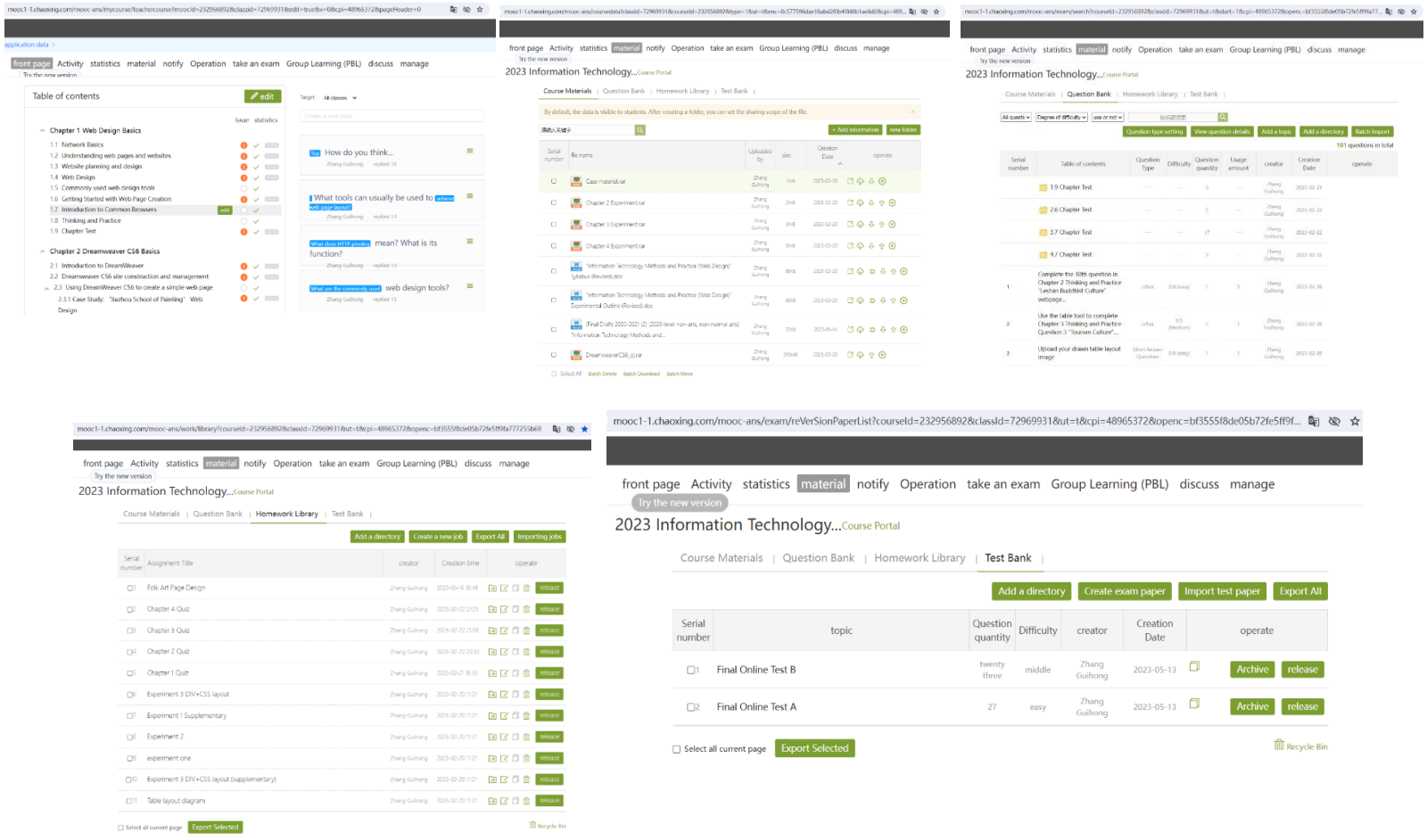

Figure 4.10 Online Course Resources

Post-test

Examination

After the training, an exam plan (see appendix C9 for specific content) and test paper (see appendix C10 for specific content) will be formulated, and then students will be tested. The analysis of the test results is as follows:

The evaluation method of this exam is a skills test, and the test questions include: fill-in-the-blank questions, multiple-choice questions, and operational questions. Fill-in-the-blank questions and multiple-choice questions mainly involve relevant theoretical knowledge, understanding of basic concepts, and common sense in using the main software for this course. The operational questions are mainly used to assess students' website design abilities on the spot.

The specific results of the experimental group are shown in Table 4.51.

Table 4.51 The results of students in the experimental group

Student	Regular Grade	Final Grade	Comprehensive Grade
E1	80	74	77
E2	89	88	89
E3	78	76	77
E4	81	77	79
E5	87	84	86
E6	78	76	77
E7	86	82	84
E8	92	90	91
E9	92	89	91
E10	90	86	88
E11	81	78	80
E12	92	88	90
E13	88	88	88
E14	86	85	86
E15	86	60	73

Table 4.51 (Continued)

Student	Regular Grade	Final Grade	Comprehensive Grade
E16	84	77	81
E17	78	76	77
E18	80	72	76
E19	87	87	87
E20	92	91	92
E21	85	57	71
E22	86	84	85
E23	83	82	83
E24	80	74	77
E25	90	82	86
E26	92	88	90
E27	86	84	85
E28	89	88	89
E29	86	81	84
E30	84	84	84
E31	86	81	84
E32	66	57	62
E33	68	61	65
E34	92	85	89

The distribution of test score in the experimental group was as follows: 5 students scored 90-100 (excellent), 18 students scored 80-89 (good), 9 students scored 70-79 (medium), and 2 students scored 60-69 (passed). The highest score is 92, the lowest score is 62, and the average score is 82.44. See Figure 4.11 for details.

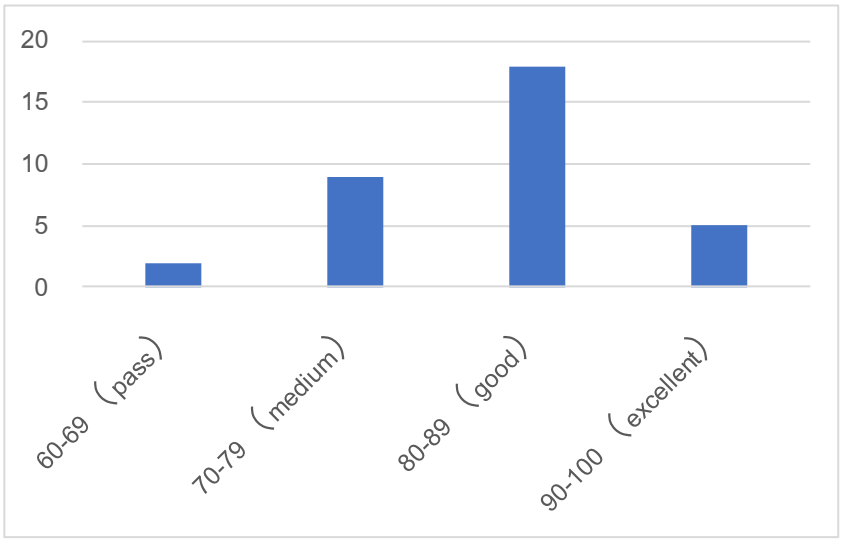

Figure 4.11 Experimental group score distribution

Judging from the test results, 34 students in the class took the test, 2 of them were excellent and 19 were good, which shows that the vast majority of students have mastered the relevant knowledge points and skill requirements, and can be more proficient in using the web page production software Dreamweaver CS6 to create web pages layout. However, there are also the following problems: Judging from the submission of the website, the works submitted by some students are relatively messy, and the site structure and file naming are not established as required. Two students forgot to save their theory test answer sheets, so they turned them in as blank sheets, resulting in unnecessary points loss.

The results of students in the control group are shown in Table 4.52.

Table 4.52 The scores of students in the control group

Student	Regular Grade	Final Grade	Comprehensive Grade
C1	83	81	82
C2	91	86	89
C3	92	92	92
C4	88	83	86
C5	80	76	88
C6	70	64	67
C7	86	85	86
C8	88	81	85
C9	80	76	78
C10	80	74	77
C11	80	74	77
C12	83	69	76
C13	90	88	89
C14	78	78	78
C15	80	78	79
C16	94	93	94
C17	83	70	77
C18	79	64	72
C19	91	89	90
C20	79	68	74
C21	88	74	81
C22	82	74	78
C23	76	72	74
C24	85	82	84
C25	91	87	89
C26	77	71	74
C27	75	69	72

Table 4.52 (Continued)

Student	Regular Grade	Final Grade	Comprehensive Grade
C28	92	87	90
C29	87	84	86
C30	78	77	78
C31	73	57	65
C32	84	72	78
C33	80	75	78
C34	92	90	91
C35	86	80	83
C36	60	12	12

The distribution of test scores in the control group: 5 people scored 90-100 (excellent), 1 person 80-89 (good), 17 people 70-79 (medium), 2 people scored 60-69 (pass), 0-60 (failed))1 person. The highest score is 94, the lowest score is 12, and the average score is 78.86. The test results of the control group are shown in Figure 4.12:

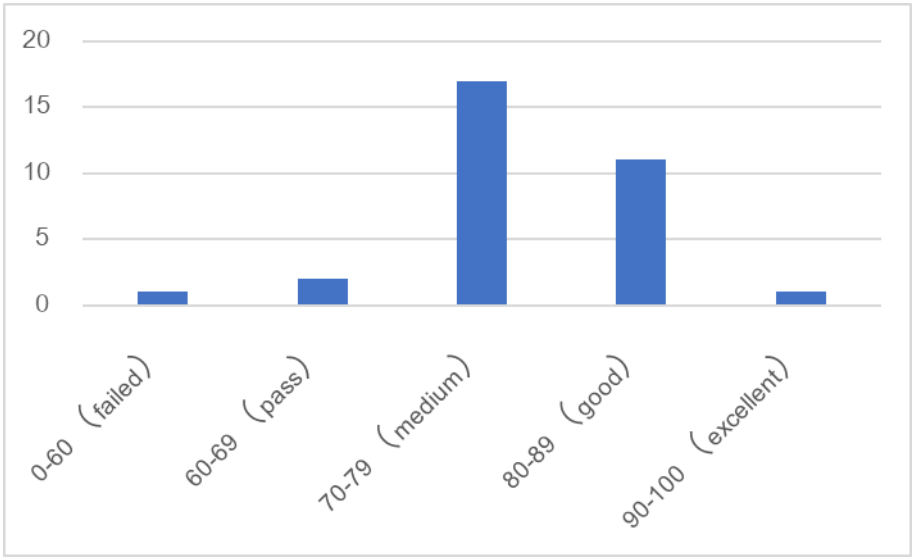

Figure 4.12 Control group grade distribution

Judging from the test results, the vast majority of students have mastered the relevant knowledge points and skill requirements, and can be relatively proficient in using the web page production software Dreamweaver CS6 to create web page layouts and set web page special effects. Judging from the specific situation of this exam, there are the following problems: more points are lost on theoretical questions, and the basic concepts and terminology of web design are not well grasped. In the operation questions, the ability to layout and design according to the effect of the web page needs to be strengthened. This part also loses more points, and the mastery of CSS style attributes is not proficient enough. In addition, one student in the exam class did not submit the answer sheet for the theoretical questions correctly, resulting in a blank sheet. The final operation question was not submitted in the correct way, and the web page file submitted was a blank document, which resulted in failed.

It can be seen from the above data that the average score of Class 1 is higher than that of Class 2. That is, the average score of the experimental group was higher than that of the control group. This also proves that the digital literacy evaluation model of the experimental group is better than the digital literacy evaluation model of the control group.

Digital literacy measurement

The "Digital Literacy Questionnaire for Tourism management of undergraduate students" (Appendix C6) was distributed to 70 students through the Questionnaire Star platform using online platforms such as WeChat and QQ communication app. Detailed explanations and explanations were given to the students in advance, so there were no invalid questionnaires. In the end, 70 valid questionnaires were obtained, and the effective recovery rate was 100%.

Questionnaire reliability and validity testing

The reliability of the questionnaire was tested using statistical software. The results are shown in Table 4.53. The overall reliability of the second part of the digital literacy questionnaire for tourism management of undergraduate students is 0.900. The Cronbach Alpha coefficient of the first-level component is at Between 0.811 -0.890, it shows that the questionnaire has high internal stability and consistency.

Table 4.53 Reliability of questionnaires

First-level components	Cronbach Alpha	Number of questions
Digital awareness	0.890	3
Digital knowledge	0.885	4
Digital ability	0.811	5
Digital responsibility	0.813	3
Questionnaire as a whole	0.900	15

The questionnaire was analyzed for validity using statistical software. The results are shown in Table 4.54. The KMO value is 0.847, the approximate chi-square value of Bartlett's sphericity test is 583.812 (the degree of freedom is 105), and the significance level α=0.000, indicating that there is a significant difference at the confidence level of α< 0.05, which indicates that the research data is suitable for relevant statistical analysis.

Table 4.54 KMO and Bartlett test

KMO sampling suitability quantity		.847
Bartlett's test of sphericity	Approximate chi-square	583.268
	degrees of freedom	105
	Significance	.000

Analysis of students' overall digital literacy

At the overall level of student sample data, the mean value of digital literacy among the 70 students was $\overline{X}$=3.84, S.D.=0.471. Compared with the average value measured before the experiment (2.82), it increased by 1.02. Among them, the number of students who scored above the average score was 37, accounting for 52.9 %, and the number of students who scored below the average score was 33, accounting for 47.1 %. The number of people scoring above average increased from

31 to 37, a percentage increase of 8.6%. The number of people with below-average scores decreased from 39 to 33, a percentage decrease of 2.8%. For the mean score M, standard deviation S. D, number of students who scored higher than the average score N1, and number of students who scored lower than the average score N2 in terms of the first-level components of digital literacy, please see Table 4.55.

Table 4.55 Descriptive statistical analysis of the overall level of digital literacy in tourism management majors

First-level components	$\overline{X}$	S.D.	N1 (above average)	N2 (below average)
Digital awareness	4.02	0.680	48	22
Digital knowledge	3.63	0.514	37	33
Digital ability	3.70	0.557	39	31
Digital responsibility	4.16	0.667	47	23

Compared with Table 4.44, the average values of digital awareness, digital knowledge, digital ability, and digital responsibility have all improved. In terms of numerical ability increased by 1.05, numerical knowledge increased by 1.00, numerical awareness increased by 0.93, and numerical responsibility increased by 0.48. In terms of the number of people above average, digital awareness increased by 8 people, digital knowledge increased by 4 people, digital ability increased by 10 people, and digital responsibility increased by 4 people. It can be seen from these data that students' digital literacy levels have improved, proving that the training is effective.

Comparison of digital literacy averages between the experimental group and the control group

Using the independent sample t-test, it is found from Table 4.56 that the average value of the experimental group is 4.11 and the average value of the control group is 3.58. The average value of the experimental group is 0.53 higher than the average value of the control group. In addition, through Table 4.57, it is found that

the value of Sig. (two-tailed) is 0. 000, and its value is less than 0.05, indicating that there is a significant difference between the two groups of data. Compared with the pre-test of 2.87, the mean digital literacy level of the experimental group increased by 1.24. Compared with the pre-test of 2.76, the mean digital literacy level of the control group increased by 0.82. This shows that the digital literacy level of the experimental group is higher than that of the control group, and also proves that the digital literacy evaluation model of the experimental group is better than the digital literacy evaluation model of the control group.

Table 4.56 Group Statistics

	Number of cases	$\overline{X}$	**S. D**	**Standard error of the mean**
Experimental group	34	4.10980	.424782	.072850
Control group	36	3.58333	.358613	.059769

Table 4.57 Independent sample statistics

		Levine 's test for equality of variances		t-test for equality of means						
		F	Significance	t	degrees of freedom	Sig. (two-tailed)	mean difference	standard error difference	95% confidence interval of difference lower limit	upper limit
Mean	Assuming equal variances	.693	.408	5.614	68	.000	.526471	.093773	.339349	.713592
	Does not assume equal variances			5.587	64.727	.000	.526471	.094230	.338265	.714677

Chapter 5
Conclusion Discussion and Recommendations

The research in the digital literacy evaluation model for tourism management of undergraduate students. The objectives of this research were as follows: 1) to extract the components of digital literacy of tourism management of undergraduate students, 2) to develop a Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students, and 3) to verify the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students. The sample group in this research were 1,308 tourism management of undergraduate students and 21 teachers from 12 universities who are engaged in teaching and research in related fields such as university education, computer science, and tourism management. The experimental and control group were 70 tourism management of undergraduate students at Leshan Normal University. The main research instruments include questionnaire, statistical software, DEL model, Microsoft excel, Super Decisions, training program, test paper, etc. The statistic to analyze the data were percentage, average value, and standard deviation. The conclusion, discussion and recommendations of this research are as follows.

Conclusion

The research in the digital literacy evaluation model for tourism management of undergraduate students. The researcher summarizes the conclusion into 3 parts, details as follows:

Part 1: The components of digital literacy of tourism management of undergraduate students

Part 2: The Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

Part 3: The rationality and scientificity of the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

Part 1: The components of digital literacy of tourism management of undergraduate students

Overall, the digital literacy level of tourism management of undergraduate students is not high and needs to be continuously improved and developed as a whole. Most tourism management of undergraduate students hope that university and relevant department will carry out digital literacy education to improve their professional and future employment competitiveness. Most students hope to strengthen their knowledge in computer application, office software use, and information related to the tourism industry. Most hope to have courses that are in line with work, to cultivate the ability to adapt to the jobs in the tourism industry, and to add practical projects in the real work environment to the teaching process. Practical courses and career guidance, such as the employment requirements of the workplace, are the focus of students; knowledge of office software that is highly related to work is the knowledge and skills that most students hope to acquire; the cultivation of information abstract logical thinking, the content of digital education, professional ability, digital ability, etc. are also highly sought-after aspects.

The mean score of digital literacy of 1,308 tourism management of undergraduate students is $\bar{X}$=3.678, and the standard deviation S.D.=0.864. In terms of gender, the average digital literacy level of boys is higher than that of girls. In terms of origin, the average digital literacy level of urban students is higher than that of rural students. In terms of grade, the digital literacy level of freshmen is the lowest, and the digital literacy level of seniors is the highest. In terms of distribution region (because the number of people in the Northeast is small, it is not included in the comparative analysis), the digital literacy level of students in the western region is the lowest, the central region is close to the overall average, and the eastern region is the highest.

Since there is a correlation between the items in Q14-Q31 in the questionnaire, the maximum variance method was chosen based on the principal component analysis, and a total of four common factors were extracted. The Cronbach's alpha of the four common factors was above 0.90, indicating that these common factors have very high internal consistency reliability. According to the

explanation of the questions, they are called "digital awareness", "digital technology knowledge and skills", "digital application", and "digital social responsibility". Combining the domestic and foreign digital literacy frameworks, as well as the previous analysis of the current situation, education situation, needs and other aspects of digital literacy for tourism management of undergraduate students, we initially extracted the components of digital literacy for tourism management of undergraduate students, including a total of 4 first-level components and 13 second-level components are shown in Table 4.24. It should be noted that the above is only a preliminary summary of the components of digital literacy for tourism management of undergraduate students. However, its rationality and whether the description of the components is appropriate and accurate still needs to be further verified, revised and improved by experts.

