THE STRATEGIES FOR IMPROVING THE LEVEL OF EDUCATIONAL TECHNOLOGY LITERACY OF TEACHERS IN UNIVERSITIES IN GUANGXI

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Thesis Title The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

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ABSTRACT

The objectives of this research were: 1) to study the current situation of the technology literacy level of teachers in Guangxi; 2) to develop strategies to improve the technology literacy level of teachers in Guangxi; 3) to evaluate strategies to improve the technology literacy level of teachers in Guangxi. The sample were from 403 teachers from six different universities in Guilin, Guangxi. Research instruments include: 1) questionnaire, 2) interview forms, 3) evaluation form. Data analysis by using percentage, mean, and standard deviation.

The results were found that university teachers in Guangxi demonstrate a significantly high level in educational technology literacy. The five dimensions of educational technology literacy were listed in decreasing order: educational technology social responsibility, educational technology professional development, educational technology application, educational technology awareness, educational technology knowledge and skills. Hence this paper puts forward 18 strategies to improve the level of technology literacy among universities teachers in Guangxi by targeting the three levels of government, university, and teacher. Upon assessing the suitability of improve strategies, the group of experts discover that the 18 strategies recommended by this research are highly suitable.

Keywords: College teachers, educational technology literacy, promotion strategy

ชื่อเรื่อง **กลยุทธ์การพัฒนาระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี**
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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์ 1) เพื่อศึกษาสภาพปัจจุบันของระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี 2) เพื่อพัฒนากลยุทธ์การพัฒนาระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี และ 3) เพื่อประเมินกลยุทธ์การพัฒนาระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี กลุ่มตัวอย่างที่ใช้ในการวิจัยครั้งนี้ ได้แก่ อาจารย์ จากมหาวิทยาลัยในเมืองกุ้ยหลิน มณฑลกวางสี จำนวน 6 แห่ง รวมทั้งสิ้น 403 คน เครื่องมือที่ใช้ในการวิจัย ได้แก่ 1) แบบสอบถาม 2) แบบสัมภาษณ์ และ 3) แบบประเมิน สถิติที่ใช้ในการวิจัย ได้แก่ ค่าร้อยละ ค่าเฉลี่ย และส่วนเบี่ยงเบนมาตรฐาน

ผลการวิจัยพบว่า ระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี โดยภาพรวมทั้ง 5 ด้านอยู่ในระดับสูงตามลำดับ ดังนี้ ความรับผิดชอบต่อสังคมในด้านเทคโนโลยีทางการศึกษา การพัฒนาวิชาชีพเทคโนโลยีทางการศึกษา การประยุกต์ใช้เทคโนโลยีทางการศึกษา ความตระหนักรู้ด้านเทคโนโลยีทางการศึกษา ความรู้และทักษะด้านเทคโนโลยีทางการศึกษา กลยุทธ์การพัฒนาระดับความรู้ด้านเทคโนโลยีทางการศึกษาของอาจารย์ในมหาวิทยาลัยในมณฑลกวางสี โดยกำหนดเป้าหมาย 3 ระดับ ได้แก่ ระดับรัฐบาล ระดับมหาวิทยาลัย และระดับอาจารย์ รวมทั้งสิ้น 18 กลยุทธ์ ผลการประเมินความเหมาะสมในการนำ 18 กลยุทธ์ไปปฏิบัติ อยู่ในระดับสูงมาก

คำสำคัญ: อาจารย์ ความรู้ด้านเทคโนโลยีทางการศึกษา กลยุทธ์การพัฒนา

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Chapter 1
Introduction

Rationale:

The application of artificial intelligence, digitization, and other information technologies in education has become a major focal point of both global and Chinese policies. Educational technology literacy refers to the latest wave of technological advancements that build upon previous information literacy and data literacy upgrades. Educational technology literacy is a new requirement for teachers in the field of educational technology. It is a type of professional literacy that teachers must possess to effectively incorporate educational technology into their teaching practices. Teachers' own level of educational technology literacy is the main driving force behind the development of educational technology in colleges and universities and has a direct impact on their quality and level. As a result, the development of artificial educational technology has garnered increased attention from various entities globally including UNESCO, the European Union, numerous research institutions, countries, and the government of China. Additionally, the Chinese government has issued a series of policies on educational technology, including the Action Plan on Artificial Intelligence Innovation in Colleges and Universities, the Action Plan on Education Informatization 2.0, the Action Plan on Improving Digital Literacy and Skills of the Whole Population, and the Guiding Opinions on Promoting the Construction of New Education Infrastructure and Building a High-Quality Education Support System. This requires colleges and universities to provide intellectual support and personnel guarantee for the development of education informatization, and utilize the pivotal role they play in educational technology theory research and personnel training. It is therefore crucial to improve teachers' educational technology literacy level.

The improvement of educational technology literacy level of college teachers in Guangxi is also affected by local policies. Guangxi has developed multiple documents related to constructing information technology in college education. The

"14th Five-Year Plan for the construction of teachers in Guangxi" states that training methods must be altered to promote the integration of information technology with teacher training and introduce combined online and offline training. The "Guangxi Internet + Education" Action Plan (2018-2022) emphasizes that efforts should shift towards improving comprehensive information literacy instead of solely focusing on enhancing the information technology application capabilities of teachers and students. As a result, teachers' information application level and information literacy must be improved across the board, and education administrators should also attain high level of information literacy. The "Three-year Action Plan for the Construction of Guangxi Digital Society (2021-2023)" highlights the requirement to facilitate information education, enhance the information quality of the populace, provide extensive information-based knowledge training to students, teachers, and social personnel, improve the general information level of the population and create a favourable environment for the expansion of the digital society. A series of requirements of Guangxi local government on the informatization construction of higher education provide a good opportunity for improving teachers' educational technology literacy.

Nonetheless, there are several challenges in improving the level of educational technology literacy among college teachers. For instance, there is a dearth of conspicuous and systematic training ideas and training mechanisms (Wang Dan, 2022, p.94). Teachers' cognition of educational technology and its educational application is still insufficient (Liu Bin, 2020, p.16). It is difficult to account for the varying levels of teachers in the uneven development of education digitization (Fan Lili, 2017, p.25). The adoption rate of information technology is inadequate, the rationality of use is insufficient, and the application methods are elementary (Zhu Jingxi et al., 2021, p.125). In the digital age, teacher’s role has undergone a transformation that many has yet to adapt to. There seems to be an ineffective integration of digital technology with classroom teaching, and it is observed that teachers over-rely on data generation while lacking the ability to analyze data and deal with teaching problems, as noted by Xu Weibin. (2022, p.1). University administrators must acknowledge that enhancing the quality of teachers' educational technology is crucial to preparing educators in the age

of educational information development. Thus, it is imperative to study the educational technology literacy of college teachers.

To sum up, this study uses theories such as teacher professional development and teacher educational technology literacy to investigate and study the current situation and influencing factors of the educational technology literacy level of college teachers in Guangxi. The study also presents some improvement strategies to meet the needs of school development.

Research Questions

1. What is the current situation of the level of educational technology literacy of teachers in Universities in Guangxi?

2. How to develop the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi?

3. How to evaluate the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi?

Research Objectives

1. To study the current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi.

2. To develop the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi.

3. To evaluate the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi.

Scope of the Research

The Population

This study analyses a sample of 7,471 teachers from 6 public undergraduate universities in Guilin, Guangxi. They include Guangxi Normal University, Guilin University of Electronic Science and Technology, Guilin University of Technology, Guilin Institute of Tourism, Guilin Medical College and Guilin Institute of Aerospace Industry.

The Sample Group

Sample size selection for the questionnaire survey followed the estimated sample size formula provided by the Research Department of the National Institute of Education in the article 'Small Sample Technology' (Krejcie & Morgan, 1970). Stratified sampling is employed to sample 403 out of 7471 people.

Interview objects and sample size selection followed random sampling and consisted of one teachers and one manager in charge of educational technology literacy training from each of the six undergraduate public universities, with a total sample size of 12 individuals.

The Variables

Based on an analysis of related theory and research, the following outlines teachers' educational technology literacy:

1. Educational technology awareness
2. Educational technology knowledge and skills
3. Educational technology application
4. Educational technology social responsibility
5. Educational technology professional development

Time

In May, 2023

Advantages

Theoretical Aspects This study summarizes relevant theories and research findings on educational technology literacy, which further enhances the existing theory and provides a theoretical basis to improve the levels of educational technology literacy in higher education.

Practical Aspects The strategies proposed in this study aim to guide the training of educational technology literacy in colleges and universities in Guangxi. They assist university managers in designing specific training for educational technology literacy, which improve the overall level of educational technology literacy. Furthermore, they provide a quality guarantee for the development of human resources in colleges and universities.

Definition of Terms

Guangxi Colleges and Universities refers to 26 ordinary public undergraduate universities in Guangxi. Six public undergraduate universities located in Guilin, Guangxi, have been selected for this study. They are Guangxi Normal University, Guilin University of Electronic Science and Technology, Guilin University of Technology, Guilin Medical College, Guilin Institute of Tourism, and Guilin Institute of Aeronautics and Astronautics.

College Teachers refers to full-time teachers who are qualified as the university teachers and undertake the teaching tasks during the statistical period.

Educational Technology Literacy refers to the comprehensive professional literacy that the teachers possess when using educational technology in educational and teaching activities. This includes awareness, skill, and responsibility amongst other aspects. Educational technology literacy includes five elements: educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility and educational technology professional development.

Educational Technology Awareness refers to the objective existence of activities related to educational information technology in the teacher's reflective thinking process, encompassing educational technology willingness and educational technology determination.

Educational Technology Knowledge and Skills refers to the educational technology knowledge and skills that the teachers need to master in educational and teaching activities, including educational technology knowledge and technology skills.

Educational Technology Application refers to teachers need to know and master to use information technology effectively in teaching activities, including educational technology teaching design, educational technology, teaching implementation and academic evaluation of educational technology, and educational technology collaborative education.

Educational Technology Social Responsibility refers to the responsibility of the teachers in the use of educational information technology activities in the ethical

cultivation and behavioral norms, including legal ethics, educational technology security protection.

Educational Technology Professional Development refers to pertains to the ability of teachers to integrate educational information technology resources for the purpose of supporting their individual and communal professional development, including educational technology learning and research, and educational technology teaching research.

Research Framework

The research title of the strategies of improving the level of intelligent educational literacy of Universities in Guangxi. A framework of the research concept has been defined by the researchers as follows:

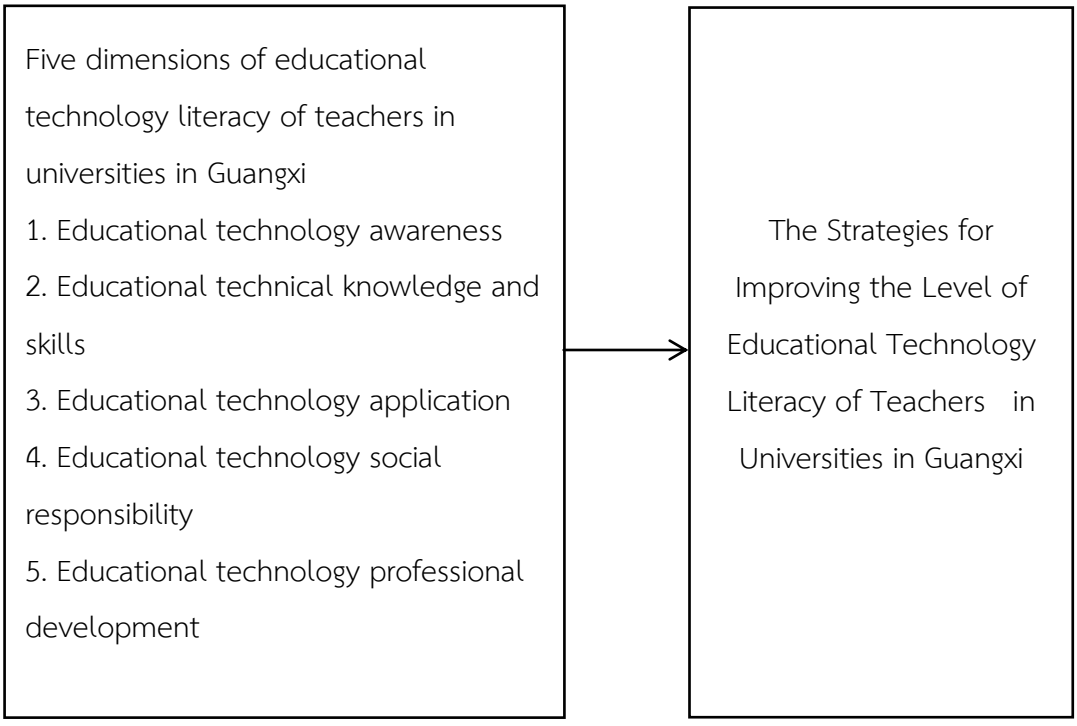

Figure 1.1 The framework of the Strategies for Improving the Level of Educational Technology Literacy of teachers in Universities in Guangxi

Chapter 2
Literature Review

The present research examines the pertinent literature and theories from both domestic and foreign sources, analyses the current state educational technology literacy, teacher technology literacy improvement strategies, along with related research, and critically evaluates these works. This study will analyze the relevant research results at home and abroad from the following aspects:

1. The background of Colleges and Universities in Guangxi
2. College teachers in Guangxi
3. Strategies to improve teachers' educational technology literacy
4. Education technology literacy
5. Related research

The Background of Colleges and Universities in Guangxi

The number and Regional Distribution of Colleges and Universities in Guangxi

According to the statistics from Guangxi Department of Education, as of September 30, 2021, there are 85 colleges and universities in Guangxi, including 38 undergraduate colleges and 47 junior colleges, of which 26 are public undergraduate colleges and 12 are private.

This paper focuses on studying 26 mainly public undergraduate colleges and universities which train students with a bachelor's degree or higher.

Public colleges and universities in Guangxi are located in various regions. Guangxi is situated in the central and western regions of China. The geography, people’s living habits, tourist attractions, and economic development level have led to the division of Guangxi into eastern, southern, western, northern, and central regions. The cities included in each region are listed below:

Western Guangxi: including all areas of Baise and Hechi.

The regional distribution of colleges and universities in Guangxi is as follows:

Northern Guangxi (6): including Guangxi normal University, Guilin University of Electronic Science and Technology, Guilin University of Technology, Guilin Medical College, Guilin Institute of Aerospace Industry, Guilin Institute of Tourism.

Central Guangxi (2): including Guangxi University of Science and Technology, Guangxi normal University of Science and Technology.

Eastern Guangxi (3): including Wuzhou College, Hezhou College and Yulin normal College.

Southern Guangxi (12): including Guangxi University, Guangxi Medical University, Guangxi University of traditional Chinese Medicine, Nanning normal University, Guangxi Institute of Arts, Guangxi University for nationalities, Guangxi College of Finance and Economics, Guangxi Police College, Guangxi Agricultural Vocational and Technical University, Guangxi normal College for nationalities, Beibu Gulf University, Guangxi Vocational normal College.

Western Guangxi (3): including Baise College, Youjiang Medical College for nationalities, Hechi College.

The situation of Public undergraduate Universities in the North of Guangxi

The subjects selected in this study are six public undergraduate universities in northern Guangxi, namely, Guangxi Normal University, Guilin University of Electronic Science and Technology, Guilin University of Technology, Guilin Medical College, Guilin Institute of Tourism, Guilin Institute of Aeronautics and Astronautics. The details of each university are as follows:

Guangxi normal University is located in Guilin, a world-class tourist city and a famous national historical and cultural city. Founded in 1932, Guangxi normal University is a university jointly built by the Ministry of Education and the People's Government of Guangxi Zhuang Autonomous region, the "The Project for the Midwest University Foundation Ability Construction". The primary objective is the development of "domestic first-class universities" in Guangxi that meet the national standards for civilized campus. The university is made up of three campuses located at Wangcheng, Yucai, and Yanshan. The three campuses cover an area of over 4,100 mu and accommodate more than 50,000 students and 4,000 staff members

(Including retirees). The university has a total of over 2,000 full-time teachers. Currently, it has 21 teaching colleges (Departments), 79 full-time general undergraduate majors, 8 first-tier discipline doctorate authorization points (Marxist theory, chemistry, Chinese language and literature, pedagogy, software engineering, sports, world history, physics), 1 professional doctoral program (Education), 3 postdoctoral research stations, 30 first-tier discipline master's degree authorization points, 21 first-tier discipline master's degree authorization points, and 12 categories are covered by majors and disciplines. More than 350 universities and institutes worldwide have established cooperative and exchange relations with the school. Overseas, there is one Confucius classroom and three Confucius Institutes. The school serves as a demonstration base in China for the study of overseas Chinese recognized by the Ministry of Education, as well as being the Chinese language education base of the Overseas Chinese Affairs Office of the State Council, and the international cultural exchange base for overseas Chinese in China. This is the recipient organization for international students who are awarded the "Chinese Government Scholarship" by the Ministry of Education, the "Confucius Institute Scholarship" by National Hanban, and the "ASEAN Scholarship" by Guangxi Government. The school is now recognized as a “leader” in teacher education in Guangxi, a “main force” in strengthening Guangxi through humanities, a “fresh force” in revitalizing Guangxi through science and technology, and a “vanguard” in international education in Guangxi. At present, the school is striving to promote the "double first-class" construction and comprehensive reform and strive to achieve the goal of building an internationally renowned domestic first-class university with the distinctive characteristics of teacher education. The school has a rich history and culture, a strong foundation in science and education, and boasts an excellent quality of teachers. It has made remarkable achievements in teaching reform, productive breakthroughs in scientific research and has shown vigorous development in the cultural industry. Additionally, it has extensive international exchange programs and a great social reputation.

Guilin University of Electronic Science and Technology is located in Guilin, Guangxi, China. It was established in 1960 by the Ministry of Industry and Information

Technology, the State Administration of Science, Technology and Industry for National Defense and the people's Government of Guangxi Zhuang Autonomous Region. Chosen as the "Education and Training Program for Outstanding Engineers", the New Engineering Research and Practice Project, the key Universities for the basic capacity Building of Colleges and Universities in the Central and Western regions, the Public Graduate Program for the National Construction of High-Level Universities, the first batch of scientific and technological achievement transformation and technology transfer bases in colleges and universities, the reserve officers' selection and training base for the Chinese People's Liberation Army, the Innovative Experimental Plan for College Students, the National Demonstration University for Deepening Reforms in Innovation and Entrepreneurship Education, the National Cultural Quality Education Base for College Students, and the First-Class Discipline Construction University in Guangxi are the only universities in Guangxi with national defense characteristics. This university is one of the 30 institutions directed by the Communication Equipment Pre-Research Project of the General Armament Department and authorized by Beidou ICD. The school comprises of four campuses, namely Jinjiling Campus, Liuhe Road Campus, Huajiang Campus and Beihai Campus, spanning a total campus area of 4,153 mu. It owns 19 teaching colleges, along with 3 postdoctoral research stations. Furthermore, it offers 5 doctoral programs in first-tier disciplines, 20 master's degree programs in first-tier disciplines, 12 authorized categories for master's degree and 71 undergraduate majors. There are more than 3,200 faculty members (including 1,893 full-time teachers) and over 43,000 full-time students. Four disciplines, namely computer science, engineering, material science and chemistry, are among the top 1% of institutions worldwide ranked by the Essential Science Indicators (ESI). The school is a university that promotes and supports postgraduate studies. It has 5 first-level disciplines that are authorized for doctoral degrees, 3 post-doctoral research stations, 20 first-level disciplines that are authorized for master's degrees, 12 authorized categories of master's degrees. It has 6 first-class disciplines in Guangxi and 3 disciplines that are in the top 1% of ESI rankings: engineering, material science, computer science and chemistry. In March 2021, the school has initiated the establishment of the China-ASEAN Satellite Navigation International Cooperation

Alliance. It has collaborated with five ASEAN countries in building international joint laboratories for China-ASEAN satellite navigation. The school has constructed the first China-ASEAN multilateral cooperation Beidou precision positioning and precision measurement application demonstration system. Additionally, it has signed a cooperation agreement with the Ministry of Labor of Cambodia. The establishment of the Guidian-ASEAN Vocational Education Center (Beihai) and the Guidian-Cambodia Vocational Education and Training Base (Phnom Penh) will be accompanied by the creation of practical training facilities for students in countries such as Cambodia, Thailand, and Vietnam. Build the "China-Malaysia Belt and Road Initiative Digital Communication Research Center", the "Belt and Road Initiative" Political, Economic and Cultural Big Data Center, as well as the Philippine Cultural Research Center. The Confucius Institute, established in collaboration with Madewang University in Cambodia, has commenced operations. Moreover, an overseas Chinese learning center has been set up in Kazakhstan.