Part 2: The Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

After the Delphi method, the components and descriptions of digital literacy for tourism management of undergraduate students were repeatedly deleted and verified, and finally the components of digital literacy for tourism management of undergraduate students with high consistency and credibility of expert opinions were obtained, such as shown in Table 4.31. Through the above research and analysis, this research constructed a digital literacy evaluation model for tourism management of undergraduate students in the digital era, as shown in Figure 4.10. It can be seen from this model that there are 4 first-level components of digital literacy for tourism management of undergraduate students, namely digital awareness, digital knowledge, digital ability, and digital responsibility; there are 15 second-level components, each of which is included in the current in the context of the digital age, tourism management of undergraduate students should focus on developing essential survival skills and key abilities.

The Analytical Network Process (ANP) was used to construct the correlation structure and hierarchy among the elements of digital literacy for tourism management of undergraduate students, and the relative weight of each element of

digital literacy for tourism management of undergraduate students was determined with the help of Super Decisions software. The weight values of the first-level components of digital literacy for tourism management of undergraduate students are ranked as follows: digital ability (0.5702) > digital knowledge (0.2153) > digital awareness (0.1605 > digital responsibility (0.0540). In terms of the weight of Weight analysis of second-level components, the top three are digital innovation and entrepreneurship, professional problem-solving, and digital security. Digital innovation, entrepreneurship and professional problem-solving are relatively high and difficult abilities for students to master. The last three are digital understanding, digital willingness, and digital determination, all of which belong to digital awareness.

Compared to other evaluation models, this research's digital literacy evaluation model for tourism management of undergraduate students has several advantages. First, the model's construction is primarily guided by complexity theory. Second, the model demonstrates the relationships and relative importance of the components of digital literacy among tourism management of undergraduate students. Finally, this model fulfills the current capacity development needs of tourism management of undergraduate students.

Part 3: The rationality and scientificity of the digital literacy evaluation (DLE) model for tourism management of undergraduate students

At the population level of student sample data, the average digital literacy score of 70 students was $\bar{X}$=2.82, S.D.=0.716. Among them, the number of students who scored above the average score was 31, accounting for 44.3 %, and the number of students who scored below the average score was 39, accounting for 55.7 %. We can intuitively find that in addition to digital awareness and digital responsibility, there are more people who are below the average in digital knowledge and digital ability, which shows that their digital literacy level needs to be improved urgently. Using the independent sample t-test, it is found from Table 4.50 that the mean value of the experimental group is 2.87, and the mean value of the control group is 2.76. The mean values of the two groups are not much different. Through Table 4.51,

it is found that the value of Sig. (two-tailed) is 0.516, and its value is greater than 0.05, so there is no significant difference between the two sets of data.

A total of 70 students from Class 1 and Class 2 of the 2022 tourism management of undergraduate students of Leshan Normal University were selected as the experimental group and control group respectively. The teachers in the experimental group and the control group were the same teachers and used the same teaching resources. The experimental group uses the digital literacy evaluation model for tourism management of undergraduate students. The control group uses the digital literacy evaluation model for college students. The experimental group set up relevant training plans based on the digital literacy evaluation model for tourism management of undergraduate students and the results of the previous questionnaire assessment. Because there are many contents, the digital tools and applications are selected for training. The control group uses the digital literacy evaluation model for college students and also sets up relevant training plans. Because there are many contents, the data processing and analysis are selected for training. There are many training methods, such as building online learning resources in Chaoxing Learning, including micro-class videos, electronic courseware, course materials, question banks, homework banks, test paper banks, etc.

After the training, an examination plan (see appendix 9 for specific content) and test questions (see appendix C10 for specific content) will be formulated, and then students will be tested. The distribution of test score in the experimental group was as follows: 5 students scored 90-100 (excellent), 18 students scored 80-89 (good), 9 students scored 70-79 (medium), and 2 students scored 60-69 (passed). The highest score is 92, the lowest score is 62, and the average score is 82.44. The distribution of test scores in the control group: 5 people scored 90-100 (excellent), 1 person 80-89 (good), 17 people 70-79 (medium), 2 people scored 60-69 (pass), 0-60 (failed))1 person. The highest score is 94, the lowest score is 12, and the average score is 78.86. It can be seen from the above data that the average score of Class 1 is higher than that of Class 2. That is, the average score of the experimental group was higher than that of the control group. This also proves that the digital literacy

evaluation model of the experimental group is better than the digital literacy evaluation model of the control group.

At the overall level of student sample data, the mean value of digital literacy among the 70 students was $\bar{X}$=3.84, S.D.=0.471. Compared with the average value measured before the experiment (2.82), it increased by 1.02. Among them, the number of students who scored above the average score was 37, accounting for 52.9 %, and the number of students who scored below the average score was 33, accounting for 47.1 %. The number of people scoring above average increased from 31 to 37, a percentage increase of 8.6%. The number of people with below-average scores decreased from 39 to 33, a percentage decrease of 2.8%.

Using the independent sample t-test, it is found from that the average value of the experimental group is 4.11 and the average value of the control group is 3.58. The average value of the experimental group is 0.53 higher than the average value of the control group. Compared with the pre-test of 2.87, the mean digital literacy level of the experimental group increased by 1.24. Compared with the pre-test of 2.76, the mean digital literacy level of the control group increased by 0.82. This shows that the digital literacy level of the experimental group is higher than that of the control group, and also proves that the digital literacy evaluation model of the experimental group is better than the digital literacy evaluation model of the control group.

Discussion

Discussion of the components of digital literacy of tourism management of undergraduate students

There is no direct research on the components of digital literacy of tourism management of undergraduate students. Therefore, the components of digital literacy of tourism management of undergraduate students in this research mainly refer to the research of the European Union, UNESCO and other scholars. Then, the relevant information of tourism management of undergraduate students is collected through questionnaires, and their digital literacy status, education situation and needs are analyzed. It should be pointed out that the breadth and sample size of the sample in the digital literacy questionnaire survey of tourism management of

undergraduate students are insufficient. Due to time and resource constraints, the number of samples for the digital literacy survey of tourism management of undergraduate students is not large enough, and the sampling ratio of tourism management of undergraduate students from different university and family backgrounds is not balanced, which may lead to certain deviations in the survey results. Finally, on this basis, the components of digital literacy of tourism management of undergraduate students are extracted, mainly including 4 first-level components, including digital awareness, digital technology knowledge and skills, digital application, and digital social responsibility, and 13 second-level components. Whether the names of these components and the descriptions of the components are appropriate and accurate, it remains to be further verified, revised and improved by experts.

Discussion of the Digital Literacy Evaluation (DLE) model for tourism management of undergraduate students

Regarding the research on digital literacy evaluation models, the main ones abroad include the Horizon Report released by the New Media Alliance of the United States, the "Seven-Component Model of Digital Literacy" proposed by the Joint Information Systems Committee of the United Kingdom, the EU Digital Literacy Framework and the UNESCO Global Digital Literacy Framework. Domestic digital literacy evaluation models are mainly focused on teachers, college students, primary and secondary school students, and government personnel. A representative one is the digital literacy evaluation model for college students proposed by Ping (2018).

There is no direct research on the digital literacy evaluation model for tourism management of undergraduate students. There are only the information literacy evaluation models for tourism management majors proposed by Yi (2020) and Fu et al. (2021). The digital literacy evaluation model for tourism management of undergraduate students includes 4 first-level components, namely digital awareness, digital knowledge, digital ability and digital responsibility, and 15 second-level components. Compared with other models, the characteristics of this model are: guided by complexity theory, it shows the relationship and relative importance of the components of digital literacy for tourism management of undergraduate

students, which meets the current needs of tourism management of undergraduate students for capacity development.

Discussion of the rationality and scientificity of the digital literacy evaluation (DLE) model for tourism management of undergraduate students

There are many ways to verify the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students. This research adopts the method of education and training. Due to time and resource constraints, only 70 tourism management of undergraduate students of Leshan Normal University were experimented, and not 493 tourism management of undergraduate students. Such experimental results may have a subtle impact on the research results. The experimental group adopted the digital literacy evaluation model for tourism management of undergraduate students, and the control group adopted the digital literacy evaluation model for college students proposed by Ping Yue (2018). Because there are no other digital literacy evaluation models for tourism management of undergraduate students, this may also affect the experimental comparison results. But in general, through experimental comparison, it can be seen from the experimental results that the efficiency of using the digital literacy evaluation model for tourism management of undergraduate students is better than that of using other models, which also proves the rationality and scientificity of the digital literacy evaluation model for tourism management of undergraduate students.

Recommendations

Implications

Based on the construction and empirical application of the digital literacy evaluation model for tourism management of undergraduate students, this research will propose corresponding countermeasures and suggestions from the government, enterprise, university and individual levels.

The government needs to build a digital ecosystem for integrated development

First of all, the government should formulate relevant policies accurately, and point out the direction for colleges and industry organizations to cultivate digital

literacy among tourism management of undergraduate students. Secondly, the government should establish an online education resource platform, integrate the best learning resources on the national education platform. Thirdly, according to the national conditions and the characteristics of tourism management of undergraduate students, the research on the connotation and index system of digital literacy is promoted. Finally, in order to solve the regional differences, the government should provide targeted digital skills training for different groups, narrowing the regional digital generation gap, and adapting to the development of the digital and intelligent era.

Tourism enterprises participate in the preparation of digital talent training programs

On the one hand, tourism enterprises should proactively adapt to the changes of the times, actively seek digital transformation in terms of organizational management, technology, facilities, leadership, etc., seek to optimize the digital environment directly corresponding to production and the real digital skills practice platform, and use their natural advantage of close contact with the market to conduct talent demand surveys around the development of the times and market demand, and timely update and improve the talent capability demand reports of different industries. On the other hand, tourism enterprises need to develop digital talent capability demand plans that are suitable for the development of tourism management of undergraduate students according to the characteristics of different professions and positions, and discuss with university to develop digital talent training plans suitable for tourism management of undergraduate students, and make suggestions for the development of the tourism management major in colleges and universities, and enhance the adaptability of college majors and the tourism industry.

Universities innovate and develop digital literacy education

First, reform and innovate the course teaching content, and incorporate explicit and implicit abilities into the course content. Second, conduct an in-depth evaluation of the digital literacy levels of tourism management undergraduates of different grades and provide targeted learning content. Third, improve teachers' digital literacy and guide students to maintain their learning ability and establish

correct values. Fourth, standardize the construction of digital environment and create a good digital learning environment for students' digital survival.

Students need to enhance their digital competitiveness

First, it is important to clearly understand the importance of improving one's own digital survival ability and establish a correct concept of digital literacy. Second, make good career plans and strive to obtain employment-oriented certificates. Third, give full play to their subjective initiative and actively participate in innovative entrepreneurial projects and practical projects.

Future Researches

The evaluation model constructed in this research is a general digital literacy evaluation model for tourism management of undergraduate students. It aims to provide a reference for the digital literacy education and self-development of tourism management of undergraduate students, and to provide more possibilities for the research on digital literacy of tourism management of undergraduate students in the future. In subsequent research, it can be extended from the following two aspects:

First, the researcher will further grasp the digital literacy of tourism management of undergraduate students from three perspectives: universities, enterprises, and tourism management of undergraduate students. We conduct in-depth research on the characteristics and limitations of digital literacy education in university, analyze the role and positioning of enterprises in digital literacy education, and further look at the essence of the problem from the perspective of tourism management of undergraduate students. The aim is to refine the components of digital literacy of tourism management of undergraduate students and their weight values, so that they have good extensibility and practicality in the application process.

Second, the researcher will expand the sample scope of the digital literacy questionnaire survey for tourism management of undergraduate students, increase the number of samples, and balance the sample ratio of each basic information. Reasonable sampling should be carried out based on the demographic characteristics of different colleges, grades, permanent residence of families, parents' education status, and parents' computer skills, so that the sample survey results can reflect the actual level of digital literacy of tourism management of undergraduate students as au

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List of Specialists and Letters of Specialists Invitation for IOC Verification

Name of Experts	Position/Office
1. Tang qianjun	Vice Dean of the School of Educational Sciences, Leshan Normal University
2. She wanbin	Director of the Organization Department, Leshan Normal University
3. Tomeyot Sanevong Na Ayutaya	Lecturer of Computer Animation and Multimedia Department, Phranakhon Rajabhat University
4. Abhisit Upakit	Lecturer of Industrial Management Department, Phranakhon Rajabhat University
5. Mongkorn Klingajay	President of Robotics, Informatics, and Intelligent control Technology Association (RIITA)

List of Specialists and Letters of Specialists Invitation for Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students

Name of Experts	Position/Office
1. Professor Dr. Guo jianying	Leshan Normal University
2. Professor Wang ying	Leshan Normal University
3. Associate Professor Qin hongying	Leshan Normal University
4. Professor Li pengjun	Chongqing Second Normal University
5. Associate Professor Dr. Zuo taian	Chongqing Second Normal University
6. Associate Professor Wang zhengbin	Chongqing Second Normal University
7. Associate Professor Dr. Wu kejun	Northwest Normal University
8. Professor Dr. Liang wangbing	Northwest Normal University
9. Associate Professor Wei yungang	Taishan University
10. Professor Dr. Peng shuzhen	Taishan University
11. Associate Professor Wang yongping	Shanxi Normal University
12. Associate Professor Dr. Zhang jiangfeng	Shanxi Normal University
13. Professor Dr. Jin shenglang	Huangshan University
14. Professor Yao lizhong	Huangshan University
15. Professor Dr. Li ya	Sichuan Normal University
16. Associate Professor Zhang song	Sichuan Normal University
17. Professor Zang liangyun	Hezhou University
18. Associate Professor Dr. Fu yeqin	Hainan Normal University
19. Professor Dr. Sun zhenjie	Hebei University of Economics
20. Professor Dr. Yin jie	Huaqiao University
21. Professor Dr. Shen shiwei	Ningbo University

Appendix B

Official Letter

Ref.No. MHESI 0643.14/ 1129

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

9 May 2024

Subject: Invitation to validate research instrument

Dear professor.Dr. Tang qianjun

Mr. Dan Qiang is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"

The thesis advisory 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. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

Assistant Professor Akaranun Asvarutpokin
(Vice Dean of Graduate School for Dean of Graduate School)

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1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

9 May 2024

Subject: Invitation to validate research instrument

Dear professor She wanbin

Mr. Dan Qiang is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"

The thesis advisory 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. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

Assistant Professor Akaranun Asvarutpokin
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Thonburi Bangkok 10600

9 May 2024

Subject: Invitation to validate research instrument

Dear Dr. Tomeyot Sanevong Na Ayutaya

Mr. Dan Qiang is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"

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

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Yours faithfully,

Assistant Professor Akaranun Asvarutpokin
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Thonburi Bangkok 10600

9 May 2024

Subject: Invitation to validate research instrument

Dear Mr. Abhisit Upakit

Mr. Dan Qiang is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"

The thesis advisory 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. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

Assistant Professor Akaranun Asvarutpokin
(Vice Dean of Graduate School for Dean of Graduate School)

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1061 Itsaraparb Hirunrujee
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9 May 2024

Subject: Invitation to validate research instrument

Dear Dr. Mongkorn Klingajay

Mr. Dan Qiang is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"

The thesis advisory 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. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

Assistant Professor Akaranun Asvarutpokin
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Appendix C

Research Instrument

Appendix C1

Questionnaire on digital literacy for tourism management of undergraduate students

Dear classmates:

Thank you very much for taking the time to complete this questionnaire. Digital literacy refers to a collection of qualities and abilities such as digital acquisition, production, use, evaluation, interaction, sharing, innovation, security, ethics, etc. that citizens in the digital society should have in their study, work and life. This questionnaire is anonymous and the results will only be used for academic research. Please feel free to fill it out, and once again, thank you for your assistance. Wishing you all the best in your studies and life!

Part 1 Basic Information

1. Your gender

A. Male

B. Female

2. Your ethnicity

A. Han ethnicity

B. Ethnic minority

3. Your place of origin

A. Rural area

B. Urban area

4. Your year of study

A. Freshman

B. Sophomore

C. Junior

D. Senior

5. The university you attend

A. "Double First-Class" university

B. Regular university

6. The location of your university

A. Provincial capital city

B. Non-provincial capital city

7. The location of your university in China

A. Eastern region

B. Central region

C. Western region

D. Northeastern region

8. Do you have a personal computer?

A. Yes

B. No

Part 2 The Current Situation of Digital Literacy

9. How much time do you spend on digital media on average per day? (Single choice question)

A. 0≤X<3 hours

B. 3≤X<6 hours

C. 6≤X<9 hours

D. ≥9 hours

10. What is the main purpose of your use of digital media? (Multiple choice questions)

A. Academic needs

B. Social interaction

C. Entertainment

D. Killing time

E. Others

11. What are your priorities when retrieving information? (Multiple choice questions)

A. Search engines such as Baidu, Sogou, BING, etc.

B. China National Knowledge Infrastructure (CNKI), school library websites

C. Social platforms such as WeChat, Weibo, Xiaohongshu, etc.

D. Professional forum

E. Other

12. Regarding social media, such as WeChat, Weibo and QQ, in addition to communication functions, what is the main use? (Multiple choice questions)

A. Browsing

B. Liking

C. Commenting

D. Sharing

E. Original content creation

F. Other

13. How do you mainly enhance your digital literacy during your school years? (Multiple choice questions)

A. Formal courses at school

B. Library activities

C. Skills competitions related to information retrieval applications

D. Lectures, open classes

E. Exhibitions of information application achievements

F. Others

Please rate the following questions according to your actual situation using a 5-point scale: 1 for "Completely Inappropriate," 2 for "Somewhat Inappropriate," 3 for "Neutral," 4 for "Somewhat Appropriate," and 5 for "Completely Appropriate." Please check the appropriate option that you believe fits best.

Question	Completely Inappropriate	Somewhat Inappropriate	Neutral	Somewhat Appropriate	Completely Appropriate
14. I can understand the value of digital technology in economic, social and tourism development.					
15. I can understand the opportunities and challenges that the development of digital technology brings to the tourism industry.					
16. I have the willingness to actively learn and use tourism management professional digital technology resources.					
17. I have the awareness to actively use information and digital technology to optimize and innovate learning and achieve sustainable personal development.					
18. When faced with digital learning problems, I have the belief to actively overcome difficulties and solve problems.					
19. I understand the connotative characteristics of common digital technologies and their procedures and methods for solving problems.					
20. I understand the basic theories and research methods of tourism disciplines, as well as the cutting-edge knowledge related to digital technology in tourism management majors.					
21. I understand the development process, basic status and future trends of digital technology.					