Guilin University of Technology is located in Guilin, Guangxi, China. Founded in 1956, Guilin University of Technology is a university jointly built by the central and local governments and mainly administered by the Guangxi Zhuang Autonomous Region. The institution has now developed into a multidisciplinary university, with a focus on various fields including engineering, science, management, liberal arts, economics, law, art, and agriculture. It has achieved coordinated development across different levels of education, including graduate and undergraduate programs, higher vocational education, international education, and adult education. The school comprehensively implements the educational policy of the Party. It upholds that the school motto of "hard work, dedication, unity and cooperation, development and innovation", and adheres to the concept of "educating people first, establishing a school with quality, invigorating the school with talents, strengthening the school with science and technology". The school regards establishing morality and cultivating people as its fundamental task and considers serving the major needs of the country and local economic and promoting social development as its own responsibility. Focusing on the high-quality development of the natural resources service industry and industry, we have made a series of breakthroughs in personnel

training, scientific research, social services and so on. The school now has 19 second-level teaching units, 3 postdoctoral research stations, 3 first-tier discipline doctoral degree authorization points, 22 first-tier discipline master's degree authorization points, and 14 professional master's degree categories. It currently has 82 undergraduate majors, 50 higher vocational colleges, more than 40,000 full-time students and more than 1,900 full-time teachers. The institution has campuses at Guilin Screen, Guilin Yanshan, Nanning Anji, and Nanning Airport. The total campus area is more than 3,300 mu. The school has established collaborative relationships with over 100 universities in more than 30 countries and regions. It has signed agreements on foreign student exchange, academic exchange, and scientific research cooperation with over 50 universities. More than 2,000 students from the school have participated in international study and exchange programs. The school aims to establish a renowned, high-level university of science and technology with distinct characteristics in the near future.

Guilin Institute of Aerospace Industry is located in Guilin, Guangxi, China. Founded in 1979, it used to belong to the Seventh Ministry of Machinery Industry, the Ministry of Aerospace Industry, the Ministry of Aerospace Industry and the China Aerospace Industry Corporation. In April 1999, the school was transferred to the Guangxi Zhuang Autonomous Region, implementing the management system of "joint construction between the central and local governments with priority given to local management". The institution was upgraded to an undergraduate university in 2012 and authorized to award bachelor's degrees in December 2015. Currently, there are 1,9634 full-time students, of which 17,993 are undergraduates. The school has 16 academic departments, offering 36 undergraduate degree programs. It spans across a campus area of 687,000 square meters and has 19,634 students accompanied by 868 full-time teachers. Leveraging the strategic location of Guangxi, the institution prioritizes the 'three major positioning' mission in Guangxi and actively engages in international academic collaborations. The institution has undertaken over 40 projects based on academic records, professional co-construction and credit mutual recognition projects with universities in more than 20 countries and regions, including the United Kingdom, the United States, Australia, Germany, Ukraine, Nigeria, Thailand

and Malaysia. More than 100 students are selected to study abroad every year. The school follows the principle of “prioritizing education” and “practical application of knowledge”. Additionally, it upholds the values of hard work, self-improvement, and the school motto of moral, erudite, thoughtful and faithful. The school is dedicated to the development of regional characteristics, making a significant impact on high-level applied universities across the industry.

Guilin University of Tourism is situated in Guilin, Guangxi, China. Founded in 1985, it is a university jointly built by the People's Government of Guangxi Zhuang Autonomous Region and the Ministry of Culture and Tourism. It is one of the two full-time independent public universities in China exclusively for undergraduate studies in tourism. The university now has two campuses located in Yanshan and Yanluan, covering an area of 1,257,200 square meters. It accommodates 12,205 full-time students and employs 623 full-time lecturers. At present, the university provides 32 undergraduate majors across seven disciplines including management, economics, literature, arts, engineering, science, and education. These include six elements related to the tourism industry, namely 'food, accommodation, transportation, travel, shopping and entertainment' and also integrate new business fields such as leisure, health and smart tourism. All these majors collectively form a professional system that aligns with the industrial structure. A personnel training mode focused on application, named as "one axis, two wings, three abilities, and four integrations", has been developed. The university has cooperated with several international organizations including the United Nations World Tourism Organization, the World Tourism Federation and the Asia Pacific Tourism Association, as well as over 20 overseas universities such as the Hong Kong Polytechnic University in various fields. The university has collaborated with the Lausanne Hotel Management Business School in Switzerland for the field of hotel management. Guangxi Tourism University aims to cultivate applied talents required by the cultural tourism industry and regional economic and social development, guided by the "Pursuing Dreams" spirit. The university strives to become a high-level applied tourism establishment with unique industrial characteristics. The university's proximity to the industry has fostered rich achievements in education reform. It boasts excellent teaching staff and

high-quality training with initial achievements in discipline construction. With extensive international exchanges, exciting industry training, and a vibrant campus culture, the university is poised to excel as a high-level applied tourism institution.

Guilin Medical College is located in Guilin, Guangxi, China. Founded in 1935, Guilin Medical College is a general university that operates directly under the Guangxi Zhuang Autonomous Region. It is one of the first universities to pilot the "Excellent Doctor Education and Training Program", a project initiated by the Ministry of Education. The school covers an area of over 1500 mu. There are three campuses of Lingui, Dongcheng and Lequn, housing 20 colleges (departments, departments), including Basic Medical College, Clinical Medical College, Pharmaceutical College, and more. There are 4 directly affiliated hospitals and 28 clinical teaching practice hospitals. There are 5 authorization points for a master's degree in first-level discipline and 8 authorization points for a master's degree. The program for full-time general higher education includes 26 undergraduate majors, like clinical medicine, pharmacy, and biotechnology, and also 4 majors for higher vocational education. Students from 30 provinces, municipalities, and autonomous regions across the country are enrolled in the school. Presently it has nearly 30,000 full-time undergraduate, postgraduate, international and other students at all levels. The institution has over 6,800 staff and medical personnel. The institution capitalizes on its disciplinary strengths and advantages, actively integrating into the development of Guangxi, and building collaborations with ASEAN nations and countries along the Belt and Road Initiative. Moreover, the school actively engages in international exchanges and collaborations with universities in Japan, South Korea, Europe and the United States, and strives to create a new situation of international cooperation and exchanges. It has carried out inter-school friendly exchanges and cooperation with universities or institutions in Japan, Spain, Hungary, Malaysia, the United States, Australia, Vietnam, Thailand and other countries and regions. Guilin Medical College abides by the motto of "good morality and good medicine", which supports the college's responsibility to cultivate new leaders in healthcare who can contribute to national rejuvenation. This has been fundamental to the college since its establishment 88 years ago, as it constantly strives to establish morality and promote

academic rigor. It aims to enhance the quality of education and teaching, promote scientific and technological innovation and social services, and reinforce international exchanges and cultural heritage. It strives to achieve the goal of building a "medical university with distinctive features and a good reputation at home and abroad".

Information Construction of Higher Education in Guangxi

Feng Xunwan. (2017, p.75) pointed out that Guangxi is a typical outlying poverty-stricken area, frontier minority area and old revolutionary base area in China. With a focus on the core concept of deep integration between information technology and education, Guangxi should comprehensively introduce the application of information technology in education and instruction. This is a crucial task in the development of college teachers. This provides an effective opportunity for bridging the digital gap and improving the quality of education in Guangxi. With national education informatization progressing rapidly, the policy environment in Guangxi now has the capacity to keep pace with national and global advancements. National policies have influenced the direction and supported the reform and development of education informatization in Guangxi. Initiatives like the China-Asean information port project provide a base for deeper interconnectivity, information sharing and mutual gain between Guangxi education and ASEAN.

The study of education information construction in six surveyed universities revealed some prevalent issues. Digital campus construction, smart classroom, and intelligent teaching equipment, as well as high-quality online resources, are under development, but not receiving the necessary attention and investment. Professional teachers do not utilise modern technology enough, they lack a high level of modern information technology and they face some difficulties in using educational technology during teaching activities. The training provided to teachers for increasing their educational technical literacy is not systematic and lacks necessary training needs and training plans.

Guangxi University education informatization construction plan

In 2021, the Guangxi Government issued the "14th Five-Year Plan (2021-2025) for the Revitalization and Development of Guangxi Higher Education", which pointed out that the level of higher education informatization should be improved and

teachers' information literacy training should be strengthened. The details are as follows:

The construction of wisdom campuses in colleges and universities will be promoted. Integration between the physical and digital campus will be promoted. Efforts will be made to expedite campus digitization and enhancement, and a network of combined wired, wireless and Internet of Things technologies will be established. The promotion of wisdom classrooms, wisdom labs, wisdom training rooms, and other teaching venues will be prioritized. The construction of wisdom learning spaces based on 5G, artificial intelligence, mobile terminals, and other new technologies will be explored, and a networked, digital, intelligent, and personalized education and teaching environment will be created. Accelerate promotion of data governance, strengthen in-depth integration of information systems, build a general business service platform, and promote the "All Access to the Internet", and enhance the ability of scientific decision-making and school governance.

The integration and innovative development of information technology with education and teaching will be promoted. Universities will be encouraged to develop "Internet plus education", "5G plus education" and "intelligence plus education". The application of information technologies such as the Internet, big data, artificial intelligence and blockchain in education and teaching will be vigorously promoted. The reform of the teaching and learning mode under the condition of information technology will be pushed forward. To facilitate teachers in undertaking educational technology reform, it is essential to encourage the development and application of online courses and blended teaching. To enhance students' information literacy, it is necessary to incorporate courses on Internet thinking, computational thinking, artificial intelligence, and other relevant courses into the curriculum system of various majors to meet the needs of the development of the new era.

Promote the joint construction and sharing of high-quality educational resources between schools. Colleges and universities will be assisted in fast-tracking the development of digital teaching resources and in developing a series of high-quality online teaching resources. Colleges and universities are encouraged to purchase and use qualified socialized and market-based high-quality online courses,

and to establish a mechanism for co-construction and sharing of course resources with diverse input, clear responsibilities and rights, sharing of rights and interests, and openness and inclusiveness. To improve the working mechanism of inter-school alliances and course alliances in regional higher education, encourage and support students to choose courses across schools and majors, and promote the construction of co-construction and sharing mechanisms and platforms for inter-school course selection and credit recognition. A virtual simulation experiment training platform should be developed at the autonomous region level to encourage co-construction and sharing of high-quality virtual simulation experiment teaching resources. A wisdom classroom connectivity system will be developed for undergraduate colleges and universities to strengthen the display and exchange of first-class courses and demonstration courses. A virtual simulation experiment training platform will be developed for regular undergraduate universities, and the co-construction and sharing of national and autonomous virtual simulation experiment teaching resources will be implemented. To sum up, teachers serve as essential support for the high-quality development of education, and their proficiency and application of educational information technology will accelerate the development of higher education informatization. In addition, the development background of colleges and universities in Guangxi, the construction of educational informatization and future planning, etc., all require colleges and universities to improve the educational technology literacy of full-time teachers as soon as possible. Despite the state's expectations and requirements for the digitization and revitalization of education in Guangxi, the educational technology literacy of teachers in colleges and universities within the region is not up to the national standards, mainly due to economic and regional factors. Moreover, a comprehensive system to enhance the educational technology literacy of the teachers is yet to be established. Consequently, extensive research needs to be carried out to explore the effective strategies that can be used to improve the educational technology literacy level of college teachers in Guangxi.

College Teachers in Guangxi

Definition of University Teacher

As outlined in the 2018 National Standards on the Teaching Quality of Undergraduate Majors in Regular Institutions of Higher Learning issued by the Teaching Guidance Committee of Higher Education of the Ministry of Education, the term 'full-time teachers' denoted those who had the duty of imparting fundamental and professional knowledge relevant to their respective fields. To become a full-time teacher, individuals were required to meet two conditions: firstly, they must hold a certificate verifying their higher education teacher qualification; secondly, they must carry out teaching duties during the designated statistical period.

The Program for the Evaluation of Undergraduate Teaching Level in Ordinary Institutions of Higher Learning (Trial) defined "full-time teachers" as those with teacher qualifications who specialized in teaching. This was that they should hold a higher education teacher qualification certificate and conduct teaching activities during the statistical period. The details include:

1. Full-time teachers with college teacher qualifications who undertake teaching tasks during the statistical period.

2. Has the qualifications for teachers in colleges and universities and the statistical period, undertake the task of teaching "Shuang Jian Tiao" (Administrative and teaching staff.

3. Non-college teacher professional and technical position series personnel who have college teacher qualifications and undertake teaching tasks during the statistical period;

4. Senior and deputy secretaries and student counselors who have college teacher qualifications and undertake teaching tasks during the statistical period in charge of student work;

5. Old comrades who failed to obtain the college teacher qualification certificate due to their educational background, but have professional and technical positions as college teachers and have been engaged in teaching work;

In this paper, only the first type of full-time teachers was investigated. This group refers to teachers who possessed college teacher qualifications and carried out teaching tasks during the statistical period.

The Composition of College Teachers in Guangxi

According to the 2021 statistics from Guangxi Education, there were a total of 74,097 faculty and staff working in regular undergraduate colleges and universities in Guangxi. This included 53,438 full-time teachers. The statistics on professional titles revealed that of the total teachers working, 5,762 held senior titles, 13,780 held associate senior titles, 19,704 held intermediate titles, 3,448 held junior titles, and 10,744 have unassigned titles. The statistics on educational structure indicated that among the teaching staff, 8,621 held a doctor's degree, 24,978 hold a master's degree, 19,487 held a bachelor's degree, while 352 had completed junior college or below.

The Importance of Educational Technology Literacy of college teachers in Guangxi

Guangxi had developed a series of documents on the development of college education informatization, which called for raising the bar for higher education informatization and offered an excellent chance to advanced teachers' familiarity with educational technology.

The Guangxi Department of Education released the 14th Five-Year Plan for the Construction of Teachers in Guangxi in 2021, which highlighted the need for revised training methods, promoting seamless integration between information technology and teacher training, and implementing a hybrid training approach combining online and offline training.

The Guangxi Department of Education issued the 'Internet + Education' Action Plan in 2019 (2018-2022), indicating the need for a shift from improving the application ability of information technology among teachers and students to a more comprehensive improvement in their information literacy. The focus was on general improvement of teachers' application level and information literacy, with special attention on enhancing information literacy among teachers and educational administrators. The guidelines on the reform of the state and autonomous regions on

comprehensively deepening the construction of teachers in the new era was fully implemented. The teachers were encouraged to actively adapt to new technological changes, such as information technology and artificial intelligence, and effectively carry out education and teaching. Institutions of higher learning and vocational colleges should provide specific training to enhance teachers' information-based teaching ability.

In 2021, the Guangxi Government issued the Three-year Action Plan for the Construction of the Digital Society in Guangxi (2021-2023), which emphasized the need to promote information education, improve the information quality of the whole people, strengthen the training of students, teachers and social personnel in information related knowledge, improve the information quality of the whole people, and form a favorable environment for the development of the digital society.

Strategies for Improving Teachers' Educational Technology Literacy

Educational technology literacy is a concept that integrates and reconstructs various literacies, such as information literacy, intelligent education literacy, information technology application ability, teachers' professional literacy, and digital literacy. It involves iterative upgrading and transformation of information literacy with the advent of the digital era, and the innovation and development of information literacy. Therefore, this study aims to summarize and sort out the development strategies to improve the level of educational technology literacy from the literature analysis..

He Yonghuan's. (2022, p.57). proposed that information literacy evaluation standards should be established at the social level and more investment should be made in schools. At the school level, leaders should pay more attention and provide more support. Investment should be increased in related hardware and software equipment, as well as in educational information technology training targeting young physical education teachers in colleges and universities. At the subject level, there was a need to change the traditional concept of physical education teaching to promote the integration of information technology and sports. At the teacher level, it

was necessary to strengthen the understanding of the importance of information literacy, exercise their own ability to innovate with information, and improve the personal survival pressure of physical education teachers.

Song Quanhua et al. (2020, p.82). proposed that the training mode of "classification, stratification and section" should be established. The authors recommended prioritizing the concept to enhance teachers' awareness of information technology. Improving the system construction, including the enhancement of hardware and software environments, was also crucial. Finally, optimising the knowledge structure of teachers was advised under the TPACK framework.

Yan Hanbing etal. (2019, p.1). proposed that in the context of the 'Internet+' era, IT can be improved in five aspects: These five ways were: shifting focus from individual abilities to supporting school development; replacing short-term training with systematic programs; supporting real-world learning instead of just departure training; emphasizing instant learning over reserve learning; and relying on data-driven approaches instead of experience-based support.

Liu Yongchao. (2018, p.245). pointed out that the teachers should strengthen independent learning, update education and teaching concepts, be good at using the Internet and big data thinking, optimize teaching methods, carry out learning resource push services, and guide students to learn efficiently. Meanwhile, teachers can build an integrated cross-border learning network based on the Internet platform and establish an information-based teaching resource sharing platform. These suggestions aimed at promote teaching reform, enhance teaching transparency, and implement cross-boundary learning.

Li Chunyan. (2018, p.74). proposed that for effective teacher professional development, college teachers should comprehend the essence of information-based teaching in inquiry learning, rebuild a new knowledge system, integrate information-based teaching into daily classroom practices, and practically apply traditional theoretical knowledge, to enhance their teaching quality and level continuously. Constructing high-quality teaching resources was a prerequisite for creating a conducive learning environment. The ability of teachers to teach using information-based tools was a process that requires continuous improvement. The

training mode for information-based teaching should aim to be flexible and diverse. It should also aid teachers in creating interactive communication platforms that allowed educators of various disciplines and specialities to share knowledge about information-based tools and update their teaching methods accordingly. Improving the eagerness and awareness of teachers to partake in information-based teaching, so as to promote the continuous development of teachers' information-based teaching ability.

Fu Yun. (2017, p.34). proposed that college teachers should comprehend the true meaning of information-based teaching and adeptly utilize Internet and big data thinking. Additionally, they needed to master the fundamental techniques of information-based teaching, seamlessly integrated information-based tools into the classroom, and facilitated students in developing independent learning habits. It was suggested that teachers should move beyond traditional exam-oriented education. Greater attention should be directed toward students' ability to learn through inquiry. Furthermore, schools must focus on enhancing teachers' information-based teaching and increase the frequency and intensity of information-based teaching ability training.

Chen Li. (2020, p.17). proposed that in order to improve the IT ability of teachers in the United States and provide inspiration for China's IT ability training, teachers should change their roles and incorporate information technology to support students' learning. This can be achieved by providing continuous and embedded development support for teachers already in-service, as well as by reforming the curriculum system for pre-service teachers' training and ensuring their IT ability was emphasized. It was also important to strengthen cooperation between universities and primary and secondary schools, and integrate pre-service and post-service training while paying attention to the IT ability of college teachers.

Wang Lin. (2022, p.174). proposed that a strategy for improving teachers' IT ability under the background of "Internet +" should enhance the awareness of such improvement. Innovate traditional teaching idea and improve information technology ability; Strengthen the integration of classroom teaching with information technology; Carry out an information-based competition for teachers' teaching abilities.

Zhang Liping. (2021, p.23). proposed that strategies could be implemented to improve the IT ability of teachers in rural primary schools. These strategies included changing traditional concepts and improving awareness of IT among teachers, increasing capital input, establishing the basic hardware environment for information technology in rural primary schools, building an online training and communication platform, and utilizing innovative technologies such as 5G and artificial intelligence. Additionally, designing the content and form of information technology training should be done reasonably.

Lv Shuang's. (2020, p.30). proposed that the strategy for cultivating IT abilities among teachers should involve the concept of lifelong learning. To achieve this, incentives and training mechanisms should be improved, followed by building an information technology learning community, and constructing diversified information technology practice links.

Hou Zhongyuan. (2022, p.184). proposed that the teaching concept needed to be revised and the awareness of informatization strengthened. An information-based teaching platform should be built, while information-based training should be strengthened. The teaching mode should be changed, and more emphasis should be placed on developing the diversification of information ability.

Liu Bin. (2020, p.15). proposed that the following factors can be used to improve teachers' intelligent educational literacy: policy direction and an action plan to actively promote teachers' intelligent educational literacy; promote the formation of an integrated system for the pre-service and in-service development of teachers' intelligent educational literacy support from several parties to enhance the conditions that would ensure the growth of teachers' intelligent educational literacy; Independent development, maximized the impact of educator professional development.

Wang Dan. (2022, p.94). proposed that intelligent educational literacy can be divided into three levels according to the professional development path of technology-competency-literacy: intelligent technology as a tool, intelligent application as a path, and intelligent talent training as the purpose.