Question	Completely Inappropriate	Somewhat Inappropriate	Neutral	Somewhat Appropriate	Completely Appropriate
22. I master the use of digital learning-related equipment, systems, and software in the field of tourism management.					
23. I can choose appropriate query tools and search strategies to obtain the required information, and screen the search results for comprehensiveness, accuracy and academic value.					
24. I can effectively organize, process and integrate information to solve problems in study and life based on my own needs.					
25. I can share data, information and digital content with others using appropriate digital communication and collaboration tools.					
26. I am able to organize, process and integrate basic digital resources and information, as well as perform routine maintenance on commonly used software and hardware equipment.					
27. I can analyze and evaluate digital content and provide decision-making solutions to problems as needed.					
28. I can abide by Internet laws and regulations and consciously regulate various online behaviors.					
29. I can abide by the order of online communication and use the Internet to spread positive energy.					
30. I can manage and protect personal information and private data.					
31. I can identify, prevent and deal with cyber risk behaviors. For example: identify, prevent, and deal with online rumors, online violence, telecommunications fraud, and information theft.					

Part 3 Basic Digital literacy education situation

32. Does your major offer information application technology/computer basics and other similar related courses?

A. Opened

B. Not opened

C. Unclear

33. What are the nature of the information application technology/computer basics courses offered by your major?

A. Required courses

B. Elective courses

C. Lecture format

D. Not opened

34. Do you think courses such as information application technology/computer basics are helpful to your professional study or work life?

A. Very helpful

B. It is helpful to a certain extent

C. Not very helpful

D. Not helpful

35. Will your teacher consciously guide you to use online information to serve your learning in class?

A. Often

B. Occasionally

C. Rarely

D. Never

36. Do you think it is necessary to carry out digital literacy education to improve your related abilities?

A. Very necessary

B. Dispensable

C. Not necessary

37. Regarding information courses, what kind of content do you hope your major should add to satisfy your future study and work?

[Fill in the blank]

_____

38. If you are willing to accept further interviews, please leave your WeChat ID or contact information, thank you!

[Fill in the blank]

_____

Appendix C2

Consultation on the Components of Digital Literacy for Tourism Management of Undergraduate Students (First Round)

Dear experts:

Hello! Thank you very much for taking the time out of your busy schedule to fill in the expert consultation questionnaire on “Components of Digital Literacy for Tourism Management of Undergraduate Students” for this research. This expert consultation is only used for this academic research, and we will keep the information and evaluation results of the questionnaire strictly confidential.

Based on domestic and foreign literature analysis and student questionnaires, this research initially constructed indexes of the digital literacy of tourism management of undergraduate students, including digital awareness, digital technology knowledge and skills, digital application, and digital social responsibility. Level factor indicators and 13 secondary factor indicators.

This questionnaire mainly consists of three parts: the first part is the basic information of the experts; the second part is the evaluation of the first and second level indicators of digital literacy of tourism management undergraduates; the third part is the expert self-evaluation on the basis of the indicator scoring.

Part 1 Expert Basic Information

Please fill in the horizontal lines of the corresponding questions or select the options in brackets that suit your situation.

1. Workplace ( )

2. Gender ( ) : A. Male B. Female

3. Age ( ): A. Under 40 years old B. 41-50 years old C. 51-60 years old D. 61 years old and above

4. Teaching experience ( ): A. 10 years and below B. 11 - 20 years C. 21 - 30 years D.31 years and above

5. Professional and technical titles ( ): A. Lecturer B. Associate professor C. Professor

6. Highest educational level ( ): A. Bachelor's degree B. Master's degree C. Doctoral degree

7. Research direction ( ): A. Fields related to education B. Fields related to library science and information science C. Fields related to computer science D. Fields related to tourism management F. Others

8. Your familiarity with the problem ( ): A. Very familiar B. Familiar C. Generally familiar D. Unfamiliar E. Very unfamiliar

Part 2 Review of the Components of Digital Literacy for Tourism Management of Undergraduate Students

Please provide modification opinions on each dimension of this indicator system and the indicators it contains. Whether the first-level indicators and second-level indicators (including names and descriptions) need to be deleted, merged, added or modified? If so, please give it to you. The specific revision opinions, main basis and reasons. (The numbers 1, 2, 3, 4, and 5 represent the importance of the indicator in this dimension. 1 represents extremely unimportant, 2 represents not important, 3 represents important, 4 represents relatively important, and 5 represents very important. Please Mark "√" in the box you think corresponds).

First-level components index evaluation

Primary component indicators	**Description**	**Appropriateness (the higher the score, the more appropriate)**					**Proposed changes**
		1	2	3	4	5	
Digital awareness	The active reflection of objectively existing digital-related activities in the mind						
Digital technology knowledge and skills	Digital technology knowledge that should be understood and digital technology skills that need to be mastered in daily study and life						
Digital applications	Ability to apply digital technology resources to carry out learning activities						
Digital social responsibility	Responsibility for ethics and conduct in digital activities						
Increase:							
delete:							
merge:							
Correction:							

Second-level components index evaluation

Primary component indicators	Secondary component indicators	Description	1	2	3	4	5	Proposed changes
Digital awareness	Digital understanding	Understand the value of digital technology in economic, social and tourism development, and understand the opportunities and challenges that the development of digital technology brings to the tourism industry						
	Digital willingness	to actively learn and use tourism management professional digital technology resources						
	Digital determination	Have the belief to actively overcome difficulties and solve problems when facing digital problems in tourism management majors						
Increase:								
delete:								
merge:								
Correction:								

Primary component indicators	Secondary component indicators	Description	1	2	3	4	5	Proposed changes
	Digital technology knowledge	Understand common digital technology knowledge, including the concepts and basic principles of common digital technologies						
	Digital technology skills	Master the selection strategies and usage methods of digital technology resources						
Digital technology knowledge and skills								
Increase:								
delete:								
merge:								
Correction:								
	Data analysis and processing	Ability to use digital tools for data wrangling, statistical analysis and data visualization						
	Digital content creation and sharing	Ability to create and edit different digital content, share and publish via online platforms						

Primary component indicators	Secondary component indicators	Description	1	2	3	4	5	Proposed changes
	Digital communication and collaboration	information and digital content with others using appropriate digital communication and collaboration tools						
Digital applications	Digital continuous learning	Ability to utilize digital technology resources for continuous learning						
	Digital Innovation and Entrepreneurship	Leverage digital technologies to innovate, start a business or improve existing business models						
Increase:								
delete:								
merge:								
Correction:								
	Digital Ethics	Comply with ethics and ethics related to digital activities						
	Digital laws and regulations	Comply with laws and regulations related to digital activities						

Primary component indicators	Secondary component indicators	Description	1	2	3	4	5	Proposed changes
Digital social responsibility Increase: delete: merge: Correction:	Digital security protection	Protect personal information and privacy and pay attention to network security protection						

Part 3 Expert Self-evaluation on the Basis of Indicator Scoring

The following table is the four judgment bases for the selection of the above indicators. Experts are asked to self-evaluate this basis and the impact on their own judgments. Make a judgment on the loudness level of "high medium, or low" and mark "√" in the options.

	Influence level		
Basis for judgment	**High**	**Medium**	**ow**
Theoretical analysis			
Work/practical experience			
Learn from colleagues at			
home and abroad			
Personal intuition			

Appendix C3

Consultation on the Components of Digital Literacy for Tourism Management of Undergraduate Students (Second Round)

Dear experts:

Hello! Thank you very much for taking the time out of your busy schedule to fill out the second round of expert consultation questionnaire on "Components of Digital Literacy for Tourism Management of Undergraduate Students" for this research. Your opinions are very important to my research. Thank you again. This expert consultation is only used for this academic research, and we will keep the information and evaluation results of the questionnaire strictly confidential.

Based on domestic and foreign literature analysis, student questionnaires, and the first round of expert consultation suggestions, this research constructed component indicators of digital literacy for tourism management of undergraduate students, including 4 first-level factor indicators and 15 second-level factor indicators.

This questionnaire mainly consists of two parts: the first part is the comments and modification opinions on the first- and second-level indicators of digital literacy for undergraduates in tourism management; the second part is expert self-evaluation on the basis of indicator scoring.

Part 1 Review of the Components of Digital Literacy for Tourism Management of Undergraduate Students

Please provide modification opinions on each dimension of this indicator system and the indicators it contains: (The numbers 1, 2, 3, 4, and 5 represent the importance of the indicator in this dimension, 1 means particularly unimportant, and 2 means not important, 3 means moderately important, 4 means relatively important, and 5 means very important. Please mark "√" in the corresponding box you think).

First-level components index evaluation

Primary component indicators	**Description**	**Appropriateness (the higher the score, the more appropriate)**					**Proposed changes**
		1	2	3	4	5	
Digital awareness	The active reflection of objectively existing digital-related activities in the mind						
Digital knowledge	Digital technology knowledge you should know when studying tourism						
Digital ability	The ability to apply digital technology resources to carry out tourism professional learning						
Digital responsibility	Responsibility for ethics and conduct in digital society						
Increase:							
delete:							
merge:							
Correction:							

		Secondary component index evaluation						
Primary component indicators	**Secondary component indicators**	**description**	**1**	**2**	**3**	**4**	**5**	**Proposed changes**
Digital awareness	Digital understanding	the value of digital technology in tourism development and professional learning, and understand the opportunities and challenges that the development of digital technology brings to tourism and professional learning						
	Digital willingness	to actively learn and use tourism professional digital technology resources, and the initiative to carry out professional learning digital practice, exploration, and innovation						
	Digital determination	Confidence and determination to overcome the difficulties and challenges encountered in the digital practice of tourism major learning						
Increase:								
delete:								
merge:								
Correction:								

Primary component indicators	Secondary component indicators	description	1	2	3	4	5	Proposed changes
Digital knowledge	Digital basic knowledge	Understand the conceptual connotation, basic theories, principles and methods of common digital technologies, including cutting-edge knowledge such as big data, virtual reality, and artificial intelligence.						
	Digital professional knowledge	Understand the basic theories and research methods of tourism as well as cutting-edge knowledge related to tourism and digital technology						
	Digital hardware knowledge	Understand the working principles, system composition and operating skills of computers, smart terminals, hotel robots, etc.						
	Digital software knowledge	Understand the principles, composition and operating skills of application software and system software related to tourism majors						
Increase:								
delete:								
merge:								

Primary component indicators	Secondary component indicators	description	1	2	3	4	5	Proposed changes
Correction:								
Digital ability	Data collection and processing	Ability to browse, search, filter, rate and manage tourism professional data, information and digital content						
	Digital content creation	Ability to create and edit travel-specific digital content and express oneself through digital means						
	Digital communication cooperation	Ability to interact and collaborate using digital technologies to share tourism professional information and content with others,						
	Professional problem-solving	Ability to creatively use digital technologies to solve tourism professional problems						
	Digital innovation and entrepreneurship	Use digital technologies to innovate, start a business or improve existing business models in the tourism profession						
Increase:								
delete:								

Primary component indicators	Secondary component indicators	description	1	2	3	4	5	Proposed changes
merge:								
Correction:								
digital responsibility	digital ethics	Comply with ethical codes and ethics related to digital activities in the tourism profession						
	digital governance	Comply with laws and regulations related to digital activities in the tourism industry						
	digital security	Protect personal information and privacy and pay attention to network security protection						
Increase:								
delete:								
merge:								
Correction:								

Part 2 Expert self-evaluation on the basis of indicator scoring

The following table is the four judgment bases for the selection of the above indicators. Experts are asked to self-evaluate this basis and the impact on their own judgments. Make a judgment on the loudness level of "high, medium, or low" and mark "√" in the options.

	Influence level		
Basis for judgment	**High**	**Medium**	**Low**
Theoretical analysis			
Work/practical experience			
Learn from colleagues at home and abroad			
Personal intuition			

Appendix C4

Expert Consultation Questionnaire on the Correlation Between the Components of Digital Literacy for Tourism Management of Undergraduate Students (third round)

Dear experts: Please read the left column factors and top factors in the table carefully and judge whether the left column factors have an impact on the top factors. If so, please tick the box where the left column factors intersect with the top factors. "√", gray is the intersection part, don't need to consider it.

	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3
A1															
A2															
A3															
B1															
B2															
B3															
B4															
C1															
C2															
C3															
C4															
C5															
D1															
D2															
D3															

Appendix C5

Consultation on the Weight of Digital Literacy Components for Tourism Management of Undergraduate Students

Instructions for filling out the form: This expert consultation will use the Analytic Network Process determines the weight of each indicator. Please compare the importance of indicators at all levels developed by this research in pairs, make judgments based on your actual experience and unique opinions, and tick in the appropriate boxes "√". The more it is to the left, the indicator on the left is more important, and the more it is to the right, the indicator on the right is more important.

Quantitative value of importance evaluation

Quantized value	Importance
1	Indicates indicatorsx and indicatorsy is equally important
3	Indicates indicatorsx ratio indicatory is slightly more important
5	Indicates indicatorsx ratio indicatory is important
7	Indicates indicatorsx ratio indicatory is very important
9	Indicates indicatorsx ratio indicatory is extremely important
2, 4, 6, 8	The compromise value of the above adjacent importance levels

Example: When comparing the two first-level components of " A number awareness " and " B number knowledge ", the relative importance is divided into 5 levels: "equally important", "slightly important", "important", "very important" and "extremely important" ". If you think " A Digital awareness " is slightly more important than " B Digital knowledge ", you can check the "Slightly Important" box on the left, as shown in the following example:

The indicator on the left is important										**The indicator on the right is important**									
Components	Extremely important	Median	Very important	Median	Important	Median	Slightly more important	Median	Equally important	Median	Slightly more important	Median	Important	Median	Very important	Median	Extremely important		Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
A Digital awareness											√								B Digital knowledge

Experts, please start filling in (the more it leans to the left, the more important the indicator on the left is, and the more it leans to the right, the more important the indicator on the right is):

First-level components

The indicator on the left is important										The indicator on the right is important									
Components	Extremely important	Median	Very important	Median	Median		Slightly more important	Median	Equally important	Median	Slightly more important	Median	Median		Very important	Median	Extremely important	Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
A Digital awareness																		B Digital knowledge
A Digital awareness																		C Digital ability
A Digital awareness																		D Digital responsibility
B Digital knowledge																		C Digital ability
B Digital knowledge																		D Digital responsibility
C Digital ability																		D Digital responsibil

Second-level components

Taking "Digital Awareness " as the criterion:

The indicator on the left is important											The indicator on the right is important									
Components	Extremely important		Very important		Important		Slightly more important		Equally important			Slightly more important		Important		Very important		Extremely important		Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9			
A1 Digital understanding																				A2 Digital willingness
A1 Digital understanding																				A3 Digital determination
A2 Digital willingness																				A3 Digital determination

Taking "Digital knowledge " as the criterion:

The indicator on the left is important										**The indicator on the right is important**								
Components	Extremely important	Median	Very important	Median	Important	Median	Slightly more important	Median	Equally important	Median	Slightly more important	Median	Important	Median	Very important	Median	Extremely important	Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
B1 Digital basic knowled																		B2 Digital professi onal
B1 Digital basic knowled																		B3 Digital hardwar e
B1 Digital basic																		B4 Digital softwar
B2 Digital professio																		B3 Digital hardwar
B2 Digital professio																		B4 Digital softwar
B3 Digital hardware																		B4 Digital softwar

Taking " Digital Ability " as the criterion:

The indicator on the left is important																		The indicator on the right is important
Components	Extremely important	Median	Very important	Median	Important	Median	Slightly more important	Median	Equally important	Median	Slightly more important	Median	Important	Median	Very important	Median	Extremely important	Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
C1 Data collection																		C2 Digital content
C1 Data collection																		C3 Digital Communication
C1 Data collection																		C4 professional problem-
C1 Data collection																		C5 Digital innovation
C2 Digital content																		C3 digital communication
C2 Digital content																		C4 Professional problem-

C2 Digital content	C5 Digital innovation and
C3 Digital communic	C4 Professional problem-
C3 Digital communic	C5 Digital innovation and
C4 Profession al	C5 Digital innovation and

Taking " Digital Responsibility " as the criterion:

The indicator on the left is important										The indicator on the right is important									
Components	Extremely important	Median	Very important	Median	Important	Median	Slightly more important	Median	Equally important	Median	Slightly more important	Median	Important	Median	Very important	Median	Extremely important	Components
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
D1 Digital ethics																		D2 Digital gover nance
D1 Digital ethics																		D2 Digital Safety
D2 Digital governanc																		D3 Digital Safety

Appendix C6

Digital Literacy Evaluation Questionnaire for Tourism Management of Undergraduate Students

Dear classmates:

Hello! Thank you very much for taking the time to fill in this questionnaire. This questionnaire is an anonymous survey and the results will only be used for academic research. Please feel free to fill it out. I would like to take up some of your precious time here and please complete this questionnaire with us. Your response is of great significance to our research. Thank you for your support and cooperation. Thank you!

Part 1 Basic Information

1. The province (municipality, autonomous region) where your current school is located is:

2. Your gender

A. Male

B. Female

3. Your place of birth

A. Rural area

B. Town

4. Your grade

A. Freshman year

B. Sophomore year

C. Junior year

D. Senior year

5. Your class

A. Class 1

B. Class 2

C. Class 3

D. Class

Part 2 Digital literacy self-assessment section

Please rate the following questions according to your actual situation using a 5-point scale: 1 for "Completely Inappropriate," 2 for "Somewhat Inappropriate," 3 for "Neutral," 4 for "Somewhat Appropriate," and 5 for "Completely Appropriate."

Question	Completely Inappropriate	Somewhat Inappropriate	Neutral	Somewhat Appropriate	Completely Appropriate
6. I can understand the value of digital technology in tourism development and professional learning, and understand the opportunities and challenges that the development of digital technology brings to the tourism industry and professional learning.					
7. I have the willingness to actively learn and use tourism professional digital technology resources, and the initiative to carry out professional learning digital practice, exploration, and innovation.					
8. I have the confidence and determination to overcome the difficulties and challenges encountered in the digital practice of tourism major learning.					
9. I understand the conceptual connotation, basic theories, principles and methods of common digital technologies, including cutting-edge knowledge such as big data, virtual reality, and artificial intelligence.					

10. I understand the basic theories and research methods of tourism as well as cutting-edge knowledge related to tourism and digital technology.
11. I understand the working principles, system composition and operating skills of computers, smart terminals, hotel robots, etc.
12. I understand the principles, composition and operating skills of application software and system software related to tourism majors.
13. I am able to browse, search, filter, rate and manage tourism professional data, information and digital content.
14. I am able to create and edit travel-specific digital content and express myself through digital means.
15. I am able to interact and collaborate using digital technologies to share tourism professional information and content with others.
16. I am able to creatively use digital technologies to solve tourism professional problems.
17. I can use digital technology to innovate, start a business or improve existing business models in the tourism industry.
18. I am able to abide by the moral codes and ethics related to digital activities in the tourism profession.
19. I am able to comply with laws and regulations related to tourism professional digital activities.
20. I can protect personal information and privacy and pay attention to network security protection.