Li Xiang. (2021, p.8). proposed that the development path for enhancing the intelligent educational literacy of teachers in the future comprised updating and optimizing teacher education courses, enhancing the hierarchy of case teaching, creating intelligent teaching environment, and cooperating with multiple subjects to improve the intelligent educational literacy of teacher educators.

Chen Fanli. (2021, p.18). proposed that the future growth route of teachers' intelligent educational literacy included the following stages: To monitor the development of intelligent educational literacy in normal university students, pertinent regulations and standards should be developed; a contemporary concept of the development of intelligent education quality in normal university students should be established. System as the foundation should be used to construct a good system for normal university students to receive intelligent education training. Both "soft" and "hard" environments should be created based on the environments for the cultivation of intelligent educational accomplishment among normal university students.

This study by Ismaila Temitayo Sanusi, ect. (2022, p.10). proposed that that school administrators introduce teaching methods and tools that can effectively improve the manual educational technology capabilities of future teachers. Second, school administrators are advised to develop innovative teaching methods, platforms, and content thorough understanding of cultural awareness, self-learning, and human-tool collaboration capabilities. Finally, the study recommends that administrators introduce a platform for peer collaboration across boundaries.

Xu Weibin. (2022, p.4). proposed that the schools should acquire proficiency in digital tools while fostering teachers' ability to analyze learning situations. Classroom data should be collected to enhance teachers' teaching ability. The use of digital resources can improve teachers' ability to design homework. Finally, an interactive platform can enhance teachers' integrated teaching and research ability.

Shen Shusheng. (2022, p.17). proposed that it was suggested to enhance teachers' ability to apply information technology by promoting the use of technology across the entire school. To achieve this objective, all the teachers should be guided to analyze the existing issues based on the school's work scene and establish a path

to improve their abilities that aligns with the current situation of the school. To ensure fairness and quality, the schools should take measures that suited their local conditions and designed a sustainable level of development from the perspective of growth at the starting point of development.

Cheng Siyue et al. (2016, p.111). proposed that in the trend of "Internet +", the construction of educational informatization is facing greater challenges, and immersion training was useful for enhancing teachers' proficiency in using information technology. The immersive training comprised community-based online study, school-based study organized by the school, case analysis of neighboring school districts, and classroom-based application training.

Lin Xiuyu. (2015, p.94). proposed that combining teachers' network training and field practice in the Web2.0 environment was one of the important ways to improve teachers' information technology application ability. Based on the training mode of teachers' technology ability in Web2.0 environment, he proposed the network training activity strategy based on teaching problems and teaching research projects.

Xu Guangtao et Al. (2014, p.12). proposed that establish a democratic communication platform and equal dialogue mechanism based on grassroots teachers; focus on the grassroots needs, adopt flexible content design and flexible mobility; based on a common vision, a good shared culture guarantees the continuous development of activities; rely on decentralization, achieve self-efficacy through multi-level participation; and continuously build an emotional dependent spiritual home with multiple communication. This study had some reference significance for awakening the internal strength of grassroots teachers and actively improving the application ability of information technology.

Wu Junqi. (2023, p.78). proposed that the country’s digital literacy education policy should pay attention to the primary and secondary schools, highlight the characteristics of digital literacy education content of primary and secondary schools, strengthen the cultivation of teachers' digital literacy and professional support, explore the support mechanism of digital literacy education of primary and

secondary schools, through the basic education, enhancing the foundation of the digital literacy promotion engineering.

Pei Ying Zhu. (2022, p.130). proposed that giving top priority to clear digital talent training goals was the key. Strengthening digital facilities and creating a favorable digital environment formed the foundation. Deepening curriculum reform and making digital literacy the focus, helped to increase the intensity of digital faculty construction through organic collaboration of academic research. A mechanism was collaboratively built to promote college students' digital literacy.

Niu Decao. (2016, p.85). proposed that the schools should establish a regional education resource database using social software. Additionally, the schools should enhance the training of teachers in their information technology application abilities and create an environment that fostered the use of information technology by the teachers.

Liang Huiyi. (2021, p.40). proposed that the teachers' workshop oriented by the practice community will become an experimental field to jointly promote the development of teachers' information technology application ability. It includes precise training research, effective expert guidance, innovative intelligent practice, standardized evaluation and assessment, standardized flat management structure, and regular research and reflection.

Yan Guangfen. (2022, p.11). pointed out that the cultivation path of teachers' digital literacy involves promoting the new digital infrastructure and creating a high-quality digital technology environment; providing diversified training programs that integrated digital technology to stimulate the vitality of digital teaching; building the digital learning community, optimizing teachers' digital cooperation and communication; strengthening the construction of digital science and technology ethics and legal norms, guiding the cultivation of digital ethics consciousness; developing digital evaluation tools and standards, and improving teachers' digital evaluation ability.

Guo Xiaolin. (2022, p.28). pointed out that the training path of teachers' professional digital literacy includes implementing training for digital knowledge, creating a networking platform for teachers, and reflecting on their digital practice.

Zhou Liangfa et al. (2022, p.6). pointed out that to cultivate a large number of high-quality, professional, and excellent digital teachers, it was necessary to prioritize strengthening theoretical research, education guidance, and wisdom campus construction. Additionally, there was a need for stronger supervision and assessment, improved evaluation, and incentive links that would provide adequate support for developing digital literacy of university teachers.

Li Yuting et al. (2022, p.51). pointed out that promoting digital literacy among university teachers can be achieved through several actions, including formulating a hierarchical framework for their digital literacy, exploring ways of integrating digital literacy into university subject courses, and strengthening their training in digital skills to improve their digital teaching ability. In addition, digital technology can be used to empower learners.

Gong Manman. (2023, p.54). pointed out that improving teachers' digital literacy required developing special digital literacy standards, creating a quality digital teaching environment, accelerating the integration between digital technology and disciplines, providing diversified training, updating teachers' professional cognition, and enhancing their learning awareness of digital literacy.

Su Jingya et al. (2021, p.13). proposed that improving the information teaching ability of college teachers required several aspects. The first was to rebuild the role identity and subjectivity awareness of teachers. Secondly, improving the knowledge structure of teachers and enhancing their understanding of information technology was crucial. Thirdly, promoting innovation in information technology can aid the collaborative evolution of education. Fourthly, building an information-rich environment and developing a suitable teaching platform was crucial. Fifthly, establishing an incentive and evaluation system can aid in smoothing the development path of teachers. Finally, to create a positive teaching atmosphere and enable the building of a learning community for teachers were necessary.

Sui Xinghua et al. (2020, p.130). proposed that a series of coping strategies were proposed: enhancing teachers' vitality and improving their efficiency in information teaching, strengthening information teaching construction to ensure its

sustained development, and implementing development projects in information teaching to enrich teachers' experiences.

Yang Yan. (2019, p.121). puts forward the following promotion strategy should be implemented: consolidating positive information consciousness, frequently updating educational teaching ideas, expanding knowledge of information, integrating information technology and subject teaching closely, enhancing information skills application, continuously improving teaching designs, upholding information ethics' bottom line, improving self-improvement, as well as enhancing the richness and effectiveness of training.

Yi Ye. (2022, p.60). proposed that there was a need to promote the internalization and sublimation of teachers' digital accomplishment, speed up the promotion of teachers' "digital + teaching" practice skills, adhere to the principle of combining integration and classification guidance, develop vocational teachers' digital literacy evaluation standards and establish digital technology and professional skills to support each other of lifelong learning community.

Song Fangfang. (2017, p.46). proposed that a series of strategies: They include integrating local university teachers into the information technology environment, conducting technology research and development tailored to the needs of local university teachers, simplifying the operating procedures of the information system for local university teachers, establishing relevant technical and academic guidance departments at local colleges and universities, enhancing the acceptance of information technology by local university teachers themselves, strengthening the maintenance of the information network at local universities, and establishing an effective reward mechanism at the university level. Other strategies included establishing academic salons on information technology, receiving policy and financial support from local governments, strengthening the construction of information platforms at local colleges and universities, standardizing the information ethics of local university teachers, improving information security laws and regulations, enhancing the supervision and management mechanism of the network, promoting self-protection awareness among local university teachers, improving the

information awareness of local college teachers, and enhancing the information skills of local university teachers.

Zhu Yi. (2022, p.47). pointed out that promotion strategies included perfecting the system environment, creating a favorable academic atmosphere, enhancing education technology training, providing more on-the-job training opportunities, setting clear training objectives, improving the training mechanism, enriching training content, modifying the training format, increasing participation, offering incentives for participation, and strengthening teachers' knowledge reserves.

Wang Ru. (2022, p.57). proposed that made some recommendations: understanding new education theories and professional knowledge, mastering emerging information technologies, promoting the integration of technology and curriculum, improving information skills, enhancing the construction of the school's information environment, enhancing training systems, establishing effective training mechanisms with personalized training plans and corresponding evaluation standards, alleviating the pressure on teaching and scientific research, improving institutional environments, and enhancing self-regulation abilities are all essential for building a research community among teachers.

The literature analysis revealed that a predominant research theme pertained to enhancing primary and secondary school teachers' proficiency in information technology. In contrast, there was limited research focusing on university teachers' information technology ability in recent times.

Educational Technology Literacy

Educational technology literacy involved the integration and reevaluation of concepts such as information literacy, intelligent education literacy, information technology application ability, teacher professional literacy, and digital literacy. It represented an iteration upgrade and transformation of information literacy caused by the digital age, and presented an innovation and development of information literacy. Thus, this study aimed at evaluating and summarizing the key concepts, importance, content and influencing factors of educational technology literacy through a thorough literature analysis.

Definition of Educational Technological Literacy

The modern Chinese dictionary defined quality as the "cultivation of self-restraint" and "maintenance of ordinary life". The Oxford English Dictionary generally defined "literacy" as the ability to read and write. There were slight differences in the definition of the word literacy among domestic and foreign researchers. However, they shared similar concerns, primarily focusing on knowledge, skills, attitudes and related aspects.

Qiu Jianxin. (2020, p.30). proposed that the teachers' professional performance is a synthesis of the qualities and achievements that teachers show in the performance of their duties in the practice of education and teaching, determine the effect of their education and teaching, and have a direct and significant impact on students. The content comprised four aspects: professional ethics, professional ideas, professional knowledge and professional abilities.

Huang Youchu. (2019, p.1). proposed that teacher professionalism refers to the qualities and skills that teachers acquired through their upbringing, education, and practice, based on their innate abilities and which significantly impact their teaching activities. Teacher professionalism was a combination of various psychological qualities required for professional engagement, in line with the contemporary development. Its constituent elements included teacher knowledge, ability, character, and beliefs.

Li Zhaoyi and Yang Xiaohong. (2019, p.113). proposed that teacher professionalism encompasses the knowledge, abilities, and beliefs of teachers related to teaching. In the era of the “Internet+”, teachers' professional literacy mainly comprised new professional concepts based on Internet thinking, new professional knowledge based on discipline literacy, scientific and cultural literacy, and new professional skills based on information technology literacy. In particular, new professional ideas based on Internet thinking include "cross-border thinking" which crosses disciplinary and speciality boundaries; "Platform thinking" to improve self-organizing adhesion; Improving targeted "data thinking" in teaching reform; and returning to "user thinking" as the essence of teaching and educating. The acquisition of new professional knowledge is based on the attainment of discipline and scientific and cultural accomplishments. This involves

systematic discipline knowledge, solid discipline skills, firm discipline belief, advanced discipline thinking, noble discipline quality, extensive scientific and cultural knowledge, rich information technology knowledge, systematic psychology knowledge, proficient pedagogy knowledge and advanced professional knowledge. The new professional skills required primarily revolve around information technology literacy, which included basic information literacy, data literacy and media literacy.

Niemi and Nevgi. (2014, p.136). proposed that research competence is one of the professional roles of teachers. Research learning is not the sole component of teacher education, but it can serve as a means of strengthening professional learning and skills in the 21st century. In the context of autonomous lifelong learning, professional development comprised systematic reflection on their practice, conducting classroom research, integrating research results from both classroom and academia into teaching, assessing the effectiveness of teaching strategies and modifying them accordingly, and evaluating one's training needs.

Birut Rachel ygaitien Linkect. (2013, p.165). proposed that teacher professional competence includes the abilities to manage the teaching/learning process, to motivate and support learners, and to plan and develop subject content.

Paul Zurkowski, president of the Information Industry Association of America, first proposed the concept of Information Literacy in 1974 within the library community. The idea was to gradually replace traditional "library literacy".

In 1987, Breivik, an information expert, presented the definition of information literacy as the comprehension of the system that provides information, the ability to recognize the significance of information, the selection of the most effective channel through which to obtain information, and the mastery of the basic skills required to obtain and store information.

Information literacy is defined by the American Library Association (ALA) in 1989 as "awareness of when information is needed and the ability of those who know how to learn to effectively find, evaluate, and use it".

In 1992, the American Library Association pointed out that information literacy is the capacity of individuals to ascertain their information needs, retrieve, evaluate, and effectively use information.

In 1999, the National and University Library Association (SCONUL) defined information literacy as "a conscious awareness of the application of legal methods and effective skills to collect, evaluate, use, manage, integrate and create information and data".

In 2015, the American Association of University and Research Libraries (ACRL) released the "Framework for Information Literacy in Higher Education". The framework highlighted that information literacy is the reflective discovery of information, the understanding of how information is generated and evaluated, and a set of comprehensive abilities to use information for the creation of new knowledge and to participate effectively in the learning community..

In April 2018, the British Library and Information Association (CILIP) released the CILIP Definition of Information Literacy 2018 report, which argues that information literacy is the ability to think critically and make balanced judgments of any used or found information.

In March 2021, the Ministry of Education of China issued the Code for the Construction of Digital Campuses in Colleges and Universities (Trial), which pointed out that information literacy refers to the consciousness, ability, thinking and accomplishment of individuals who properly use information technology to acquire, integrate, manage and evaluate information, understand, construct and create new knowledge, and discover, analyze and solve problems. Developing information literacy was vital in nurturing high-quality and innovative talent in colleges and universities. Its components include information awareness, information knowledge, information application ability, information ethics and security. This document clearly defines and constituent components of information literacy in clear terms.

Yu Xiaoya. (2019, p.71). proposed that in the field of artificial intelligence, information literacy should be based on artificial intelligence literacy. In essence, this referred to a holistic and comprehensive literacy of knowledge, ability, literacy, and personality with human-machine coexistence and virtual and real parallelism.

Lin Qijie. (2022, p.169). proposed that information literacy is defined as a kind of ability that a comprehensive quality including information awareness and

information ability. It is the ability to independently locate information accurately and punctually, analyse and evaluate it, and then apply it efficaciously in practice.

Bong-Suk Kang. (2018, p.179). pointed out that information literacy ability can be said to be a comprehensive ability necessary for a series of processes, such as perceiving one's own information needs, formulating strategies to solve information tasks, searching, analyzing, processing and evaluating information.

Yang Yan. (2019, p.119). believed that teachers' information literacy is one of the qualities of their professional development. It served as a significant indicator for teacher team construction, and a basic guarantee for teachers to effectively respond to the demands of smart society and smart education.

Jiang Congwen. (2019, p.22). proposed that teachers' information literacy is an integral element of their professional competence in modern times. It is "the information awareness and ability for teachers to actively learn information theoretical knowledge and effectively collect, evaluate, analyze and synthesize information on the basis of fully understanding the value and function of information technology to realize the integration of information technology and specific education and teaching practices".

Wang Yi. (2017, p.111). pointed out that in order to achieve specific teaching objectives, teachers adopt certain information media and teaching methods following the relevant theories and syllabuses of education and teaching. They also utilized comprehensive knowledge systems such as subject professional knowledge, education and teaching knowledge, psychology knowledge and teaching practice experience to impart corresponding teaching contents to teaching objects. And enable them to master the relevant subject knowledge and basic skills under the assistance of information technology.

Yu Yang. (2021, p.34). proposed that Information literacy of college teachers is the ability to develop fundamental information skills using contemporary resources and to acquire, acquire, analyze, organize, evaluate and utilize information to achieve their own professional development, improve teaching quality and promote students' growth under the background of educational informatization. Information literacy among college teachers comprised basic information literacy, integrated

information technology teaching literacy, professional development literacy, as well as ethical and moral literacy.

Zheng Bei. (2022, p.49). pointed out that teachers' information-based literacy refers to the skills or abilities that they acquired through continuous training and practice in the application of information-based educational technology. This means that teachers can incorporate teaching materials effectively and systemically using network, communication, database, multimedia, and other technologies in a systematic, reasonable, and in-depth manner. This ability also helped to stimulate students' interest in learning.

Palmira Peciuliauskiene. (2022, p.6). proposed that information literacy includes two parts: information search and information evaluation literacy. Additionally, teacher information literacy also covered a series of abilities that teachers should have. Teachers with lower information literacy skills are more likely to avoid addressing problems related to information.

Liu Bin. (2020, p.13). proposed that intelligent educational literacy refers to the collection of knowledge, abilities, attitudes and ethics that support teachers in their educational practice and professional development in the era of artificial intelligence.

Hu Xiaoyong et al. (2021, p.61). proposed that intelligent educational literacy is based on the conception that "literacy as the leader and creativity as the core". The teachers must strive for a coordinated development of knowledge, ability, thinking, and cultural practice. Educational artificial intelligence was proposed to enable creative synergy and a symbiotic relationship between educators and students during the educational practice process.

Guo Jiong. (2021, p.124). proposed that intelligent educational literacy is the ability, thinking and quality required by the teachers in the era of intelligent technology, particularly with regards to conducting ethical man-machine collaborative teaching..

Li Xiang. (2021, p.6). proposed that teachers' intelligent educational literacy refers to a comprehensive literacy that teachers are competent for education and

teaching in the intelligent era. It also represented the artificial intelligence literacy of citizens in the intelligent society in professional education work.

Wang Dan. (2022, p.94). pointed out that teachers' intelligent educational literacy refers to their ability to adjust and optimize their professional competence, adapt to the changing demands of the profession as it evolved with society and manifest in their personalized development. She believes that teachers' intelligent educational literacy is a diversified and systematic concept category based on the development of information technology. She believed it to be a comprehensive quality enabling teachers to use technology such as artificial intelligence to enhance efficiency in teaching and management, innovate talent training modes, shape intelligent ethics and defined value norms, and boost students' personalized, intelligent learning and innovative ability.

Zhao Leilei. (2021, p.111). pointed out that the teachers should concentrate on integrating knowledge and fostering morality to enhance their technical literacy in education. It was necessary for teachers to be able to retrieve, identify, and construct digital resources, integrate interdisciplinary knowledge, enhance their awareness of risks associated with intelligent education ethics, as well as improve their ability to examine data values and provide emotional support.

Dorit Alt. (2022, p.3). pointed out that in a report following a workshop on training teachers for online teaching (Israeli Ministry of Education, 2020), five principles for professional training for teachers in a digital environment were formulated: (1) Enhancing techno-pedagogical skills; (2) Developing technological and techno-pedagogical teaching methods that aims to provide equal opportunities for learning and assessment for heterogeneous classes; (3) Relating to teachers' beliefs and attitudes toward incorporating technology in teaching and evaluating them at the first stage of training in online teaching (Dovbenko etal, 2020); (4) Creating a model for training and professional development that combines various teaching approaches; (5) Relating to the social and emotional aspects that come with online teaching.

Gong Man. (2023, p.16). proposed that teachers digital literacy refers to the digital environment. The teachers consciously comprehended the basic digital tools,

used digital technology to carry out the education teaching, promote information exchange and sharing, improve digital security, using digital technology to solve practical teaching problems, and guide students in handling digital technology in a creative and critical manner.

Li Yuting. (2022, p.49). proposed that digital literacy refers to a teacher's ability to fully utilize the potential of digital technology for teaching purposes. This included understanding the meaning of digital teaching, developing effective and inclusive teaching strategies, helping students creatively and critically use digital technology, and using digital technology to help learners achieve their goals.

To sum up, this study proposed that educational technology literacy encompassed the complete range of professional literacy that teachers possess to utilize educational information technology for education and teaching activities. This included their awareness, abilities and responsibilities. The subsequent investigations of the educational technology literacy of teachers in this study are founded on this concept.

The Importance of Education Technology Literacy

Education is built on the foundation of teachers, and their professionalism is crucial for its successful development. As information technology is becoming more extensively applied in education, enhancing teachers' technological competence is becoming increasingly urgent. Several countries, along with UNESCO, the European Union, and numerous global research institutions, have formulated numerous policy documents.

For example, in 2016, the United States pointed out in Preparing for the Future of AI' the need to integrate AI into the national education system to increase awareness among the population.