Appendix C7

Digital Literacy Training Program for Tourism Management of Undergraduate Students

Training objectives	Through this training course, tourism management of undergraduate students will be able to: 1. Understand the importance and impact of digital technology on tourism. 2. Master digital tools and applications related to tourism management. 3. Improve information sketching and critical thinking skills to better analyze market trends and customer needs. 4. Learn to effectively use digital media and social media to promote tourism products and services. 5. Develop skills in digital project management and data analysis. 6. Understand the application of digital ethics and privacy protection principles in the tourism industry.	
	Module 1 Introduction to Digital Literacy (2 hours)	1. What is digital literacy? 2. Application and importance of digital technologies in tourism management. 3. Assess your current level of digital literacy.
	Module 2 Digital Tools and Applications (16 hours)	1. Operate commonly used digital tools and applications such as web design, online booking systems, customer relationship management software, etc.

		2. Understand how to use these tools to manage travel products and services.
	Module 3 Information Sketching and Market Analysis (4 hours)	1. Identify and analyze travel market trends. 2. Use data and information to predict customer needs and behavior. Critical thinking and information evaluation skills.
Training content (48 hours)	Module 4 Digital Marketing and social media (4 hours)	1. Develop a digital marketing strategy, including search engine optimization (SEO) and social media marketing. 2. How to use social media platforms to promote travel products and services.
	Module 5 Digital Project Management (4 hours)	1. Learn the fundamental principles and tools of digital project management. How to effectively plan, execute and monitor tourism projects.
	Module 6 Data Analysis and Decision Support (4 hours)	1. Master basic data analysis skills, including data collection, cleaning, and visualization. 2. How to use data to make strategic decisions.
	Module 7 Digital Ethics and Privacy Protection (4 hours)	1. Fundamental principles of digital ethics, particularly their application when handling customer information. 2. How to protect customer privacy and data security.
	Module 8 Integrated Projects and Practice (6 hours)	1. Apply knowledge gained to real tourism management situations through integrated projects and practical case studies.

	Module 9 Summary and Future Outlook (2 hours)	1. Review the entire training program and the progress made. 2. Explore trends and development opportunities for digital literacy in the future of tourism.
Training methods	Lectures and Demonstrations Group discussions and interactions Practical operations and exercises Projects and case studies Regular tests and assessments	
Assessment method	Class engagement and interaction coursework take an exam	
Training period	September 1, 2023 - December 31, 2023	
Training location	Leshan Normal University, Leshan City, Sichuan Province, China	
Training objects	34 sophomores, tourism management of undergraduate students	
training expert	Teachers in computer, education, tourism management and other majors	

Appendix C8

Teaching Plan (Digital Tools and Applications)

Teaching module	Teaching content	Teaching requirements	Teaching hours	Experiment hours
Web design basics	1. Basic knowledge of network 2. Web pages and websites 3. Web Design Rules 4. Commonly used software for web design 5. Dreamweaver interface 6. How to establish a local site 7. Create HTML files	1. Enable students to understand the basic knowledge of the Web, including network basics, websites and web pages, and web design rules. 2. Be familiar with the Dreamweaver CS6 interface. 3. Master the methods of creating and managing sites based on the Dreamweaver platform. 4. Master the ability to create and save web pages, and be able to insert simple text information.	1	1
Create a wb page with pictures and text	1. Image insertion and editing 2. Text formatting: paragraphs, titles, lists 3. HTML basics 4. CSS basics	1. Master the image insertion method. 2. Master text formatting operations and implement paragraph, title and list formats of text.	3	3

Teaching module	Teaching content	Teaching requirements	Teaching hours	Experiment hours
		3. Understand the basic syntax of HTML, master the top-level structure tags of HTML, and the involved image and text tag elements. 4. Master CSS style settings, and implement the settings and applications of tags, class names and ID selectors based on embedded CSS styles.		
Comprehensive web design	1. Table basics and layout 2. DIV+CSS layout 3. Multimedia material insertion 4. Hyperlink application 5. External CSS application 6. Complete the table layout 7. Complete DIV+CSS layout 8. Complete the hyperlink application	1. Master table layout tools. 2. Master the basics of DIV, including how to insert DIV, box model and box floating. 3. Master the DIV+CSS page layout. 4. Master the setting and application of hyperlinks. The main types include internal, external, text, picture and anchor. 5. Understand the setting method of external CSS files and distinguish the application scope of internal CSS and external CSS.	6	6

Teaching module	Teaching content	Teaching requirements	Teaching hours	Experiment hours
Advanced Web Design Applications	1. Form 2. Embedded framework 3. CSS3 basics and applications 4. JavaScript basics and applications 5. Complete the use of CSS3 to create page special effects 6. Complete the use of JavaScript to realize the display and hiding effects of elements	1. Understand forms and common control insertion. 2. Learn how to insert and edit embedded frames. 3. Master the production of practical special effects using CSS3. 4. Master the three important elements of JavaScript language: objects, events and actions. 5. Be able to skillfully use the behavior panel to set up the display and hiding of elements.	2	2
Create web picture materials	1. Photoshop CS6 interface 2. Basic operations of Photoshop CS6 files 3. Commonly used tools in Photoshop 4. Concept and basic usage of layers 5. Use of path and text tools 6. Adjust the color and tone of your image	1. Understand the theoretical knowledge of image processing, including pixels and image resolution, bitmaps and vector images, image color modes, and image file formats. 2. Familiar with the Photoshop CS6 working environment. 3. Be familiar with the basic operations of Photoshop	2	2

Teaching module	Teaching content	Teaching requirements	Teaching hours	Experiment hours
	7. How to use masks 8. How to use filters 9. Complete Photoshop CS6 web page image production	CS6, including basic file operations, image display, and the use of auxiliary tools. 4. Be able to skillfully use the basic tools of Photoshop, including selection creation and editing, image drawing, modification and editing. 5. Master the creation and application of layers, including the basic concepts of layers, basic operations of layers, editing layers, layer effects and styles. 6. Master the application of path and text tools, including path creation, path editing, text input, text editing and conversion. 8. Master the application of layer masks to achieve image fusion. 9. Understand the use of filters.		

Teaching module	Teaching content	Teaching requirements	Teaching hours	Experiment hours
Travel website	Organize website documents (category and store related documents), test pages to display normally, test hyperlinks, and achieve normal and accurate page jumps.	1. Master the entire design process of travel website, including site planning, homepage production, and template production. 2. Submit the final assessment work (website production). 3. Including the organization of documents (the classification and storage of related documents), the page can be displayed normally, the normal link of the hyperlink is tested, and the normal and accurate jump of the page can be achieved.	2	2
total			16	16

Appendix C9

Exam plan

Exam content

The examination questions mainly include: fill-in-the-blank questions, multiple-choice questions and operational questions.

The knowledge of fill-in-the-blank questions and multiple-choice questions covers the entire book, mainly involving relevant theoretical knowledge, understanding of basic concepts, and common sense in using the main software for this course.

The operational questions are mainly used to assess students' website design abilities on the spot.

Exam Organization

1. Exam time and format: 90 minutes, computer-based exam.

2. Proposed teachers: all classroom teachers.

3. Test question management: Before the exam, the teacher will put it at ftp://210.41.166.252 to facilitate the downloading and distribution of test questions during the exam. During the exam, the invigilator downloads the test questions and materials from the FTP252 designated folder.

4. the designated disk of the student computer through Jiyu software. After students complete the exam, they will package and upload their test papers to the FTP designated by the teacher.

5. End of the exam: The invigilator compresses the student exam data with the file name of "computer room number + teacher name + class name + number of candidates + number of actual exams + number of absentees + name of invigilator", and then uploads it to the designated folder of FTP252.

6. Grade processing: The teacher handles the grades of students in the class.

Scoring Criteria

Serial number	Question type	Content	Number of questions	Points for each question	Sub-Score
1	Fill in the blanks	Basic knowledge related to textbooks	5	2	10
2	Multiple choice questions	Involves basic knowledge and application abilities	10	2	20
3	Operational questions	Tourism web design and comprehensive application	1	70	70
	total		16		100

illustrate:

1. Fill in the blanks (2 points for each question, 10 points in total).

Students open the text file issued (with questions attached) and fill in their student number, name and answers, save and submit it.

2. Multiple-choice questions (2 points for each question, 20 points in total).

Students open the text file issued (with questions attached) and fill in their student number, name and answers, save and submit it.

3. Operational questions (70 points).

Specify the design interface of the website and provide corresponding design materials, package the designed website and submit it. Scoring criteria for operational questions: able to open the website correctly for browsing (10 points), reasonably design the site structure (10 points), and the website style and content conform to the designated website (25 points). Reasonable application of web design technology (25 points).

Course grade composition and proportions

The performance assessment is based on a combination of final exam scores and usual grades. The final exam scores account for 50% and the usual grades account for 50%.

Appendix C10

Test paper

Exam duration: 90 minutes

Exam instructions:

1. Please first create your own folder on the last hard drive: "Student ID Name". For example: 22001 Zhang San.

2.Students download materials and test questions from the address designated by the invigilator.

3. Please save the answers and result files of all the following questions in your own folder: the answers to the theoretical questions (fill-in-the-blank questions and multiple-choice questions) are written into the file "Fill-in-the-blank and multiple-choice questions.txt", and operate the question will result according to the meaning of the question.

4. When handing in the paper, compress your folder first and then transfer it to the handover address designated by the teacher.

Fill-in-the-blank questions (5 questions in total, 2 points each, 10 points in total)

1. ( ) is Hypertext Transfer Protocol.

2. Press the ( ) key combination to insert a line break in the HTML document.

3. Select the [Insert]/[HTML]/[( )] command in the main menu of DreamweaverCS6 to insert a horizontal line in the document.

4. There can only be ( ) body tags in an HTML file.

5. a: hover indicates the state of the hyperlink text in ( ).

Multiple-choice questions (10 questions in total, 2 points for each question, 20 points in total)

1. The host domain name center.nbu.edu.cn consists of four subdomains, among which the ( ) subdomain represents the country code.

A. center B.nbu C.edu D.cn

2. Currently the most widely used service on the Internet is ( ).

A. FTP service B. WWW service C. Telnet service D. Gopher service

3. The meaning of Domain Name System DNS is ( ).

A. Direct Network System

B. Domain Name System

C. Dynamic Name System

D. Distributed Network Service

4. In HTML, the cell mark is ().

A.<td> B.C.<tr>D.<body>

5. In HTML, the tag used to define an empty link is ( ).

A. <a href="#"> B. <a href="?"> C. <a href="@"> D. <a href="!">

6. The attribute of the body element used for background color is ( ).

A.alink B. vlink C. bgcolor D. background

7. Among the following HTML tags, the one that belongs to the image tag is ( ).

A. br B. img C. font D. p

8. The * sign next to the file name in the label at the top of the document window represents ( ).

A. There is an error in the content of the document

B. The document is saved successfully

C. There is an error in the document name

D. The document has not been saved after modification

9. When editing a web page in Dreamweaver, if you want to undo the previous operation, you can use the shortcut key ( ).

A. Ctrl+A B. Ctrl+Z C. Ctrl+Y D. Ctrl+C

10. When the table width is set to 80%, its meaning is ( ).

A. The table width is a fixed value

B. The width of the table is 80% of the width of the parent element

C. The table width is 800 pixels

D. The width of the table is 8 cm

Operation questions (1 question in total, 70 points in total)

Use table layout tools to complete the production of the "Tourism Culture" web page, and use CSS to beautify the style, as shown in the figure.

Design requirements:

1. Create a site: Use the folder of your "student ID number" as the site root folder, copy the directory in the given test material folder as a site subdirectory, and create a new site home page file as index.html, which is stored in the root directory. , all subsequent designs are based on this file.

2. Use DIV+CSS layout or table layout to design a "Tourism Culture" web page effect, and set the web page width to 1000 pixels. And set the following web page effects:

1) Picture zoom setting: When the mouse is placed on the picture of "Puxian Bodhisattva in Four Directions", the picture will be enlarged 1.5 times and displayed. When the mouse is left, it will return to its original state.

2) Set the picture under "Jiazhou(Leshan) School of Painting " to scroll from left to right. When the mouse is placed on the picture, the scrolling will stop, and when the mouse is left, the scrolling effect will be restored.

3) Set the "Food Culture" hyperlink on the navigation bar to "yswh.html" in the html folder, and display the target file in a new window. And set the hyperlink style to black without underline. When the mouse points to the link source, it will appear in red with underline.

Appendix D

The Results of the Quality Analysis of Research Instruments

IOC

Content Matching Checklist Expert

Digital Literacy Evaluation Questionnaire for Tourism Management of Undergraduate Students

With the assistance of five experts, the questionnaire is used to investigating the objective consistency index (IOC) of the digital literacy level of tourism management of undergraduate students. The questionnaire is anonymous, and all data are only used for research and comprehensive statistical processing.

Clarification: Qualified personnel are required to consider the consistency, comprehensiveness, and completeness of the issue, and define and check in the rating box based on the actual situation. The scores are as follows.

+1 represents: The problem is consistent with the definition of the required measurement

0 represents: Uncertain whether the problem meets the definition to be measured.

-1 represents: The problem is inconsistent with the measurement definition.

No.	Contents	Reviews Results					Average
		E1	E2	E3	E4	E5	Score
	Part 1 Basic Information						
1	The province (municipality, autonomous region) where your current university is located is	1	1	1	1	1	1
2	Your gender A. Male B. Female	1	1	1	1	1	1

3	Your place of birth A. Rural area B. Town	1	1	1	1	1	1
4	Your grade A. Freshman year B. Sophomore year C. Junior year D. Senior year	1	1	1	1	1	1
5	Your class A. Class 1 B. Class 2 C. Class 3 D. Class 4	1	1	1	1	1	1
	Part 2 Digital literacy self-assessment section						
6	I can understand the value of digital technology in tourism development and professional learning, and understand the opportunities and challenges that the development of digital technology brings to the tourism industry and professional learning.	1	1	1	1	1	1
7	I have the willingness to actively learn and use tourism professional digital technology resources, and the initiative to carry out professional learning digital practice, exploration, and innovation.	1	0	1	1	1	0.8

8	I have the confidence and determination to overcome the difficulties and challenges encountered in the digital practice of tourism major learning.	1	1	1	1	1	1
9	I understand the conceptual connotation, basic theories, principles and methods of common digital technologies, including cutting-edge knowledge such as big data, virtual reality, and artificial intelligence.	1	1	0	1	1	0.8
10	I understand the basic theories and research methods of tourism as well as cutting-edge knowledge related to tourism and digital technology.	1	1	1	1	1	1
11	I understand the working principles, system composition and operating skills of computers, smart terminals, hotel robots, etc.	1	1	1	1	1	1
12	I understand the principles, composition and operating skills of application software and system software related to tourism majors.	1	1	1	1	1	1
13	I am able to browse, search, filter, rate and manage tourism professional data, information and digital content.	1	1	1	0	1	0.8
14	I am able to create and edit travel-specific digital content and express myself through digital means.	1	1	1	1	1	1

15	I am able to interact and collaborate using digital technologies to share tourism professional information and content with others.	1	1	1	1	1	1
16	I am able to creatively use digital technologies to solve tourism professional problems.	1	1	1	1	1	1
17	I can use digital technology to innovate, start a business or improve existing business models in the tourism industry.	1	1	1	0	1	0.8
18	I am able to abide by the moral codes and ethics related to digital activities in the tourism profession.	1	1	1	1	1	1
19	I am able to comply with laws and regulations related to tourism professional digital activities.	1	0	1	1	1	0.8
20	I can protect personal information and privacy and pay attention to network security protection.	1	1	1	1	1	1

Reliability analysis

This research used Cronbach's Alpha coefficient for reliability testing. It is generally believed that if the Cronbach's Alpha coefficient is greater than 0.7, the questionnaire is considered to have high stability and consistency. The statistical software was used to conduct a reliability test on the questionnaire. The results are shown in table below. The overall reliability of the second part of the digital literacy questionnaire for tourism management of undergraduate students is 0.907, and the

Cronbach's Alpha coefficient of the first-level component is 0. 853 -0.902, thus indicating that the questionnaire has high internal stability and consistency.

Table Reliability of the questionnaire

First-level components	Cronbach Alpha	Number of questions α
Digital awareness	0.853	3
Digital knowledge	0.892	4
Digital ability	0.902	5
Digital responsibility	0.901	3
Questionnaire as a whole	0.907	15

Validity analysis

Questionnaire content validity

In this research, the components and descriptions of digital literacy for tourism management of undergraduate students were formed based on relevant domestic and foreign experiences, the needs of tourism management of undergraduate students, and after multiple rounds of verification and revision by experts in related fields. The above shows that, the digital literacy questionnaire for tourism management of undergraduate students compiled this time has good content validity.

Questionnaire structural validity

In order to test the structural validity of the components, this part further uses exploratory factor analysis to test the structural validity of the valid data. The analysis results show that: the KMO value is 0.855, the approximate chi-square value of Bartlett's sphericity test is 841. 812 (the degree of freedom is 105), α=0.000, indicating that there is a significant difference at the confidence level of α<0.05, the research data is suitable for the next step of factor analysis. Set the "Number of extracted factors" to "4 ", which is the same number as the number of first-level components in this research, and use the Promax oblique rotation in the oblique rotation axis method to obtain the analysis results shown in table below. Among the four extracted common

factors, the factor loadings of all 15 factors (ie, second-level components) are greater than 0.50. The cumulative explanatory variable is 79.991 %, which is much higher than 60%.

Table Summary table of factor analysis results

Digital literacy	**Common factor**			
variables	**One**	**Two**	**Three**	**Four**
Digital understanding	0.815			
Digital willingness	0.871			
Digital determination	0.766			
Digital basic knowledge		0.824		
Digital hardware knowledge		0.833		
Digital hardware knowledge		0.893		
Digital software knowledge		0.806		
Data collection and processing			0.753	
Digital content creation			0.872	
Digital communication cooperation			0.838	
Professional problem-solving			0.817	
Digital innovation and entrepreneurship			0.835	
Digital ethics				0.884
Digital governance				0.940
Digital security				0.870

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mr. Dan Qiang

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

Interdisciplinary Academic and Research Journal
ISSN 2985-2749 (Online)
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Acceptance Letter for Publication

To **Dan Qiang, Prapai Sridama, Piyanan Issaravit, Kanakorn Sawangcharoen**

Due to You submitted the article entitled **"Development of Digital Literacy Evaluation Model for Tourism Management of Undergraduate Students"** for publishing in Interdisciplinary Academic and Research Journal (Online), Old ISSN 2774-0374 (Online): New ISSN 2985-2749 (Online) indexed by Thailand Citation Index (TCI) Tier 2, **DataCite-International Data Citation, DOI CrossRef Member, and ResearchGate** The editorial team has carried out the article review process by submitting to Peer Reviewer for consideration and editing for completeness of the article before publication.
The editorial team would like to inform you that your article has been successfully considered by three peer reviewers from different institutes, and is in the process of being published in Interdisciplinary Academic and Research Journal, volume 4, Issue 6, November-December 2024. follow the article at https://so03.tci-thaijo.org/index.php/IARJ/about
Thank you for submitting for publication. The editorial team hopes to receive interesting and useful articles from you to publish in the next issue of the journal as always.

Regards

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