In 2016, the United States released its fifth National Education Technology Program, the NETP2016, which emphasized that teachers should use technology effectively in their teaching. Subsequently, the "Outline of Promoting Educational Technology Policy in Teacher Education" was published. Its goal was to develop teachers' information technology ability. It put forward four guiding principles to

promote teacher education technology progress and discuss the primary challenges and solutions for effective integration of technology in teacher.

In 2017, the UK released the document "Developing Artificial Intelligence in the UK", which proposed that data science and AI should be widely embedded in education.

In 2019, United Nations Educational Scientific and Culture Organization proposed its report "Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development", taking "improving teachers' AI literacy" as an important part of building an education ecosystem in the era of artificial intelligence.

In 2019, the United States proposed the "Plan for the Construction of an AI Research Institute" with an investment of about 200 million US dollars. The plan focused on six directions, including "AI-enhanced learning".

In 2020, at the international level, the Institute for Future Today (Future Today Institute) released the latest version of the 2020 Technology Trends Report, which noted the development of educational technology and the understanding of the correlation between science, technology and the uncertain future.

Saudi Arabia's Vision 2030 and the National Transformation Programme recognize the importance of AI in the country's future. In October 2020, Saudi Arabia hosted the Global AI Summit and became the world leader in AI events. Saudi Arabia's Ministry of Communications and Information Technology (MCIT), in cooperation with the Ministry of Education, has developed a machine learning training program, which was to be included in the ministry's curriculum. They had also introduced key STEM training and courses aiming to improve AI and technical skills.

In 2021, The United Nations Educational, Scientific and Cultural Organization (UNESCO) published the 'Artificial Intelligence and Education: Policy Maker's Guide. The guide aimed to help national leaders and policy makers better understand the potential uses of artificial intelligence in education and teaching. The ultimate goal was to provide inclusive, fair quality education and lifelong learning opportunities, to ensure that every citizen has the opportunity to improve artificial intelligence literacy.

The Digital Education Outlook 2021 released by the OECD, the data revolution and the complete reimagining of teaching and learning are driving the next step of education.

The Chinese government has also developed a series of documents on educational technology. In 2010, China promulgated the Outline of the National Medium-and Long-Term Education Reform and Development Plan (2010-2020), which clearly stated that "accelerating the process of education informatization".

In 2012, China issued the Decade Development Plan for Education Informatization (2011-2020), pointing out that the integration of information technology and teaching should be promoted to promote the professional development of teachers.

In 2013, the Ministry of Education of China issued the opinions on the implementation of the national project to improve the application ability of information technology for primary and secondary school teachers.

In January 2017, the Chinese government issued the "13th Five-Year Plan for the Development of National Education", which proposed supporting the implementation of wisdom campuses in schools at all levels, harnessing the potential of Internet, big data, artificial intelligence, and virtual reality technologies. Alongside, they issued the Development Plan of the New Generation of Artificial Intelligence, in which the development of education technology was emphasized as a significant aspect, focusing on the utilization of artificial intelligence technology to expedite talent training and education and teaching reform, as well as building a new education system that included intelligent learning and interactive learning.

In 2018, China proposed to promote the development of educational technology in the Action Plan for AI Innovation in Institutions of Higher Learning. The promotion of school education and teaching reform involved the establishment of artificial intelligence-related knowledge and skills courses in both pre-service and on-the-job training. Furthermore, the ability of the teachers to implement educational technology was nurtured.

In April 2018, the Chinese Government issued the Action Plan of Education Informatization 2.0, which proposed to promote the application of artificial

intelligence in teaching and management, accelerate the reform of talent training mode and teaching methods, and explore ubiquitous and intelligent systems. The plan emphasized the need to shift from an emphasis on technological applications to developing information literacy abilities through cooperation between technology and information literacy.

In 2019, China issued the "China Education Modernization 2035", pointing out that the use of modern technology to accelerate the reform of talent training mode, and realize the organic combination of large-scale education and personalized training.

In March 2019, the state issued the Key Points of Education Informatization and Network Security in 2019, and proposes "Compiling the Plan of China's Education Technology Development" and holding the International Conference on Artificial Intelligence and Education. Development of artificial education technology had also been mentioned by the Ministry of Education over the last five years.

In May 2019, the Chinese government and UNESCO jointly held the International Conference on Artificial Intelligence and Education in Beijing, and releases the Beijing Consensus-Artificial Intelligence and Education.

In November 2021, the Cyber Security and Information Commission of the CPC Central Committee issued an Action Program for improving the Digital Literacy and Skills of Citizens. The program identified that improving digital literacy is fundamental, strategic and a pioneering work in the development of a digital China and cyber power.

In 2021, the Ministry of Education and other six departments issued the Guiding Opinions on Promoting the Construction of New Education Infrastructure and Building a High-quality Education Support System, pointing out that the deep integration of information technology and education and teaching should be promoted.

In 2022, in the same year, the Ministry of Education opened the national wisdom education platform.

Many researchers in academic circles have also put forward the importance of technical literacy in teacher education.

Teresa Pozo-Rico. (2020, p.2). proposed that the importance of training teachers in capacities related to information and communication technology (ICT) during the COVID-19 pandemic. Due to the fact that ICT has become an essential resource for 21st-century education, especially during the pandemic, the need for teachers to be trained in this area became crucial. The availability of face-to-face classrooms had been affected by the pandemic. Studies indicated that integrating information and communication technologies into teaching and learning can enhance the quality of education. Of course, integrating ICT into education also required teachers to meet significant professional demands.

Xing Xishen. (2022, p.108). proposed that the future of basic digital education required improvement in relevant standards, construction of application wisdom education platform, promotion of digital literacy and skills among teachers and students, ensuring network and information data security, building new digital education, playing to the advantages of the integration of digital technology innovation, developing a high-quality education system supported by digital technology, promoting basic education digital strategy implementation, and helping to realize basic education modernization.

Pei Yingzhu. (2022, p.130). pointed out that digital literacy was increasingly vital in the digital economy era, leading more countries and regions to incorporate digital literacy education into their national quality education system. Considering the developmental trend of digital literacy from the perspective of core literacy along with its influence in the digital economy era and significance in the "post-epidemic" period, enhancing the digital literacy of Chinese citizens is now a national strategy and crucial aspect in quality-oriented education and core literacy cultivation. Digital literacy cultivation is a rising trend in higher education.

Su Jingya et al. (2021, p.13). pointed out that universities functioned as the main strategic base for cultivating high-quality talents and thus have a leading role in modernizing education. Being the leader of information teaching in colleges and universities, their ability to develop information teaching is not only crucial to improving the quality of talent training but also made a crucial impact on promoting the modernization of education.

Sui Xinghua et al. (2020, p.128). proposed that information technology has become deeply integrated into the teaching process, making it essential for teachers to have a basic understanding of it. However, due to the rapid development of information technology, the pure information technology ability possessed by teachers were inadequate to meet the current teaching demands. Therefore, the significance of studying the university teachers' information teaching ability is more prominent.

The Structure of Educational Technology Literacy

In 2012, China's Ministry of Education officially announced the professional standards for Chinese teachers, proposing that teachers' professional quality mainly includes their professional philosophy, ethics, professional knowledge and professional ability.

Professor Ye LAN. (1998, p.41). a famous Chinese education expert, proposed that teacher professionalism is the concentrated expression of contemporary teacher quality, and the future teacher professionalism mainly includes educational ideas; professional knowledge (basic knowledge of contemporary science and humanities, a firm groundwork of instrumental disciplines and adept application of skills, as well as a thorough understanding of the specialized knowledge and proficiencies of a discipline in the field of education), professional ability (interpersonal ability, management ability, and educational research ability), and four aspects of education wisdom.

Chai Jingmin et al. (2021, p.73). pointed out that five key components of teachers' professional literacy: knowledge literacy, ability literacy, professional ethics literacy, educational concept literacy, and physical and mental literacy. To enhance teachers' professional literacy in the era of big data, it was recommended to enhance the quality of education-related data, improve teachers' data literacy, establish a scientific evaluation system, engage in diverse teaching and research activities, and conduct effective teaching reflections.

Zhang Xiaohan. (2021, p.11). proposed that future teachers should possess a comprehensive literacy of "knowledge, affection, meaning, and line," and display proficiency in their professional background. They should also embrace the concept

of lifelong learning, possess a global vision, and have a good sense of social service. Concrete performance, growth, and expansion were the three aspects that covered foundation, growth, and expansion domains. The foundation domain included professionalism and digital ability, growth involved sustainable, lifelong, and interdisciplinary practices, and expansion refers to the situation, migration, and multifaceted system mesh way of thinking.

Valica & Rohn. (2013, p.867). proposed that teacher’s competence includes: expert /technical competence; moral and ethical responsibility; pedagogy-psychology and teaching-methodology competence; self-development competence.

Martina Blaskova ect. (2014, p.459). proposed that in addition to education, professional and moral ability, teachers' professional abilities also include: improvisation ability, professional and personal training ability, intervention ability, example ability, mature personality ability, motivation and communication ability.

Eleonora Urunbassarova. (2014, p.4830). also pointed out that teachers' professional ability not only includes good knowledge and skills, but also should take into account personal ability, personal characteristics and social characteristics.

In 2018, UNESCO updates the framework for teachers' information and communication technology (ICT) abilities (the 3rd edition) in response to the potential changes that artificial intelligence technology can bring to education. This update aligns with the United Nations' 2030 sustainable development goals and introduces new requirements for teachers' information technology application. These requirements include three levels of knowledge acquisition, knowledge deepening, and knowledge creation, and six practical levels encompassing the understanding of information communication technology education policy, curriculum and evaluation, education teaching, digital skills application, organization and management, and teachers' professional learning.

Hou Zhongyuan. (2022, p.184). proposed that university teachers should possess several abilities related to information, including basic information technology ability, general information technology ability, specialized information technology ability, information resource induction, integration ability, and information teaching ability.

Yu Ling. (2019, p.68). proposed that teachers' information literacy is composed of information attitude, information awareness and information ability. Information attitude, a type of attitude towards information, is the moral, social, and emotional responsibility that teachers should uphold when gathering information. Information awareness refers to teachers' cognitive ability and sensitivity when acquiring necessary information for education, teaching, and scientific research. Information ability described the teachers' capacity to procure, communicate, and apply information to solve problems related to teaching and scientific research, which entails comprehensive application of information.

Yu Xiaoya. (2019, p.72). proposed that there are eight aspects of teachers' information literacy, with artificial intelligence being the most important. These included understanding ICT in education, curriculum and evaluation, teaching and learning, information and communication technology (ICT), organization and management, professional learning for teachers, safety and law, ethics and ethical principles.

Qiao Yingying. (2021, p.59). pointed out that the information literacy of kindergarten teachers in the era of artificial intelligence should focus on the tool function of artificial intelligence. It was important to emphasize the intelligent characteristics of tools and aimed to enhance teacher's information literacy through intelligent teaching, management and research. The training paths of teachers 'information literacy are as follows: strengthening educational technology training, enhancing their information concept and information awareness; strengthening their educational technology practice, enhancing their ability to apply information technology, and constructing professional development symbiosis and optimizing the practice ecology for the development of teachers' information literacy.

Kangjian. (2022, p.164). pointed out that the connotation of information literacy should include three dimensions: The first part were information search, acquisition, transmission and application; The second term cover information skills, information refinement retrieval, computer literacy, computer research and learning; and thirdly, information thinking; which refers to expanding learning based on information resources, problem-solving utilizing effective information, and innovation in existing information and technology.

Liu Danhe. (2022, p.123). proposed that three-dimensional connotation framework of information literacy in the intelligent age: information thinking training, information skill operation, and information humanistic care. Information literacy essentially involved the ability to identify, retrieve, utilize, evaluate, communicate, reflect, and create information. Among these, information thinking training refers to the ability of individuals to demonstrate high level of information sensitivity, obtain useful and important information, dig different information channels, utilize various information means, and apply critical thinking in processing the information while solved problems. Information skill operation refers to the knowledge and skills that individuals possessed. The awareness of humanistic care concerning information refers to the concern for the value and significance of human beings, irrespective of the technology used in the intelligent age.

Gu Xueying. (2022, p.60). proposed that Information literacy is a comprehensive system that includes information awareness, information knowledge, information ability and information morality. Information awareness refers to the active reflection of objective information and information activities in the human mind. Information knowledge is individuals' comprehension of information itself. After forming an understanding of information, individuals possess the capability to differentiate, utilize, and process it. Information morality refers to the moral awareness, standards, and conduct utilized for regulating various social relationships.

Shi Hongyan. (2017, p.142). pointed out that information literacy includes the ability to integrate information resources, the application of network tools, the design of instruction based on the network, classroom management in the context of the network, and network communication.

In 1998, The American Library Association and the American Association for Educational Communication and Technology (AECT) described information literacy in three aspects: information skills, independent learning and social responsibility. "Information skills" comprise the capacity to effectively obtain information, assess it critically and skillfully, and use it precisely and inventively. “Independent learning” encompassed various aspects: the ability to explore information related to personal interests, the ability to appreciate the creative expression of information, the ability

to make the most of information retrieval and knowledge innovation; “Social responsibility” entails: recognizing the importance of information for a democratic society, being able to apply ethical codes of conduct in relation to information and information technology, being able to actively participate in group activities to explore and create information..

In 2004, the International Association for Educational Technology (International Society for Technology in Education, ISTE) issued the International Technical Standards for Teachers. These standards established six dimensions for teacher information literacy, including: information technology concepts and operations, planning and designing learning environments, teaching and curriculum, evaluation, productivity and professional practice, and social, moral, legal, and human considerations.

In 2013, UNESCO issued the Global Framework for Media and Information Literacy Assessment. The framework stressed the importance for individuals with information literacy to understand their information needs; effectively obtain information and evaluate information quality; extract and store information; morally use and disseminate information; and apply it to create and disseminate knowledge.

Alison Hicks. (2022, p.3). proposed that information literacy research may help to inform several key areas of how people interact with information in a healthy environment. These key areas include information, information models, the social dynamics of the information environment, the outcomes of information activities, and the key methods of information practice.

According to Liu Bin. (2020, p.13). proposed that the Ministry of Education documents suggested that intelligent education literacy in the state had two main aspects. Firstly, teachers need to understand and master the knowledge of artificial intelligence technology. Secondly, the teachers must be able to use artificial intelligence technology to enhance teaching and develop innovative talent training methods. Based on this perspective, the researcher argued that teachers' intelligent education literacy should include basic knowledge, core competence and ethical attitude. Basic knowledge covered theoretical, practical and technical aspects. Core competence refers to intelligent education and teaching ability and independent

development ability based on artificial intelligence, and ethical attitude covers rational attitude and ethical practice.

By Hu Xiaoyong et al. (2021, p.63). proposed that intelligent education literacy consisted of four layers: knowledge base, ability aggregation, thinking support, and cultural value deepening. The knowledge base layer comprised teaching methods, knowledge of educational artificial intelligence technology, and creativity. The ability aggregation layer includes a creative teaching designer, a creative teaching actor, an intelligent teacher leader who integrated educational artificial intelligence technology, and a creative intelligent learning model. The thinking support layer comprised educational thinking, design thinking, computational thinking, and data thinking. Lastly, the cultural value deepening layer includes the cultural context of classroom learning, social cultural activities, and the cultural values of educational artificial intelligence technology.

Guo Jiong's. (2021, p.125). proposed that teachers' intelligent education literacy consisted of three dimensions: technology, education and society. The technology dimension includes consciousness emotion, ontological knowledge, application ability and technical thinking. The education dimension includes intelligent education concept, intelligent education thinking, intelligent teaching and learning design, intelligent teaching and learning evaluation, and intelligent teaching and learning management, social dimension literacy includes social cognition, social responsibility and social guidance.

Li Xiang. (2021, p.8). proposed that teachers' intelligent education literacy can be classified into three basic dimensions: knowledge and skills, abilities, and ethical beliefs. This included AI ontology knowledge, integration of AI subject teaching knowledge, integration of AI teaching abilities, and AI education ethics and beliefs.

Chen Fanli. (2021, p.16). pointed put that the components of intelligent education literacy. It was made up of three dimensions: knowledge theory, moral cognition, and technology application. The knowledge dimension includes intelligent knowledge literacy, while the moral cognition dimension comprised intelligent morality and intelligent thinking. Finally, the technology application dimension included intelligent technology, intelligent information, and intelligent data.

Ismaila Temitayo Sanusi, ect. (2022, p.4). proposed that Artificial intelligence education literacy includes AI Knowledge, AI Skill, and AI Attitude. They further proposed a framework of competencies for AI education: Knowledge competence (Skill, Cultural), Learningcompetence (Cognitive, Self-learning), Team competence (Teamwork, Human-tool, collaboration), and Ethics of AI.

Shi Jinwen et al. (2015, p.212). pointed out that teachers' information technology application abilities include basic technology literacy, the ability to use technology to enhance classroom instruction, the ability to use technology to alter students' learning preferences, and the ability to use technology to advance teachers' own professional development. In order to promote the development of teachers' information technology application ability, it was necessary to do a good job in policy coordination, strengthen the organization and leadership, promote the construction of educational information environment, and enhance teachers' active consciousness of the development of information technology application ability.

Yan Guangfen. (2022, p.11). proposed that digital technology is increasingly becoming an important driving force for educational reform. Digital literacy was the key attribute of the future teachers, and the European Union and its member states have conducted a thorough research, exploration and practice, which led to the development of seven representative and influential digital literacy frameworks for teachers. The analysis suggested that the seven digital literacy frameworks for teachers have core components which included digital teaching, digital content creation, digital communication and collaboration, digital security, and digital evaluation.

Yang Shuang. (2019, p.62). proposed that an evaluation index system of digital literacy of university teachers owns 5 dimensions and 18 indicators, namely digital technology use, digital information management, digital content creation, digital community construction, and digital security capability.

Gong Manman. (2023, p.18). proposed that primary school teachers' digital literacy consisted of five first-level components: the ability to use digital technology, the ability to teach digitally, the ability to collaborate socially, the ability to ensure digital security, and the ability to solve problems.

Guo Xiaolin. (2022, p.28). pointed out that the core elements of teachers' digital literacy are the digital concept, digital knowledge, and digital ability. Digital concept primarily covered data ethics and morality, social emotion, and subject consciousness. Digital knowledge comprised digital technology ontology knowledge, digital technology method knowledge, subject knowledge, and student development knowledge. Digital ability related to the interpretation of students' learning data, optimization of course resources, and teacher-student interaction.

From the domestic and foreign researchers on educational technology literacy research, information literacy from the initial library literature retrieval to the later information evaluation, information acquisition consciousness, information confidentiality consciousness, information compliance consciousness, information ethics, information utilization ability, etc. With the advancement of information technology, these topics had extended to include information critical evaluation ability, information discrimination ability, and information ethics. Information literacy has also developed from a single technical function to a multi-functional comprehensive literacy, and started from a single subject in the library to more disciplines, and its connotation has changed constantly. The concept and content of information literacy have not only changed in terms of quantity but also undergone a significant qualitative development. Information literacy has been progressively replaced by data literacy, digital ability, digital competency, intelligent literacy, educational technology literacy and so on.

It can be seen from the above analyses that with the development of the digital age, the original teachers 'information literacy can no longer meet the requirements for the improvement of teachers' information literacy. The educational technology literacy of university teachers is the combination of information literacy and the development of teachers 'professional literacy, which shares the latter's connotation and content while extending it. It involves the interdisciplinary extension and integration of information literacy, as well as the enhancement and transformation of teachers' information literacy. The specific connotation and focus of each literacy index will vary depending on the time period. Teacher education technology proficiency is a new concept that aligns with the current development of

the times. The main components of college teachers' educational technology literacy are basically similar to that of information literacy, but it also has the unique feature of teachers' professional development. The elements of teachers' educational technology literacy are constantly changing with the development of The Times.

Table 2.1 Combined Results of Educational Technology Literacy

Author / Educational technology Literacy dimension	Xueying (2022,p.60)	Guo Jiong(2021,p.125)	Ismaila Tem(tayo Sanusi, ect(2022,p.4)	Yu Ling(2019,P.68)	Liu Bin(2020,p.13)	Hu Xiaoyong(2021,p.63)	Hou Zhongyuan(2022,p.184)	Chen Fanli(2021,p.16)	Qiao Yingying(2021,p.59)	Li Xiang(2021,p.8)	Shi Hongyan(2017,p.142)	Industry standards for the digital literacy of Chinese teachers (2022,p.1)	Yu Xiaoya(2019,p.72)	Dorit Alt(2022,p.3)	Palmira Peciuliauskiene(2022,p,6)	UNESCO 《ICT Competency Framework for Teachers (3rd Edition)》 (2018)	Bong-Suk Kang(2018,p,179)	**total**
Educational Technology Awareness	√	√	√	√								√		√			√	7
Educational technology knowledge and skills	√	√	√		√	√	√	√		√	√	√	√	√	√	√		14
Educational technology application		√		√	√	√	√	√	√	√	√	√			√	√	√	13
Educational Technology Social Responsibility	√	√	√	√				√		√		√	√	√				9
Educational Technology Professional Development				√					√			√	√	√		√		6

According to Table 2.1, the researchers analyzed and refined the relevant documents, concepts, theories and related research on educational technology literacy, including Gu Xueying. (2022, p.60); Guo Jiong. (2021, p.125); Ismaila Temitayo Sanusi, ect. (2022, p.4); Yu Ling. (2019, p.68); Liu Bin. (2020, p.13); Hu Xiaoyong et al. (2021, p.63); Hou Zhongyuan. (2022, p.184); Chen Fanli. (2021, p.16); Qiao Yingying. (2021, p.59); Li Xiang. (2021, p.8); Shi Hongyan. (2017, p.142); Industry standards for the digital literacy of Chinese teachers. (2022, p.1); Yu Xiaoya. (2019, p.72); D Orit Alt (2022, p.3); P Almira Peciuliauskiene. (2022, p.6); UNESCO's ICT Competency Framework for Teachers (3rd Edition) (2018); Bong-Suk Kang. (2018, p.179). The Researchers selected the corresponding dimensions according to the criteria. As the framework for this study, the researchers choosed the characteristics of more than 5, including 5 dimensions: 1) educational technology awareness; 2) educational technology knowledge and skills; 3) educational technology application; 4) educational technology social responsibility; 5) Educational technology professional development.

To sum up, educational technology literacy contains five elements: educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility and educational technology professional development. In this study, the definition for each dimension of teachers' educational technology literacy is based on the definition of each dimension of teachers' digital literacy in the Chinese industry standard.

Educational technology awareness refers to the active reflection of objective educational information technology related activities in teachers' minds, including educational technology understanding and willingness to utilise it.

Educational technology knowledge and skills refers to the educational information technology knowledge and technical skills that teachers require to excel in educational and teaching activities, including educational technology knowledge and educational technology skills.

Educational technology application refers to the use of information technology resources by teachers to carry out educational and teaching activities, such as designing educational technology instruction, implementing educational

technology teaching, evaluating academic results of using educational technology, and engaging in collaborative education using educational technology.

Educational technology social responsibility refers to the moral cultivation and behavioral norms of teachers in their use of educational information technology activities, which encompasses adherence to legal and ethical norms as well as ensuring the safety of educational technology.

Educational technology professional development refers to teachers' proficiency in utilizing resources within educational information technology to advance their personal and communal professional development, including educational technology learning and research, teaching, research and innovation in educational technology.

Factors of Educational Technology Literacy

Liu Bin. (2020, p.16). pointed out that the factors mainly affecting the level of literacy in intelligent education were the construction of the educational technology environment, resource guarantee, and diversified support.

Chen Fanli. (2021, p.16). pointed out that the factors that influenced the level of intelligent educational literacy were primarily educational management policies, educational management theories, training systems for intelligent educational literacy and the teaching environment for intelligent educational literacy.

Wang Dan. (2022, p.94). proposed that the cultivation of teachers' intelligent education literacy was influenced by teaching scenarios, classroom environment, and innovative thinking.

Li Xiang. (2021, p.10). pointed out that the development of teachers' intelligent education literacy was felt by the terms of the intelligent education environment, the training planning of the education management, the intelligent education literacy training platform, and the professional community.

Ismaila Temitayo Sanusi, ect. (2022, p.10). proposed that argue that cultural awareness, teamwork, collaboration between individuals and tools, self-learning, skills, and the ethical implications of AI curriculum content offered useful insights for managers. The effectiveness of intelligent education literacy can be improved through appropriate training methods, platforms, tools, and content.

Xu Hongqiao. (2017, p.127). proposed that certain colleges and universities lacked explicit requirements for teachers' implementation of information technology teaching and do not considered these standards when evaluating their performance and eligibility for professional advancement. This deficiency undermined teachers' motivation to utilize information technology in their classroom teaching and diminished their initiative in applying these tools effectively.

Liu Zhe's. (2016, p.114). conducted a survey of 366 university teachers, their awareness of information teaching behavior was influenced by their performance, personal efforts, and social influence. This ultimately had a considerable impact on their ability to teach information.

Gong Manman. (2023, p.47). proposed that the primary factors influencing the situation at the national level were the absence of national education policy guidance and the unbalanced economic development between rural and urban areas. Inadequate pre-service and in-service training are the main factors influencing the situation at the school level. The main factors influencing the situation were a backward digital education concept and insufficient internal motivation for teachers' professional development.

Zuo Wei. (2023, p.28). pointed out that several factors that impact the information literacy of foreign language teachers in college, such as the teachers themselves, the inadequate information awareness and insufficient application ability of information means of the teachers, insufficient investment in intelligent classroom construction on the part of the school, inadequate teacher training programs for information literacy, and the absence of standardized evaluations for the information literacy ability of teachers.

Zhao Baoying et al. (2022, p.88). proposed that the heavy workload of teaching and conducting scientific research, as well as the lack of time and energy, were factors that affected the participation of foreign language teachers in information literacy training. The length, content and level of institutional support for the training impacted the motivation of teachers to participate in information literacy training.

Su Jingya et al. (2021, p.10). proposed that technology perception ability,

internal motivation, technology and task adaptation, convenient conditions, facilitating conditions and social influence all had a significant positive impact on the information teaching ability of college teachers. The convenience condition had been identified as the most influential factor among the six identified factors, while intrinsic motivation had the smallest influence coefficient.

Sui Xinghua et al. (2020, p.130). revealed the current state of information teaching among university professors in Hunan Province based on their investigation and research. Moreover, this paper uses a structural equation model to verify the significant influence of five variables on the information teaching ability of university professors: continuous information teaching intention, teachers' perception of technology's usefulness, ease of use, teachers' self-efficacy in using technology, and computer experience.

In summary, three levels affect the technical literacy of university teachers: government, school, and individual teachers. At the government level, factors affecting technical literacy include the guidance of educational policy and educational technology planning. At the school level, factors include constructing the necessary software and hardware environment, creating educational technology awareness, promoting educational technology concepts, training for educational technology literacy, and implementing evaluation and incentive mechanisms for teachers' educational technology literacy. Finally, at the level of individual teachers, factors include their low awareness, lack of skills, lack of motivation, and disregard for the role of educational technology.

Related Research

Zhou Ling et al. (2016, p.9). conducted a survey on the information technology abilities of teachers in 16 primary and secondary schools within Shaoguan city. In light of the current information technology abilities of primary and secondary school teachers in Shaoguan city and the TPACK integration mode, a TPACK development mode targeting rural teachers was proposed. The development mode was based on the teaching process and had been initially applied to training practice.

Nie Xiaoying et al. (2016, p.85). conducted a survey on 265 pre-service

teachers in a normal university, and it was found that their perception of information technology is at a medium level, which indicated that they are confident in mastering the emerging information technology and using it for their personal and professional development. Despite this, the pre-service teacher's overall application of Information and Communication Technology (ICT) remains low.

Jiao Zhongming et al. (2016, p.1). conducted a questionnaire survey and quantitative analysis to investigate the information literacy and equipment utilization status of 1143 rural teachers in Jiangxi Province. The results showed that the information literacy and equipment use status among rural teachers was of a generally medium level and had a significant positive correlation with factors such as school type, age, teaching experience, educational background, and job title.

Yang Yan et al. (2019, p.117). conducted a survey on the current state of information literacy among teachers in three undergraduate universities. 261 valid questionnaires were collected. The survey results indicated that university teachers have a robust awareness of information and their information knowledge structure is largely reasonable. However, their ability to apply information was deficient in its recognition of information ethics. The research proposed a strategy for cultivating the information literacy of college teachers.

Jiang Hongxia. (2023, p.29). conducted an information literacy survey of a university teacher and collected 393 valid questionnaires. The results show that the overall situation of teachers' information awareness is good, and they can actively learn about information technology to improve their teaching level. However, their awareness in using information technology for teaching innovation and in-depth research required improvement. Teachers showed an inclination to pay more attention to the information knowledge of their subject field, and have a good grasp of it. Yet there is still room for improvement in their knowledge of the current trends in information technology, as well as information security, and channels to seek expert guidance. The overall situation of teachers 'information application ability is good, which reflects that the school has achieved certain results in teachers' information technology training. There was still significant room for improvement in terms of the breadth and depth of content in teacher information technology

training and the coverage of training subjects. Teachers possessed considerable competency in information ethics, including safeguarding intellectual property rights, adhering to academic norms, and eliminating academic misconduct. However, there was still considerable scope for improvement in the information security literacy of teachers, including mastering information security skills, preventing computer virus and hacker attacks, and regularly backing up important information data.

Zhu Yi. (2017, p.47). conducted a survey of professional teachers in a university in Hunan province and collected 285 valid questionnaires. The outcomes suggested that there exist dissimilarities in the respondents' informaion awareness, knowledge, ability, and ethics across different majors. The natural science teachers' scores in information awareness, ability, knowledge, and ethic significantly surpassed those of their social science counterpart. There are differences in the information awareness, information knowledge and information ability of the respondents of different genders. Male teachers score significantly higher in information awareness, knowledge, and ability when compared to female teachers. There are differences in the levels of information awareness, knowledge, and ethic among teachers of different age groups. More specifically, information literacy scores were higher for teachers aged 30-40 and 40-50, followed by those over 50 years of age. The lowest scores belong to teachers under 30 years old. In fact, teachers under 30 exhibited higher levels of information awareness, knowledge, and ability. However, the low scores in information ethic affected their overall information literacy score which was why they received the lowest scores among all age groups of teachers. The respondents' information literacy levels may be significantly impacted by their educational backgrounds across all dimensions. The findings suggested that higher educational backgrounds were linked to better information literacy, and this relationship was closely associated with the teachers' educational levels. Information literacy levels of the respondents varied depending on their training periods. A higher number of training sessions was associated with greater satisfaction and improved information literacy. Such findings further suggest that training can play a vital role in enhancing the teachers' information literacy levels.

Wu Di's team. (2020, p.56). conducted an initial study of 17,015 primary and

secondary school teachers' information literacy in eastern, central, and western provinces, including Zhejiang, Henan, and Ningxia. The study revealed that the overall level of teachers' information literacy is fair but unevenly developing. Information awareness, ethics, security, and professional development are at high levels, while information knowledge and application are poor. At the regional level, there are no significant differences in information literacy between urban, county, and rural teachers, but the development level varies across the five dimensions.

Chen Min. (2020, p.116). conducted empirical research on the information literacy development and differences of 5820 primary and secondary school teachers in Eastern X province, using a comprehensive index method for information literacy among primary and secondary school teachers. They suggested some opinions for development in four aspects: cultivating information innovation consciousness, enhancing the level of information management, strengthening information application security, and focusing on rural teachers and other vulnerable groups.

Chen Min's team. (2020, p.78). conducted a questionnaire survey on primary and secondary school teachers in S City, Z Province in East China, and a total of 4,950 valid questionnaires were collected. According to the results, the development level of information literacy and information consciousness of the teachers in S City were strong, with higher levels of information ethics and morals. However, there were some weaknesses in basic information knowledge and information technology, as well as in teaching optimization, innovation application, evaluation and analysis application, and effective communication and professional ability growth.

Su Hong. (2022, p.55). conducted a research study on 198 foreign language teachers from four medical universities in Guangdong province. The study randomly selected 22 teachers for interviews and aimed to investigate the information literacy and information application status of these university foreign language teachers. Additionally, the study aimed to actively explore the construction of a foreign language teacher's information literacy promotion strategy, with the goal to strengthen the application of information technology tools in foreign language teaching.

Yi Ye et al. (2022, p.55). investigated the current situation of digital literacy of

teachers in 335 full-time teachers in higher vocational colleges in Zhejiang Province through random sampling. The authors found that there were no significant differences in digital literacy levels among full-time vocational college teachers with different genders, academic titles, degrees, educational properties, levels, and age groups. The study proposed a set of strategies to enhance teachers' digital literacy.

Gong Manman. (2022, p.21). researched in the Shandong L city 10 school of primary school teachers. The study used literature research, questionnaire surveys, and interviewed with 10 primary school teachers who completed 600 questionnaires. The objective was to investigate the development of primary school teachers' digital literacy, analyze the existing problems, and proposed effective strategies to enhance their digital literacy.

Wang Mengjie. (2022, p.48). introduced three international frameworks for promoting teachers' literacy: SAMR, TPACK, and TDC. Furthermore, the author analysed the United States' and Nordic nations' policies and practices on digital literacy for teachers using the examples of SAMR, TPACK, and TDC, thereby discussing the ideal state and advanced experiences for promoting teachers' digital literacy. Moving on to domestic research, the author delves into the history and status of digital literacy amongst Shanghai's primary and secondary school teachers. On the one hand, through historical and literature research, the author explored digital literacy policies for primary and secondary school teachers in Shanghai and China. On the other hand, through interviews with Shanghai-based primary and secondary school teachers and education leaders, the author gained valuable insights into their practical experiences.

Lukasz Tomczyk's. (2022, p.1). was conducted at the Krakow Education University, the largest university in Poland for educating teachers. The study surveyed 450 pedagogy teachers in Poland and looked into issues related to self-assessments of digital literacy using text editors, spreadsheets, presentation and graphics software. Moreover, the study explored the experiences of participating in compulsory online learning, searching for information on the Internet, attending paid and free online learning courses, and attending information-based study groups.

María del Carmen Gálvez-de-La-Cuesta. (2020, p.1), proposed that the purpose of this research is to analyze the degree of digital literacy and media education that future teachers of Primary Education possess. The study employed a case study methodology involving semi-structured interviews with teachers who trained prospective primary education teachers at the University of Castilla la Mancha (Spain). The content analysis technique was used to interpret the results, with an exhaustive review model. The study concludes that promoting media and information literacy in teacher training is essential.

Hao Qilei. (2017, p.43). conducted an investigation on the information technology ability of 467 primary and secondary school teachers in X City, central Shanxi Province, The research revealed that teachers mainly applied it for pre-class teaching preparation and as support for classroom teaching activities. The vast majority of teachers have basically mastered the common computer skills. However, skills like web page production required training and improvement. The application of information technology by teachers correlated with their teaching experience, educational background, and training duration. Teachers' application of information technology ranged from the strong to the weak level across different educational groups. Teachers belonging to different academic groups have varied abilities, and their abilities are significantly better than other teachers to varying degrees. Primary and middle school teachers surpass high school teachers in this respect.

Han Jianliang. (2016, p.124). analyzed the current status of primary and secondary school teachers' ability to apply information technology, with a focus on the National Primary and Secondary School Teachers Information Technology Application Ability Promotion Project implemented by the Ministry of Education. The study identified the main reasons behind project implementation and proposed preliminary measures to improve information technology application ability among primary and secondary school teachers in the Shanxi Province.

Lu Jiawei. (2022, p.141) analyzed to the information literacy for secondary vocational teachers and students, the information ability of 300 grade one to three students in a secondary professional school in J city, based on their satisfaction levels. The research showed that the students were more satisfied with the teachers'

ability to acquire information, but less so with their ability to integrate information. Consequently, Lu Jiawei proposed a strategy to cultivate the information ability of secondary vocational teachers.

Zhu Jingxi et al. (2021, p.125). proposed a phased improvement approach aiming at enhancing the application ability of teachers' information technology ability. The goal was to improve the overall application level of the region through three levels of quantity, quality, and product, by first enhancing individual stratification ability of teachers. For example, in Gansu province, the article presented methodological measures such as informatization classroom teaching research, culture research, competition and the combination of multiple research countermeasures. After three years of practical inspection, the local interactive media application had made an initial shift from basic sporadic usage to daily application, from blind usage to rational usage, and from simple implementation to a comprehensive fusion of the three changes.

Cattle. (2016, p.28). researched in 240 teachers in 10 large schools to investigate how primary school language teachers used information technology in classroom teaching. Through collaboration with local primary school language teachers to identify issues in their development of information technology application ability, three strategies were developed to improve their ability in information technology application. These included: building a regional education resource database using social software II, optimizing the training of teacher information technology application ability and fostering an environment conducive to information technology application for teachers in schools.

Li-li fan. (2016, p.19). conducted a research study on 356 primary and secondary school teachers from 33 counties across nine cities in Shanxi Province. The study aimed at assessing teachers' ability to use information technology and to identify the current status of education information resources in the province. Additionally, the study investigated the effectiveness of the provincial departments' training programmers for improving primary and secondary school teachers' ability to use information technology. Five problems were identified in the process of training primary and secondary school teachers in information technology application ability

in Shanxi Province: (1) Unbalanced development of educational informatisation and teacher level, (2) Over-emphasis on uniform training content rather than balancing with teacher demand, (3) Limited focus on in-service teacher development, (4) Insufficiently motivated teacher training interest because of simplistic learning methods, and (5) Difficulty in comprehensively evaluating teachers' level due to the use of a single evaluation method. The following training strategies to improve the application ability of information technology of primary and secondary school teachers are proposed: 1. To include not only in-service teachers as training objects; 2. To offer four types of courses in the training content: technical literacy, comprehensive, thematic, and teacher professional development courses. 3. To combine online and offline courses in the training mode. Three typical models-teacher workshop, national training plan, and backbone radiation-are recommended. 4.To apply several learning forms, such as expert lectures, class example research, seminar, on-site observation, practical practice, and work competition; 5. To use a comprehensive evaluation system that covered pre-training diagnostic evaluation, process evaluation, and final evaluation, to take the evaluation of teachers' micro-courses as an example.

Gong Manman. (2023, p.1). researched in the development status of digital literacy among 10 primary school teachers in Shandong province's L city. She analyzed the existing problems and reasons, and proposed strategies to effectively improve primary school teachers' digital literacy. Her proposed strategies include formulating special digital literacy standards, creating a quality digital teaching environment, accelerating the integration of digital technology and disciplines, and providing diversified training for teachers. Additionally, updating teachers' professional cognition and enhancing their awareness of digital literacy learning were also essential.

Throughout the above literature at home and abroad, Chinese researchers study the theories of educational technology literacy, such as the concept, connotation and characteristics of educational technology literacy, etc; Additionally, international researchers had conducted empirical studies on the implementation status and problems faced by teachers in developing their educational technology

literacy, proposing strategies based on their findings. Despite some achievements made by domestic and foreign researchers in various aspects, many challenges still exist in China regarding educational technology literacy, particularly in the following areas:

Firstly, from the research content, the research indicates that the current level of information literacy, information technological ability, and information digital literacy of teachers in domestic education cannot satisfy the demand of integrating technology into education. Therefore, teacher education technology literacy has become a crucial component of teachers' professional skills. However, research on educational technology literacy is still at the theoretical stage. Despite the description of the concept, definition, and cultivation of teacher education technology literacy, the influencing factors are not thoroughly explored. More emphasis is given to the implementation and evaluation of this concept.

Secondly, the preliminary scholars have conducted both theoretical and empirical research on information literacy, information technology ability, and digital literacy from a research methods perspective. As the digital age advances, the researchers are increasingly exploring the theory of educational technology literacy, including its concept, connotation, characteristics, and cultivation. However, there is a lack of empirical research on educational technology literacy in universities. As China continues to promote artificial intelligence integration in university teaching, the level of teacher education technology literacy directly influences the quality of university education digitalization. The cultivation of teacher education technical literacy is of paramount importance and will be a key focus of this study.

Thirdly, from the research level, the present research focuses on the overall depiction at the macro level. However, there is insufficient research on the micro level, including specific implementation and operation. Future research will require particular attention to this area. Future studies will cover both the macro and micro facets of educational technology literacy. At the macro level, the researchers plan to provide technology literacy training for university teachers, study the factors influencing technology literacy in teachers’ education, and develop a technology literacy development strategy for universities. They seek to explore the use of artificial intelligence technology in education and discuss the ethical considerations of using such

technology. In terms of micro aspect, the researchers will concentrate on enhancing the teaching practices using high education technology literacy and artificial intelligence technology. They will utilize knowledge analysis, course design, teaching evaluation reflection, and intelligent classroom organization to improve teachers' professional development through education technology literacy internalization.

Thus, this also offers a helpful insight for this study. This research will employ a questionnaire survey and interviews to investigate the current status and problems of education technology literacy among college teachers in Guangxi. By analyzing the influencing factors, the study is to propose a path for promoting education technology literacy among college teachers in Guangxi that will have practical value and theoretical significance.

Chapter 3
Research Methodology

This study uses questionnaire survey and interview to investigate: 1. To study the current situation of the level of educational technology literacy of teachers in universities in Guangxi; 2. To develop the strategies for Improving the level of educational technology literacy of teachers in universities in Guangxi; 3. To evaluate the strategies for improving the level of educational technology literacy of teachers in universities in Guangxi. To provide scientific data supporting for the teacher training and management of university administrators. To address the issues mentioned in Chapter 1 and accomplish the study objectives, the researcher follows the procedure described below:

1. The Population / Sample Group
2. Research Instruments
3. Data Collection
4. Data Analysis

The Population / Sample Group

The Population

The sample schools in this study are six public undergraduate universities in Guilin, Guangxi, namely Guangxi Normal University (A), Guilin University of Electronic Technology (B), Guilin University of Technology (C), Guilin Institute of Aerospace sampling Technology (D), Guilin Medical College (E), Guilin Tourism Institute (F). The total number of full-time teachers in these six public undergraduate universities is 7471.

The Sample Group

The selection of sample size for questionnaire survey: 403 individuals are sampled from 7471 individuals using a stratified sampling method, based on the estimated sample size formula provided by the Research Department of the American National Education Association in the article 'Small Sample Technology' (Krejcie & Morgan, 1970). The number of samples is based on the total number of teachers in each university:

Table 3.1 Sampling Table

No.	6 public undergraduate universities in Guilin, Guangxi	Population	Sample Group
1	A	1893	111
2	B	1793	93
3	C	1472	71
4	D	868	72
5	E	623	24
6	F	822	32
	Total	**7471**	**403**

Interviewees

The selection of interview participants and sample size: Among the six undergraduate public universities, one teacher and one manager in charge of educational technology literacy training are interviewed, making a total of 12 interviewees.

Assessment group for the suitability of development strategies

The personnel and departments involved in university education technology literacy development recommend selecting an evaluation team comprising 20 members, including education management, human resources development, education technology, measurement and evaluation experts, managers, and dedicated teachers from different professional backgrounds, to assess the suitability of the strategy.

Research Instruments

This study employs several instruments, including a questionnaire, an interview form and a form for assessing the appropriateness of development strategies.

Questionnaire

The preparation of the questionnaire in this study refers to the Chinese digital literacy industry standard for teachers, which is released in China at the end of 2022, and the survey on the improvement path of international Chinese teachers' intelligent literacy conducted by Xu Tong, a master student of Southwest University (2021, p.92). The study questionnaire is divided into three parts:

Part 1: The questionnaire investigates the personal information of the respondents, such as their gender, age, education, title, teaching experience and subject taught.

Part 2: The status of educational technology literacy level in Guangxi colleges and universities. The questionnaire is mainly designed from five dimensions: educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility, and educational technology professional development. Among them, there are 5 questions about educational technology awareness, 3 questions about educational technology knowledge and skills, 14 questions about educational technology application, 5 questions about educational technology social responsibility, 4 questions about educational technology professional development.

In the mean analysis of the level of educational technology literacy in Guangxi universities, the data interpretation for average value based on Rensis Likert. (1932). The data interpretation are as follows:

4.50 – 5.00 express highest level

3.50 – 4.49 express high level

2.50 – 3.49 express medium level

1.50 – 2.49 express low level

1.00 – 1.49 express lowest level

Part 3: There are two questions related to influencing factors.

The questionnaire includes 5 types of variables that are classified as very consistent, consistent, uncertain, non-conforming, and very non-conforming. The average values are interpreted using Rensis Likert's. (1932). scale. The corresponding values are 5, 4, 3, 2, and 1. The respondents rate the observed variables based on their true emotions.

Constructing a Questionnaire Processes

The questionnaire is constructed as follows:

Step 1: Review and analyze documents, concepts, theories and studies related to educational technology literacy in universities.

Step 2: Construct the questionnaire to assess educational technology literacy in Guangxi. Then the questionnaire outline is sent to the paper consultants who review and provide recommendations for revision of the content.

Step 3: The objective consistency index (IOC) of the questionnaire is tested by three experts. The target consistency index (IOC) is 1.00.

Step 4: Modify the questionnaire based on the advice of the experts.

Step 5: Send the questionnaire to 30 teachers from a university in Guangxi for testing. The reliability of the questionnaire is determined by Cronbach's Alpha coefficient of 0.965; the validity of the questionnaire is measured by KMO, and the validity value is 0.957.

Step 6: The survey is conducted by using a questionnaire among 403 teachers in Guilin, Guangxi.

Interview Outline

The interview outline includes the problems existing in the educational technology literacy of university teachers in Guangxi, the factors affecting the improvement of the overall educational technology literacy of university teachers, and the suggestions on improving the level of the educational technology literacy for university teachers.

Interview Form

This study examines the development strategies of educational technology literacy of university teachers in Guangxi. It covers the analysis of questionnaire data and the results of structured interview data analysis conducted with full-time teachers in various universities. The evaluation team has assessed the appropriateness of these development strategies. The data interpretation for average value based on Rensis Likert. (1932). The data interpretation are as follows:

4.50 – 5.00 express highest level

3.50 – 4.49 express high level

2.50 – 3.49 express medium level

1.50 – 2.49 express low level

1.00 – 1.49 express lowest level

Data Collection

Questionnaire Survey

(1) In March 2023, this study is collected in the form of online questionnaires (questionnaire star), and 403 teachers is selected from 6 public universities in Guilin, Guangxi.

(2) The questionnaire is distributed to 403 teachers for online completion, and a total of 403 questionnaires are returned, accounting for 100%.

Interview

(1) One full-time teacher and one teacher-trained administrator are selected from 6 colleges and universities.

(2) Respondents are invited to interview according to the interview outline.

Assess

(1) An expert group is formed by selecting professionals from 6 universities in disciplines such as education management, human resource development, educational technology, measurement and evaluation, and full-time teachers of different majors.

(2) The evaluation form is released to assess the appropriateness of the strategy.

Data Analysis

In this research, data analysis is conducted using a software program, as outlined below:

Step 1: The information about the respondents for the sample is analyzed by frequency and percentage, classified by gender, age, educational background, professional title, teaching experience, and teaching discipline.

Step 2: The current situation of educational technology literacy of the teachers in universities in Guangxi is analyzed by the average value and standard deviation.

Step 3: The research content of the structured interview is analyzed using the content analysis method.

Step 4: The suitability evaluation of the university teachers' educational technology literacy improvement strategy is analyzed using average value and standard deviation.

Chapter 4
Data analysis results

This chapter is to study the current situation and the improving strategies of teachers educational technology literacy of in universities in Guangxi. The results of the data analysis provide valuable references for university administrators. This study is mainly divided into four parts, specifically as follows:

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

The details are as follows.

Symbol and Abbreviations

n	Refers to sample group
$\overline{X}$	Refers to average value
S.D.	Refers to standard deviation
%	Refers to percentage

Presentation of Data Analysis

Part 1: The analysis presents personal information of the respondents classified by gender, age, educational background, professional title and teaching discipline. The data is presented as frequency and percentage.

Part 2: The analysis results of the present situation of educational technology literacy of teachers in universities in Guangxi. The data has been presented as average value and standard deviation.

Part 3: The analysis result about the interview contents about the improving strategies of educational technology literacy of teachers in universities in Guangxi.

Part4: Develop strategies to improve the level of educational technology literacy of teachers in universities in Guangxi.

Part5: The analysis results of suitability evaluation about improving strategies educational technology literacy of teachers in Guangxi. The data is presented by using average value and standard deviation.

Results of Data Analysis

Part 1: The analysis presents personal information of the respondents classified by gender, age, educational background, professional title and teaching discipline. The data is presented as frequency and percentage.

Table 4.1 Personal Information of the Surveyed Respondents

(n=403)

	personal information	**frequency**	**%**		**personal information**	**frequency**	**%**
Gender	Male	209	51.9	professional titles	professor	62	15.4
	Female	194	48.1		Associate professor	150	37.2
education level	Bachelor	37	9.2		lecturer	151	37.5
	Master	180	44.7		Lecturer below	40	9.9
	Doctor	186	46.1	In the university	A	111	27.5
age	20-30 years old	37	9.2		B	93	23.1
	31-40 years old	192	47.6		C	71	17.6
	41-50 years old	145	36		D	72	17.9
	Over 51 years old	29	7.2		E	24	6.0
Teaching discipline	Liberal arts	162	40.2		F	32	7.9
	Science	100	24.8				
	Engineering	141	35				

Table 4.1 shows that there are 403 valid participants involved in this study. As for the gender of the participants, the majority are male teachers (51.9%) while the rest are female teachers (48.1%), with 209 and 194 respectively. Regarding the age of the teachers, those aged 31-40 years old have the highest representation (47.6%), following by those aged 41-50 years old (36%). The least represented age groups are teachers aged 20-30 years old and 51 years old, with 37 (9.2%) and 29 (7.2%) teachers respectively. Regarding educational background, most teachers have high levels of education, with 366 teachers (90.8%) possessing master's or doctoral degrees, and only 37 (9.2%) having bachelor's degrees. As for professional titles, many teachers hold the titles of associate professors and lecturers, with 301 (74.7%), while fewer teachers held professional titles below professors and lecturers, with 62 (15.4%) and 40 (9.9%) respectively. In teaching discipline, 162 (40.2%) teachers instruct in liberal arts, 141 (35%) in engineering, and 100 (24.8%) in science disciplines. From the sample number of universities, there are 111 teachers (27.5%) in universities A, 93 teachers (23.1%) in universities B, 71 teachers (17.6%) in universities C, 72 teachers (17.9%) in universities D, 24 teachers (6.0%) in universities E, and 32 teachers (7.9%) in universities F.

Part 2: The analysis results of the present situation of educational technology literacy of teachers in universities in Guangxi. The data has been presented as average value and standard deviation.

In order to form a basic understanding of the overall level of teachers' educational technology literacy, this section mainly analyses five dimensions including educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility, and educational technology professional development. Table 4.2 illustrates the scores of overall educational technology literacy among the teachers and the dimension-wise scores.

Table 4.2 Level of Educational Technology Literacy of University Teachers

(n=403)

	$\overline{X}$	S.D.	Level	Rank
Educational technology awareness	3.86	0.58	high	4
Educational technology knowledge and skills	3.79	0.76	high	5
Educational technology application	3.93	0.69	high	3
Educational technology social responsibility	4.42	0.63	high	1
Educational technology professional development	4.15	0.70	high	2
Total	**4.03**	**0.57**	**high**	

According to table 4.2, the digital literacy of the surveyed teachers is generally at a high level ($\overline{X}$ =3.86). From the average value of the five dimensions, the surveyed teachers are also at a high level in each dimension. Here are the rankings of the levels, from highest to lowest: first is educational technology social responsibility ($\overline{X}$ =4.42), followed by the professional development of educational technology ($\overline{X}$ =4.15), with educational technology application ranking third ($\overline{X}$ =3.93), educational technology awareness ranking fourth ($\overline{X}$ =3.86), and for educational technology knowledge and skills, the lowest level is recorded ($\overline{X}$ =3.79).

Then, the specific situation of the five dimensions of teachers' education and technology literacy is described and analyzed.

Educational Technology Awareness

Educational technology awareness denotes the objective existence of activities related to educational information technology in the teacher's reflective thinking process, encompassing educational technology willingness and educational technology determination. It can be seen from table 4.3 that the scores of each item in the dimension of educational technology awareness.

Table 4.3 Score of Educational Technology Awareness Dimension

(n=403)

Question item	$\overline{X}$	S.D.	Level	Rank
1. You have the willingness to actively learn and use educational technology resources	4.33	.786	high	1
2. You have the initiative to carry out educational technology practice, exploration and innovation	4.21	.823	high	2
3. You have the confidence and determination to overcome the difficulties and challenges encountered in the practice of educational technology	4.15	.810	high	3
Total	**3.86**	**0.58**	**high**	

Table 4.3 reveals that the teachers possess a high level of educational technology awareness in all three aspects ($\overline{X}$ =3.86). From the results of this table, the order of importance from highest to lowest for the three given questions is as follows: Question 1, "you have active learning and use of education technology resources will" score the highest ($\overline{X}$ = 4.33). Question 2 "you have the education technology practice, exploration, innovation initiative" scored second highest ($\overline{X}$ = 4.21). Finally, Question 3, "you have to overcome difficulties and challenges of confidence and determination" scored the lowest ($\overline{X}$ = 4.15).

Educational Technology Knowledge and Skills

Educational technology knowledge and skills refers to the educational information technology knowledge and technical skills that teachers need to master in educational and teaching activities, including educational technology knowledge and educational technology skills. Table 4.4 demonstrates the scores of teachers' educational technology knowledge and skill dimensions.

Table 4.4 Score of Educational Technology Knowledge and Skill Dimension

(n=403)

Question Item	$\overline{X}$	S.D.	Level	Rank
1. You are well aware of the connotation and characteristics of common educational technologies and the procedures and methods to solve problems	3.72	.900	high	3
2. You can master the principles and methods of choosing educational technology, equipment software and platform in education and teaching	3.86	.863	high	2
3. You are very skilled in operating and using various educational technology, equipment, software, platforms	3.88	.837	high	1
4. You can skillfully solve the problems arising from using educational technology	3.71	.877	high	4
Total	**3.79**	**0.76**	**high**	

According to table 4.4 teachers' educational technology knowledge and skills is at a high level ($\overline{X}$ =3.79). The results of this study, from the highest to the lowest level is as follows: the highest level is question 3 "You can skillfully use various educational technology equipment, software, platforms, etc." ($\overline{X}$ = 3.88). This is followed by question 2 "You can well master the principles and methods of choosing educational technology equipment, software and platform in education and teaching" ($\overline{X}$ = 3.86); question 1 "You well understand the connotation of common educational technology and their procedures and methods for solving problems" ($\overline{X}$ = 3.72); and finally, question 4 "You can skillfully solve the problems in using educational technology" ($\overline{X}$ = 3.71).

Educational Technology Application

Educational technology application refers to teachers need to know and master to use information technology effectively in teaching activities, including educational technology teaching design, educational technology, teaching implementation and academic evaluation of educational technology. Table 4.5 presents the scores of each item in the application dimension of teachers' educational technology.

Table 4.5 Score of Educational Technology Application Dimension

(n=403)

Question item	$\overline{X}$	S.D.	Level	Rank
1. You can use educational technology tools to evaluate and analyze the students' learning situation	3.92	.793	high	3
2. You can collect educational resources through multiple channels, and select, manage and produce educational resources of educational technology according to your teaching needs	3.92	.806	high	3
3. You can design teaching activities integrating educational technology resources according to your teaching objectives	3.98	.729	high	1
4. You can use the resources of educational technology to break through the limitation of time and space, and create a learning environment integrating the network learning space and the physics learning space	3.88	.824	high	4
5. You can use the resources of educational technology to organize teaching activities in an orderly manner to enhance students' participation and communication initiative	3.98	.769	high	1
6. You can use the tools of educational technology to collect student feedback in real time, find out students' learning differences, improve teaching behavior, optimize teaching links, and regulate the teaching process	3.94	.795	high	2
Total	**3.93**	**0.69**	**high**	

Table 4.5 shows that teacher's educational technology application is at a high level ($\overline{X}$ =3.93). The present study reveals the following order of highest to lowest level: Question 3 " You can follow the teaching objectives, design teaching activities integrating educational technology resources "($\overline{X}$ = 3.98) and question 5" You can use the resources of educational technology to organize teaching activities in an orderly manner, enhance student engagement and communication initiative " ($\overline{X}$ = 3.98) rank the highest at first place. Question 6: "You can use the tools of educational technology to collect student feedback in real time, finding that student learning

differences, Improved teaching behavior, optimize the teaching links, regulating the teaching process" ($\overline{X}$ = 3.94) ranks second. The first question is, "You can use educational technology tools to evaluate and analyze the students' learning situation," and the second question is, " You can collect it through multiple channels, and select, manage and produce educational resources of educational technology according to teaching needs " ($\overline{X}$ = 3.92) and ranked third. Question 4 " You can use the resources of educational technology to break through the limitation of time and space, create a learning environment integrating network learning space and physical learning space " with the lowest score ($\overline{X}$ = 3.88).

Educational Technology Social Responsibility

Educational technology social responsibility is defined as the responsibility of the teachers in the use of educational information technology activities in the ethical cultivation and behavioral norms, including legal ethics, educational technology security protection. Table 4.6 shows the scores of teachers' educational technology and social responsibility dimension.

Table 4.6 Score of Educational Technology Social Responsibility Dimension

(n=403)

Question item	$\overline{X}$	S.D.	Level	Rank
1. In the process of education and teaching, you will abide by the Internet laws and regulations, consciously regulate various online behaviors, and spread positive energy	4.57	.710	highest	1
2. You can guide students to properly choose and use the resources of educational technology to support learning, and pay attention to cultivating students' sense of social responsibility	4.40	.731	high	4
3. You use educational technology products and services in accordance with the principles of positive necessity, informed consent, clear purpose and security, and respect intellectual property rights	4.46	.747	high	3

Table 4.6 (Continued)

(n=403)

Question item	$\overline{X}$	S.D.	Level	Rank
4. In the education and teaching work, you should pay attention to the security management and maintenance of the information and privacy data of individuals, students, parents and others	4.48	.685	high	2
5. You can identify, guard against, and solve the network problems	4.16	.839	high	5
Total	**4.42**	**0.63**	**high**	

According to table 4.6, the current situation of teachers in the five aspects of educational technology social responsibility is at a high level ($\overline{X}$ =4.42). From the results of the present study, the levels of the aspects are ordered from the highest to the lowest levels as follows: the highest to the lowest level is as follows: the highest level is question 1: "You comply with the Internet laws and regulations, Consciously regulate the online behavior, Propagate positive energy" ($\overline{X}$ = 4.57). This is followed by question 4 " in education and teaching work, You should pay attention to the security management and maintenance of the information and privacy data of individuals, students, parents and others" ($\overline{X}$ =4.48); question 3 "You use educational technology products and services by following the principles of positive necessity, informed consent, clear purpose and security, Respect for intellectual property rights "($\overline{X}$ = 4.46); and then question 2 "You can guide students to properly choose and use the resources of educational technology to support learning, Focus on cultivating students' sense of social responsibility" ($\overline{X}$ = 4.40). The final question 5 "You can identify, prevent and solve network problems", has the lowest score ($\overline{X}$ = 4.16).

Educational Technology Professional Development

Educational technology professional development pertains to the ability of teachers to integrate educational information technology resources for the purpose of supporting their individual and communal professional development, including educational technology learning and research, and educational technology teaching research. Table 4.7 shows the scores of each item in the educational technology professional development dimension.

Table 4.7 Score of Educational Technology Professional Development Dimension

(n = 403)

Question item	$\overline{X}$	SD	Level	Rank
1. You can use educational technology resources to learn according to your personal development needs	4.20	.787	high	1
2. You can use educational technology resources to analyze your personal teaching practice and support teaching reflection and improvement	4.17	.756	high	2
3. You can take the initiative to participate in or host the network training community, learn, share experience, seek help and solve problems together	4.12	.783	high	3
4. You can use educational technology resources to support educational research activities according to the teaching problems of educational technology	4.09	.756	high	4
Total	**4.15**	**0.70**	**high**	

According to table 4.7, the current situation of teachers in the four aspects of educational technology professional development is at a high level ($\overline{X}$ =4.15). The results of the present study reveals that the levels in the various aspects are ranked from the highest to the lowest level as follows: the highest level is the question 1 "You can use educational technology resources to carry out learning according to your personal development needs" ($\overline{X}$ = 4.20). Question 2 " You can use educational technology resources to analyze your personal teaching practice, supporting teaching reflection and improvement " ranks second ($\overline{X}$ = 4.17). Question 3 " You can actively participate in or host the network training community, learning together, sharing experience, seeking help, and solving problems " ranks third ($\overline{X}$ = 4.12). And finally, question 4 is " You can address the teaching problems of educational technology, using educational technology resources to support teaching and research activities " with the lowest score ($\overline{X}$ = 4.09).

Influencing factor

The main factors that affect teachers to use educational technology during the teaching process are identified through data analysis. Shown in table 4.8.

Table 4.8 Main factors influencing teachers to use educational technology to carry out teaching during the teaching process

(n = 403)

option	n	%	rank
Lack of necessary educational information equipment and environmental support	275	68.24	1
Unable to use a variety of strategies to regulate the time duration, rhythm and sequence of technology application and non-technology application in real time to maintain students' interest and attention	207	51.36	2
Teaching management is not enough attention, the lack of the corresponding intelligent teaching atmosphere	204	50.62	3
They lack the necessary modern educational technology operation skills and knowledge theory	201	49.88	4
The traditional teaching methods and concepts are deeply rooted	172	42.68	5
There are lack of plans to deal with emergencies in teaching	131	32.51	6

According to table 4.8, 68.24% of the teachers believe that educational information equipment and environmental support are the most important factors; 51.36% of the teachers believe that the usage of various teaching strategies, real-time regulation of the duration, rhythm, and sequence of technology, non-technology applications' links, and maintaining students' attention and interest is the second-most crucial factor; 50.62% of the teachers expresses that the teaching management doesn't pay adequate attention. Lack of associated wisdom teaching environment appeared as the third major factor. 49.88% of the teachers identify their limited skills and knowledge in modern educational technology operation and theory as the fourth main factor. 42.68% of the teachers view traditional teaching methods

and concepts as the fifth factor. Moreover, 32.51% of teachers think that there is a lack of response plan for emergency situations in teaching, which is the sixth influencing factor.

Table 4.9 Factors Affecting the Improvement of Teachers' Educational Technology Literacy Level

(n=403)

option	Total	%	Rank
C. Education and university technology environment atmosphere	265	65.76	1
B. Colleges and universities attach importance to the specific implementation of policies related to teachers' education technology literacy	263	65.26	2
E. Related resources to promote the development of teachers' educational technology literacy, such as teaching resources, educational technology literacy improvement courses, educational technology platform, etc	243	60.3	3
D. The training system of college teachers is perfect	216	53.6	4
H. The incentive mechanism of colleges and universities for teachers to use educational technology in teaching	216	53.6	4
A. The formulation of national policies on teachers' educational technology ability and literacy	187	46.4	6
F. Intellectual support from the Educational Technology Literacy research team	182	45.16	7
J. Teachers' own reasons	153	37.97	8
G. Organizational support from the Teacher Educational Technology Professional Development Community	146	36.23	9
I. Technical support from the society and enterprises	101	25.06	10
K. Please indicate other	3	0.74	11
This question is valid for filling in the number of people	403		

According to table 4.9, the teachers consider the educational technology environment in colleges and universities as the most favorable, while the specific implementation and attention given to policies related to teachers' education and technical literacy rank second. The assurance of relevant resources for fostering teachers' technology literacy is ranking third, such as teaching resources, educational technology literacy improvement courses, educational technology platform, etc. The soundness of the training system of educational technology literacy for teachers and the incentives to use educational technology for teaching come in fourth place. This is the fifth priority for the development of national policies related to the teacher's educational technology literacy, following by intellectual support from the educational technological literacy research team, teachers' self-initiative, organizational support from the Teachers' Educational Technology Professional Development Community (TEPDC), and technical support from the society and enterprises followed.

Part 3: The analysis result about the interview contents about the improving strategies of educational technology literacy of teachers in universities in Guangxi.

The above questionnaire analysis data and interview data have been used to identify the issues, factors, and recommendations that influence the educational technology literacy of university teachers in Guangxi. The details are provided as follows:

1. What problems exist in the cultivation of educational technical literacy of college teachers in Guangxi?

The Government

There are few relevant policies.

Nearly all respondents state that while there are national policies aimed at improving digital literacy, there are limited policies that focus on enhancing teachers' technical literacy. In comparison to several international standards, such as information literacy and digital literacy, China has merely published the teacher digital literacy industry standards,' printed by the Ministry of Education in the previous year. Over half of the respondents suggest that there are no corresponding

incentive and assessment policies at the state level in China aimed at improving teachers' educational technology literacy.

Various safeguards are insufficient.

The state has no corresponding financial support for the training of university teachers. Moreover, there is no unified platform or system for the government to assess, evaluate and improve teachers' educational technology literacy. There is no relevant policy to supervise and manage the use of educational technology by university teachers.

Colleges and Universities

Insufficient support is provided for school software, hardware, and other resources.

Currently, the school is equipped with smart classroom equipment. However, most classrooms are being used for regular teaching activities, and they are not yet organized in clusters, thereby impeding teachers' ability to allocate intelligent teaching resources according to their preferences. The majority of hardware and software resources are not standardized, and their functions vary depending on the technology and equipment deployed. Mastery of a single educational technology does not allow teachers to achieve a wide range of teaching effects. Additionally, limited selection and usage of resources may impede their performance, thereby reducing their motivation to enhance their educational technology literacy. Specialized technical support is lacking from the school's resources. The school's platform offerings are relatively limited, as they do not provide a variety of educational technology tools that could improve the quality of education delivery.

The system’s guarantee for teachers to improve their educational technology literacy is not flawless.

Most colleges and universities do not give sufficient attention to training teachers in educational technology literacy. As a result, schools are not sufficiently popular and many teachers are reluctant to change their traditional mode of teaching. The measures to encourage and ensure teachers' education technology literacy are unclear, and the investment in the cultivation of teachers' education technology literacy is insufficient. This lack of motivation results in many teachers

being content with their existing information technology skills and adherence to traditional teaching methods. All respondents indicate that no relevant documentation is available at their schools. Schools lack evaluation mechanisms, and as a result, there is not any effective feedback or technology training evaluation. There is no specialized organization in schools.

The training system of teacher education technology literacy is neither standardized nor systematic.

Every year, the schools hold the training for the improvement of teachers' education and technology literacy, and the training scope can cover all the schoolteachers. However, the training theme and content are quite generic, and the training form lacks depth to provide targeted and precise training tailored to the actual needs of teachers. The quality of training is not high enough to fulfil its role in enhancing the educational technical literacy of teachers. Furthermore, the training lacks coherence as it does not integrate with teachers' teaching, assessment, evaluation, and other related activities. There is a lack of unified evaluation standards. While many training activities are available for the educational technology literacy of teachers, they often rely on relatively simple forms. Therefore, it is recommended to diversify these activities. There is an insufficient investment for teacher education technology training. School training refers to single-mode, technology-driven teaching, whereby teachers attend lectures delivered by experts and follow the traditional teaching techniques. However, the lack of personalization renders such training ineffective, leaving many teachers struggling to apply the skills learned, which in turn compromises the training's effectiveness. The schools lack systematic training programs. Teacher training courses are not comprehensive enough, with a lack of targeted and relevant training opportunities. Consequently, the full potential of educational technology in supporting teaching is not realized. The pursuit of credits and certificates motivates some teachers to participate in these courses. Individuals prefer to develop the corresponding 1-to-1 training or a small range of targeted training. The school does not provide appropriate specialized training for its teaching staff. There is insufficient opportunity for collaboration between educational technology and subject matter experts regarding the application of educational technology.

Teachers

Teachers are not highly motivated to actively learn and use the knowledge and skills of educational technology.

According to some interviewed teachers, they are unwilling to acquire educational technology knowledge and fail to use it in innovative ways during the teaching process due to a shortage of incentives and resistance to change brought about by the school. Some respondents highlight that the rapid development of educational technology and availability of numerous tools have resulted in confusion on choosing the best fit, leading to laziness and reluctance to gain experience in using such technologies. The teachers lack the motivation to actively use educational technology tools due to a lack of creativity in the rational application of technology, leading to a reluctance to reinvest time and effort in learning.

Teachers lack the knowledge and skills to use educational technology tools.

Although some simple educational technology tools are utilized in teaching, only one or two types of educational technology are proficiently used because they require extensive skill and knowledge. Classroom tests and interactions use fewer educational technology tools due to inadequate technical knowledge and skills, which hinder effective teaching support (e.g. software use problems and equipment setting problems). The utilization of educational information technology is shallow and limited to simple techniques such as courseware creation, information browsing, and online questions and answers. Moreover, educational technology is applied to innovate teaching methods, optimize coursework, and analyze students' learning performance. Numerous teachers are inexperienced and lack adequate knowledge in the practical application of educational technology to teaching. Teachers often experience significant challenges when trying to integrate educational information technology with the teaching content, develop engaging and interactive instructional materials and achieve desired learning outcomes. The educational technology theory of teachers is relatively weak, and their core competence regarding the integration of information technology and curriculum remains superficial. They also lack the design ability to incorporate modern educational theories into their teachings and combine information technology seamlessly with their own teaching methods. Moreover, their

ability to master new technologies, develop and design teaching systems, and resources is insufficient. Additionally, their teaching methods are relatively outdated. Software tools need to be utilized more effectively. For example, gaining proficiency in software systems demands a considerable amount of effort and time. The teaching management system, such as the students' class check-in system, is unstable and poorly integrated, creating potential difficulties. The adoption of new technologies is slow, and the frequency of their use is not high enough. Additionally, the integration of new technologies with teaching needs improvement.

Teachers lack the ability to identify correct information and information security management.

Most of the respondents pointed out that the use of multimedia network can help teachers to obtain the latest and varied teaching information. Nevertheless, a few respondents highlight that while registering educational technology tools or materials, others sometimes overlook the importance of safeguarding their intellectual property rights and information security.

Teachers lack the awareness of using educational technology to promote their own professional development.

The vast majority of respondents put forward that the teachers can generally use educational technology for research purposes, and it also enables them to enhance their professional and scientific research skills. Nevertheless, educational technology is seldom used to facilitate cooperative learning. Furthermore, the teachers have fewer chances to attend courses, training, and seminars. According to some participants, the teachers employ educational technology to screen and distribute digital resources - for instance, identifying valuable educational materials for specific teaching exercises. However, there is a reduction in the creation and sharing of educational resources with the help of educational technology.

2. What are the factors that affect the improvement of teachers' educational technical literacy in your school?

Construction of school teaching information environment

Based on the interview information of the interviewees, the most important influencing factor of the information environment construction of the school teaching

environment is extracted. It is mainly reflected in the following factors: information environment and resource facilities; the provision of necessary technical support and resource input for teachers; training courses and resources for teachers; system and platform construction; level of campus infrastructure construction and atmosphere of educational technology application.

Schools learn to improve the atmosphere and culture of educational technology

Following the interview information of the subjects, influencing factors of the school's learning atmosphere and culture on the improvement of educational technology are extracted. This is mainly reflected in the following interview information of the interviewees: schoolteachers learning to improve educational technology; creating a positive learning atmosphere and culture, establishing educational technology community, promoting the communication and sharing between teachers, and strengthening the interaction and support between teachers.

The school's institutional guarantee for the improvement of teachers' educational technology literacy

During the interview, almost all the respondents propose that the school's incentive and guarantee mechanisms for support, degree, attention, evaluation, and feedback are external factors that affected the improvement of their educational technology literacy. Only by understanding the level of teachers' educational technology literacy, providing feedback and suggestions, and giving certain incentives, can the schools help teachers to continuously improve and improve their educational technology literacy level.

Training of university teachers

All levels of improvement and ability depend on various types of training. All respondents have suggested to different extents. And school-based training is also among the crucial factors influencing the enhancement of teachers' educational technology literacy. For instance, the breadth and depth of training, training methods, training method, training theme, training content, training intensity, training experts, training assessment requirements, professional support, and well-organized systemic education on technical literacy delivered by the school, will all influence their improved competencies.

Teacher's own understanding and development

By sorting out and summarizing the interview information of the interviewees, the main factors affecting teachers' educational technology literacy can be found, including educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility, and educational technology professional development. This is embodied in the following interview information:

According to most respondents, the teacher’s educational technology consciousness, learning methods and strategies, learning attitude and habits, willingness to continue learning and explore new education technology applications, teacher's own subjective initiative, personal consciousness, preferences and information consciousness, as well as self-learning, are important factors that affect the promotion of their own quality.

Regarding educational technology knowledge and skills, the participants believe that possessing the technical knowledge and skills require to help the teachers apply educational technology tools flexibly, to support teaching, is one of the factors that influenced teaching practices.

By educational technology application, the respondents highlight the teacher’s practical experience in classroom settings, as teachers are familiar with teaching scenarios and student needs. Therefore, they can integrate educational technology into curriculum design and develop interactive and engaging teaching links, which can improve their literacy levels.

Concerning educational technology social responsibility, most interviewers point out that the teachers' information cultivation and information security awareness are also one of the main factors.

As far as educational technology professional development is concerned, most of the respondents suggest that self-reflection, continuous learning, information creation, ability to accept, impact of use, mastery of resources, cooperative learning, have all affected the sustainable development of their majors.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

Government level

The government ought to optimize the top-level blueprint and offer policy guidance and support. They can also introduce corresponding policies and establish unified training standards. Furthermore, the government should provide relevant financial aid and open courses for educators to strengthen support for schools, conduct inter-school exchanges, and cooperation. Finally, the government must devise relevant educational technology policies and offer corresponding resources and infrastructure.

University level

Colleges and universities to improve the guarantee mechanism of improving teachers' educational technology literacy. They should establish and improve management systems and work norms, pertaining to the enhancement of teachers' educational technology literacy. Also, they ought to enhance various infrastructures and create an excellent platform for teachers to impart information teaching. They must optimize the software and hardware environment of modern information technology applications. Additionally, colleges and universities need to provide the teachers with the required technical support and resource input. Colleges and universities need to enhance publicity and guidance, learning environment and promote the use of educational technology. Moreover, colleges and universities should strengthen the awareness of the teachers to improve their educational technology competency. It is critical for colleges and universities to develop diversified and flexible training programmers for enhancing the teacher's competency. The training must be targeted and effective, and the teachers should be encouraged to attend more training sessions. Furthermore, colleges and universities should establish training institutions to provide education and training to improve the information and educational technology literacy of teachers. They can also organize funds and services for providing better educational technology tools and application services. Colleges universities are to establish courses on educational technology and

provide training and support for teachers. Moreover, educational institutions should encourage teachers to conduct research on educational technology and innovation. Also, colleges and universities should collaborate by sharing resources and offering various forms of cooperative training and exchange programs.

The Teacher Level

Teachers are recommended to improve their own educational technology teaching knowledge and skills, and proactively improve the ability to apply educational technology. The, they are advised to participate in training and online training videos. Changing their teaching concepts, strengthening their own information technology literacy and education technology literacy cultivation are also on demanding. In addition, the teachers must enhance the awareness of their own development as well as strengthen the application of information technology. It is necessary for the teachers to accumulate experience in practice, to improve their own educational technology literacy through independent learning, professional training and continuous practice. What is more, the teachers themselves must learn to master and use all kinds of relevant hardware and software, Using the characteristics of the information age, Online search to collect relevant teacher education technical literacy knowledge. To improve comprehensive utilization of various resources is to strengthen self-improvement level. Teachers should improve their ability of continuous learning, have a clear plan for their personal self-development, keep up with the development of educational technology, and strive to improve their personal skills and practical application.

Part4: Develop strategies to improve the level of educational technology literacy of teachers in universities in Guangxi.

This paper proposes strategies to increase the educational technology literacy levels of teachers in universities in Guangxi. The strategies are based on the results of a questionnaire survey which identified the item with the lowest mean score for each variable. The suggestions are also supported by interview findings and relevant literature theories. Improving the educational technology literacy of teachers depends not only on their own internal roles but also on the support of external environments, such as the government and universities. Therefore, this study

combines the results of the questionnaire and interview survey analyses to develop scientific and reasonable promotion strategies from the three levels of government, universities, and teachers. It includes 18 strategies, consisting of 5 for the government, 8 for universities, and 5 for teachers.

Table 4.10 The item With the Lowest Mean Score in the Questionnaire Survey

		The lowest scoring item
1	Total	Educational technology knowledge and skills
2	educational technology awareness	You have the confidence and determination to overcome the difficulties and challenges encountered in the practice of educational technology
3	educational technology knowledge and skill	You can skillfully solve the problems arising from using educational technology
4	educational technology application	You can use the resources of educational technology to break through the limitation of time and space, and create a learning environment integrating the network learning space and the physics learning space
5	educational technology social responsibility	You can identify, guard against, and solve the network problems
6	educational technology professional development	You can use educational technology resources to support educational research activities according to the teaching problems of educational technology

Table 4.11 The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	**How to**
Government level	1. The state formulates relevant policies for the improvement of educational technology literacy 2. The state formulates the educational technology information management system in colleges and universities to ensure the security of educational technology information in colleges and universities and standardize the safety behavior of educational technology 3. The state establishes a supervision mechanism for educational technology literacy to evaluate the moral behavior of educational technology 4. The state will strengthen the improvement of educational technology literacy 5. The state will build and improve a resource sharing and information exchange platform conducive to the improvement of educational technology literacy 6. Colleges and universities actively improve and implement relevant supporting policies for the improvement of teachers' educational technical literacy 7. Colleges and universities create a full-coverage and multi-level systematic training mode that combines overall improvement with classified guidance

Table 4.11 (continued)

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	How to
University level	8. Colleges and universities establish a multi-functional digital literacy platform integrating skill evaluation, online courses, self-study platform, skill training and skill assessment. 9. Colleges and universities improve the level of educational information infrastructure construction, 10. Colleges and universities simplify the process of using educational technology tools 11. Colleges and universities build a cooperative community of teacher education and technical literacy learning 12. Colleges and universities build a research team on educational technology literacy 13. Colleges and universities will hold various educational information competitions
Teachers' own development level	1.Teachers should improve their own educational technology awareness, improve the awareness of independent learning, and stimulate the development of educational technology drive. 2.Teachers should strengthen their own educational technology knowledge and skills, and actively try the use of educational technology tools in teaching. 3.Teachers should consolidate their own educational technology application, and actively design the teaching activities integrating the resources of educational technology according to the teaching objectives. 4. Teachers should enhance their own educational technology social responsibility, abide by Internet

Table 4.11 (continued)

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	How to
	laws and regulations, consciously regulate various online behaviors, and pay attention to the management and protection of personal and students' information and private data. 5. Teachers should strengthen their own planning of educational technology professional development and pursue the professional development of educational technology literacy.

Part5: The analysis results of suitability evaluation about improving strategies educational technology literacy of teachers in Guangxi. The data is presented using average value and standard deviation.

Establish and implement the suitability evaluation table according to the strategy (level 5 evaluation scale, very high, high, average, low, very low). 20 experts from the different universities are invited to assess the effectiveness of strategies aimed at enhancing the technical literacy levels of university teachers in Guangxi. The group consists of leaders responsible for teacher training, senior experts in educational technology, and full-time teachers. Here are the details.

This survey includes 20 experts: the gender distribution is 50% male (10) and 50% female (10). Regarding the age distribution, 30% (6) of the teachers are aged 51-60 who are mainly senior experts in educational technology, while 35% (7) are leaders in charge of teacher team building and another 35% (7) are full-time teachers. The assessment of strategies is primarily divided into three aspects. The evaluation covers government strategies (1-5), university strategies (6-13), and teachers' own strategies (14-18).

Table 4.12 The suitability evaluation results of the strategy of improving the educational technology literacy level of college teachers in Guangxi

(n = 20)

No.	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	$\overline{X}$	S.D.	Level	Rank
1	The state shall relevant policies for the improvement of educational technology literacy	4.75	.444	highest	3
2	The state has formulated a management system for educational technology information in colleges and universities to ensure the security of educational technology information and standardize the safety behavior of educational technology	4.60	.503	highest	7
3	The state establishes the supervision mechanism of educational technology literacy and evaluates the moral behavior of educational technology	4.55	.510	highest	12
4	The state to strengthen the improvement of educational technology literacy funds input	4.60	.503	highest	8
5	The state has built and improved a platform for resource sharing and information exchange conducive to the improvement of educational technology literacy	4.65	.489	highest	6
6	Colleges and universities actively improve and implement the relevant supporting policies for the improvement of teachers' education technology literacy	4.70	.470	highest	5
7	Colleges and universities create a full-coverage and multi-level systematic training mode that combines overall improvement and classified guidance	4.90	.308	highest	1

Table 4.12 (Continued)

No.	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	$\overline{X}$	S.D.	Level	Rank
8	Colleges and universities establish a multi-functional digital literacy platform integrating skill evaluation, online courses, self-study platform, skill training, skill assessment and so on	4.55	.510	highest	13
9	Colleges and universities improve the level of education information infrastructure construction	4.45	.510	high	17
10	Colleges and universities simplify the process of using educational technology tools	4.55	.510	highest	14
11	Colleges and universities build a cooperative community of teacher education and technical literacy learning	4.50	.513	highest	15
12	Colleges and universities build an educational technology literacy research team	4.60	.503	highest	9
13	Colleges and universities hold various educational information competitions	4.60	.503	highest	10
14	Teachers should improve own educational technology awareness, improve their awareness of independent learning, and stimulate the internal driving force of educational technology development	4.75	.444	highest	4
15	Teachers should strengthen their own educational technology knowledge and skills, and actively try the use of educational technology tools in teaching	4.60	.503	highest	11

Table 4.12 (Continued)

No.	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	$\overline{X}$	S.D.	Level	Rank
16	Teachers should consolidate their own educational technology application, and actively design the teaching activities integrating the resources of educational technology according to the teaching objectives	4.85	.366	highest	2
17	Teachers should enhance their own educational technology social responsibility, abide by Internet laws and regulations, consciously regulate various online behaviors, and pay attention to the management and protection of personal and students' information and private data	4.40	.503	high	18
18	Teachers should strengthen their own planning of educational technology professional development and pursue the professional development of educational technology literacy	4. 50	.513	highest	16
	total	4.6167	.15177	**highest**	

Following the suitability evaluation of the promotion strategy by the expert group, the evaluation data undergo descriptive statistical analysis. Table 4.12 shows that each of the 18 strategies analysis has a suitability score above 4.4. The mean score for the overall strategy is 4.6167, with a standard deviation of 0.15177. These figures indicate that the 18 strategies proposed in this study are highly suitable and scientifically feasible. Therefore, the strategy proposed in this study can be used as a reference by countries, universities, and teachers to enhance the level of educational technology literacy.

Chapter 5
Conclusion Discussion and Recommendations

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi. The objectives of this study include: 1) to study the current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi; 2) to develop the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi; 3) to evaluate the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi. The survey comprises a sample group of 403 full-time teachers from 6 universities in Guilin, Guangxi. In addition, the sample group includes 6 full-time teachers and 6 managers responsible for team construction from the same universities. The research tools employ in this study include literature analysis, questionnaires, and structured interviews. The statistical measures employ to analyze the data covering percentage, mean, and standard deviation. The results of this study are as follows:

1. Conclusion
2. Discussion
3. Recommendations

Conclusion

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi. The investigator summarizes the conclusion in three parts as described below:

Part1: The current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

Part2: Develop the Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

Part3: Evaluate the suitability and feasibility of the strategies for Improving the level of Educational Technology Literacy of Teachers in Universities in Guangxi

Part1: The current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

The surveyed university teachers exhibit a high level of educational technology literacy across five dimensions. These dimensions are, in decreasing order of teacher proficiency: educational technology social responsibility, educational technology professional development, educational technology application, educational technology awareness, and educational technology knowledge and skills.

Educational technology social responsibility is at high level. Considering the results of this research, aspects are ranked from the highest to the lowest levels being as follow:

The highest score is awarded to "In the process of education and teaching, you comply with the Internet laws and regulations, consciously regulate the online behavior, spreading positive energy "; The second-highest score is recorded by "In the education and teaching work, pay attention to the security management and maintenance of the information and privacy data of individuals, students, parents and others. "; The next one is "Use of educational technology products and services, following the principles of positive necessity, informed consent, clear purpose and security, respect for intellectual property rights"; “Resources that can guide students in the appropriate selection and use of educational technology to support learning, focus on cultivating students' sense of social responsibility” ranked fourth; The fifth question has the lowest score of "able to distinguish, prevent and solve network problems".

Educational technology professional development is ranked second. Taking the findings of this research into account, the aspects are ranked from highest to lowest as follows: The first rank is awarded to the statement "You can use educational technology resources to carry out learning according to your personal development needs”, while the second place is given to "Educational technology resources can be used to analyze individual teaching practices, Supporting teaching reflection and improvement "; The third place is “Can actively participate in or host the network training community, Learning together, sharing experiences, seeking help, and solving problems”; Finally, the last rank is awarded to "Can address the teaching

problems of educational technology, Using educational technology resources to support teaching and research activities ".

Educational technology applications are ranked third. Considering the results of this research, the aspects ranged from the highest to the lowest levels, as follow: The highest score is awarded to " According to the teaching objectives, Design teaching activities integrating educational technology resources "and" organize teaching activities orderly by using educational technology resources, Improve student participation and communication initiative "; The second-highest score is recorded by "The ability to collect student feedback in real time, finding that student learning differences, improving the teaching behavior, optimize the teaching links, regulating the teaching process "; The third one is "To be able to use educational technology tools to evaluate and analyze students' learning conditions" and " to be able to collect through multiple channels, and according to the teaching needs to select, manage, production of educational technology educational resources "; The lowest score is the description about "You can use the resources of educational technology to break through time and space constraints, create a learning environment integrating network learning space and physical learning space ".

Educational technology awareness is ranked fifth. Based on the findings of this study, the aspects ranged from the highest to the lowest levels as follows: The highest scoring criterion is "willingness to actively learn and use educational technology resources"; following by "initiative in educational technology practice, exploration and innovation" in second place; The third and final criterion is "confidence and determination to overcome the difficulties and challenges encountered in educational technology practice".

Educational technology knowledge and skills take the lowest priority. The aspects, ranged from the highest to the lowest levels according to the study's findings, are as follows: "Can skillfully operate and use a variety of educational technology equipment, software, platform, etc." come in first place; "Can well master the principles and methods of choosing educational technology, equipment, software and platform in education and teaching" ranks second; "Very well aware of the connotation and characteristics of common educational technology, And its

problem-solving procedures and methods " place third; "To solve problems in the use of educational technology" is the least ranked.

Part2: Develop the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

Strategies to improve the literacy of teachers in Guangxi include 18 strategies, 5 strategies for the government, 8 strategies in universities and 5 strategies for the teachers.

Government level

1. The government formulates relevant policies for the improvement of educational technology literacy.

2. The government shall develop an information management system for educational technology in colleges and universities to safeguard information security and standardize safety practices for educational technology.

3. The government establishes a supervision mechanism for educational technology literacy and evaluates the moral behavior of educational technology.

4. The government should strengthen the improvement of educational technology literacy.

5. The government needs to build a resource-sharing and information exchange platform conducive to the improvement of educational technology literacy.

University level

6. Colleges and universities actively improve and implement relevant supporting policies to improve teachers' educational technology literacy.

7. Colleges and universities are considering a full-coverage and multi-level systematic training mode that combines overall improvement and classified guidance.

8. Colleges and universities are recommended to create a multifunctional digital literacy platform that combines skills evaluation, online courses, self-study tools, skills training, and skills assessment.

9. Colleges and universities enhance the quality of information education.

10. Colleges and universities simplify the process by using educational technology tools

11. Colleges and universities build a cooperative community of teachers' education and technical literacy learning.

12. Colleges and universities build a research team on educational technology literacy.

13. Colleges and universities hold various educational informatization competitions.

Teachers' own development level

At the teacher's level, the strategies are proposed from five aspects: educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility, and educational technology professional development.

14. The teachers should improve own educational technology awareness, via improving their awareness of independent learning and stimulating the internal driving force of educational technology development.

15. The teachers should strengthen their own learning for educational technology knowledge and skills, and actively try the use of educational technology tools in teaching.

16. The teachers should consolidate their own application of educational technology, and actively design the teaching activities integrating the resources of educational technology according to the teaching objectives.

17. The teachers should enhance their own social responsibility for educational technology, abide by Internet laws and regulations, consciously regulate various online behaviors, and pay attention to the management and protection of personal and students' information and private data.

18. The teachers should strengthen their own planning of educational technology professional development and pursue the professional development of educational technology literacy.

Part3: Evaluate the suitability and feasibility of the strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

The expert group's suitability evaluation yields an overall average score of 4.54 for the proposed improvement strategies, confirming its scientific validity and practical applicability. Consequently, these strategies could serve as a basis and reference for universities and the country as a whole.

Government-level suitability strategies:

1. The government formulates relevant policies for the improvement of educational technology literacy.

2. The government shall develop an information management system for educational technology in colleges and universities to safeguard information security and standardize safety practices for educational technology.

3. The government establishes a supervision mechanism for educational technology literacy and evaluates the moral behavior of educational technology.

4. The government should strengthen the improvement of educational technology literacy.

5. The government needs to build a resource-sharing and information exchange platform conducive to the improvement of educational technology literacy.

University level suitability strategies:

6. Colleges and universities actively improve and implement relevant supporting policies to improve teachers' educational technology literacy.

7. Colleges and universities are considering a full-coverage and multi-level systematic training mode that combines overall improvement and classified guidance.

8. Colleges and universities are recommended to create a multifunctional digital literacy platform that combines skills evaluation, online courses, self-study tools, skills training, and skills assessment.

9. Colleges and universities enhance the quality of information education.

10. Colleges and universities simplify the process by using educational technology tools

11. Colleges and universities build a cooperative community of teachers' education and technical literacy learning.

12. Colleges and universities build a research team on educational technology literacy.

13. Colleges and universities hold various educational informatization competitions.

Teachers' own development level suitability strategies:

At the teacher's level, the strategies are proposed from five aspects: educational technology awareness, educational technology knowledge and skills, educational technology application, educational technology social responsibility, and educational technology professional development.

14. The teachers should improve own educational technology awareness, via improving their awareness of independent learning and stimulating the internal driving force of educational technology development.

15. The teachers should strengthen their own learning for educational technology knowledge and skills, and actively try the use of educational technology tools in teaching.

16. The teachers should consolidate their own application of educational technology, and actively design the teaching activities integrating the resources of educational technology according to the teaching objectives.

17. The teachers should enhance their own social responsibility for educational technology, abide by Internet laws and regulations, consciously regulate various online behaviors, and pay attention to the management and protection of personal and students' information and private data.

18. The teachers should strengthen their own planning of educational technology professional development and pursue the professional development of educational technology literacy.

Discussion

The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi. The investigator summarizes the discussion in 2 parts as follows:

Part I: The current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi;

Part2: The strategies for improving the level of Educational Technology Literacy of Teachers in Universities in Guangxi.

Part I: The current situation of the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

The research findings indicate that the surveyed university teachers have a high level of educational technology literacy, which is consistent with the findings of Yi Ye et al. (2022). The teachers' levels of the five dimensions are from the highest to lowest in order: educational technology social responsibility, educational technology professional development, educational technology application, educational technology awareness, and educational technology knowledge and skills. This shows that while the overall level of teachers has been improved, the level of educational technology literacy is relatively poor across the three dimensions of educational technology application, educational technology awareness, educational technology knowledge and skills. There is particular need for further development of proficiency in educational technology knowledge and skills. This is related to the teachers' inadequate intensive improvement training, unfamiliar technology application, wide application scope, inadequate information literacy and low willingness to continuous learning (Yang Yan et al, 2019, p.121).

Educational technology awareness is at a high level, but it ranks the fourth among the five dimensions, which indicates that there is still some room for improvement in this dimension. For instance, the willingness of teachers to adopt educational technology slightly exceeds their actual use, and their scores for educational technology practice exploration and innovation initiative are higher than those for difficulties and challenges. This lack of willingness to engage in active learning and use educational technology tools, coupled with low motivation to implement teaching innovation with the help of educational technology, often leads to teachers retreating when they face technological problems (Jiang Hongxia, 2022, p. 29). Hence, to encourage teachers to integrate educational technology into their

teaching practices, the schools need to enhance their training in this point. This will help the teachers develop the proficiency needed to overcome educational technology challenges.

Educational technology knowledge and skills is at a high level, but scored the lowest among the five dimensions, so teachers' educational technology knowledge and skills is relatively weak and needs to be further strengthened (Yang Yan et al., 2019, p.123). The teachers possess a slightly higher level of educational knowledge than skills, indicating their ability to select appropriate educational technology tools. However, they still lack mastery to solve problems. To enhance the educational technology literacy of teachers, the schools should allocate ample time and resources to improve their knowledge and skills, establish relevant systems, and devise training courses.

Educational technology application is at a high level, but it ranks the third among the five dimensions, implying that the level of educational technology application among the teachers is also weak and needs to be further strengthened (Yang Yan et al., 2019, p.123). Despite the teachers benefitting enhancement in teaching design and implementation by utilizing educational technology tools, there are issues with using such tools for academic performance evaluation, and to discover and generate fitting educational technology resources. This shows that the teachers can use the resources of educational technology to organize basic teaching activities in an orderly manner, improve their teaching practices and regulate their approach based on feedback from the classroom. Despite this, educational technology resources are challenging to use in high-level teaching activities, for instance, integrating network learning space with traditional physical learning space. Therefore, in the improvement of teachers 'educational technology literacy, it is necessary to strengthen the use and training of teachers' high-end educational technology tools.

Educational technology social responsibility has ranked highest and has achieved a high level. It suggests that the teachers who took part in this study excelled in fulfilling their educational technology social responsibilities, consistent with the findings of Yan Yang et al. (2019). On the other hand, the results of the

analysis show that while the teachers can follow legal ethics more effectively when utilizing educational technology, there are inadequacies in ensuring the safety of educational technology. For example, regarding legal ethics, the teachers can comply with Internet laws and regulations, regulate online behavior and promote positive values in the process of teaching. However, they may lack the ability to guide and encourage their students to utilize educational technology resources for learning and cultivate their social responsibility. In terms of safeguarding the educational technology, the teachers adhere to the principles of its use, service, and intellectual property rights. However, they have significant weaknesses in identifying, preventing, and resolving network problems. Therefore, it is necessary to enhance the education and guidance on the challenges that arise in the use of educational technology social responsibility in teacher training programs. This will enable them to effectively leverage educational technology tools.

Educational technology professional development ranks second, indicating that the teachers who involve in this study perform better in educational technology social responsibility and educational technology professional development. This is in line with the findings of Yan Yang et al. (2019). Nevertheless, according to the analysis results, while the teachers have some foundation and level in studying educational technology, their research and teaching in this field is somewhat lacking. Certainly, throughout the research, there is a strong recognition of the importance of using educational technology resources for the purpose of self-directed learning in response to personal developmental needs. Educational technology resources can also be used to analyze personal teaching practice and support teaching reflection and improvement. However, great improvements need to be made in actively seeking external assistance, or active participation in or presiding over the research community network, learning, sharing experience, and collectively seeking assistance to solve problems. Hence, in educating teachers’ educational technology literacy, the schools should primarily support and pay attention to teachers’ teaching research, provide high-quality resources for teachers' independent learning, and lastly, guide and supervise teachers' active learning and participation in network joint research and study.

Part 2: The strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

Government level

Strategy 1. The government formulates relevant policies to improve educational technology literacy. This is similar to the view of Liu Bin. (2020, p.15), who believes that the country should take policies as the guidance and vigorously promote the improvement of teachers' intelligent education literacy. The idea is also similar to the view of Wu Junqi et al. (2023, p.78). Pei Yingzhu. (2022, p.130), who suggest that the country should do a good job in the top-level design of policies.

Strategy 2. It is important for the government to develop an educational technology information management system for colleges and universities. This will ensure the security of educational technology information, promote standardized safe behavior and practices within the colleges and universities. Song Fangfang. (2017, p.46). shares the same view, who asserts that there is a need to improve information security laws and regulations and the supervision and management mechanism of the network for better protection of the educational technology within colleges and universities.

Strategy 3. The government establishes a supervision mechanism of educational technology literacy and evaluates the educational technology moral behavior. This is consistent with the views of Yan Guangfen. (2022, p.11), who points out that strengthening the construction of digital technology ethics and legal norms should be encouraged to guide teachers to develop the awareness of digital ethics.

Strategy 4. The government should strengthen the investment in improving educational technology literacy, which is in line with the views of He Yonghuan. (2022, p.57), Zhang Liping. (2021, p.23) and Song Fangfang. (2017, p.46), who consider that the government should increase the efforts in schools, especially the investment.

Strategy 5. The government is to build and improve the resource-sharing and information exchange platform conducive to the improvement of educational technology literacy. This aligns with the research opinions of He Yonghuan. (2022, p.57). and Zhang Liping. (2021, p.23), who suggest building an online training and communication platform.

University level

Strategy 6. Colleges and universities actively improve and implement the relevant supporting policies for the improvement of teachers' education technology literacy. Song Quanhua. (2020, p.82), Zhou Liangfa. (2022, p.6) and Su Jingya (2021, p.13). reckon that the system construction should be improved, supervision and assessment should be strengthened, evaluation and assessment should be improved, the incentive mechanism should be improved, and the incentive and evaluation system should be established.

Strategy 7. Colleges and universities build the overall promotion and classification guidance combined full coverage, multi-level system training mode. This is following with the studies of Gong Manman (2023, p.54), He Yonghuan. (2022, p.57), Yan Guangfen. (2022, p.11), Yi Ye. (2022, p.60), Song Quanhua. (2020, p.82). They all think that targeting university teacher education technology training should adhere to the principles of combining integration, promotion, classification guidance, and building 'classification stratified segmentation' to provide diversified cultivation modes.

Strategy 8. Colleges and universities is to establish a multifunctional digital literacy platform integrating skill evaluation, online courses, self-study platform, skill training, skill assessment, etc. This is analogous to the conclusion drawn by Ismaila Temitayo Sanusi et al. (2022, p.10), who recommend implementing a cross-border peer collaboration platform. Su Jingya et al. (2021, p.13). also points out that an information teaching platform should be built.

Strategy9. He Yonghuan. (2022, p.57), Pei Yingzhu. (2022, p.130), Yan Guangfen. (2022, p.11), Su Jingya. (2021, p.13), and Song Quanhua. (2020, p.82). have expressed similar views that colleges and universities improve the level of education information infrastructure construction. To achieve this, universities should increase investments in hardware and software equipment, and work towards creating an efficient digital environment.

Strategy 10. Colleges and universities Simplify the process by using educational technology tools. This is consistent with the view of Song Fangfang (2017, p.46), who has rolled out that the operation procedures of local university teachers on the information system should be simplified.

Strategy 11. Colleges and universities build a cooperative community for teacher education and technology literacy learning. This is similar to the research results of Yan Guangfen. (2022, p.11), Liang Huiyi. (2021, p.40), Su Jingya et al. (2021, p.13), Lu Shuang. (2020, p.30) and Li Chunyan. (2018, p.74). They believe that it is necessary to build an information technology learning community to workout community and interactive platform, and realize the sharing of the knowledge of information tools.

Strategy 12. Colleges and universities develop an educational technology literacy research team. This is similar to the views of Zhu Yi. (2022, p.47), Wang Ru (2022, p.57). and Song Fangfang. (2017, p.46). To create a positive academic atmosphere and establish a teaching and research community for the educators, they suggest setting up academic forums for information technology.

Strategy 13. Colleges and universities hold various education information competitions, which is consistent with the research results of Wang Lin (2022, p.174), who proposes that universities should carry out teachers' information teaching ability competition.

Teachers' own development level

Strategy 14. The teachers should improve own educational technology awareness, via improving their awareness of independent learning and stimulating the internal driving force of educational technology development. This is consistent with the views of Lu Shuang. (2020, p.30). and Liu Yongchao. (2018, p.245), who supports that the teachers should strengthen independent learning and establish the concept of lifelong learning.

Strategy 15. The teachers should strengthen their own learning for educational technology knowledge and skills, and actively try the use of educational technology tools in teaching. The viewpoint is similar to the research results of Fu Yun. (2017, p.34). He indicates that Lots of effort should be made to learn the basic means of information teaching and fully integrate information tools with the classroom.

Strategy16. The teachers consolidate the application of educational technology for teachers, and seek the professional development of educational

technology literacy. This is similar to the research results of Li Chunyan. (2018, p.74), who believes that only by integrating information teaching into daily classroom teaching can the individuals continuously promote their professional development.

Strategy 17. The teachers should enhance their social responsibility for educational technology and actively design teaching activities that integrate the resources of educational technology with the teaching objectives. This aligns with Yang Yan's view. (2019, p.121) who suggests that the teachers should expand knowledge learning, maintain a close integration of subject teaching and information technology, strengthen the application of information skills and continuously improve teaching design.

Strategy 18. To strengthen the planning of teacher's educational technology professional development, it is imperative to comply with internet laws and regulations, regulate online behavior, and prioritize the management and protection of personal and student data and private information. This resonates with the perspectives of Yang Yan. (2019, p. 121) and Song Fangfang. (2017, p. 46), who urge the educators to uphold the ethics of information and seek self-improvement.

Recommendations

Implications

According to the lowest mean of the variables presented in the questionnaire analysis, five suggestions are given to the school administrators:

In terms of educational technology awareness, the school administrators should establish a platform for evaluation, learning, and training. Additionally, the teachers need to improve their ability to overcome difficulties and challenges related to educational technology practice with confidence and determination, through scientific testing and learning.

Regarding educational technology knowledge and skills, the school administrators should conduct systematic training to develop teachers' problem-solving abilities concerning educational technology usage.

With regard to educational technology application, the school administrators must improve the hardware and software infrastructure of educational technology

and provide targeted training for the teachers on how to utilize these resources. This will enable them to overcome limitations of time and space and create a learning environment that integrates network and physical spaces.

In the sense of educational technology social responsibility, the school administrators have the obligation to establish a supervisory mechanism for educational technology literacy. Additionally, they should help develop teachers' capability to recognize, prevent, and resolve computer network issues.

Concerning educational technology professional development, the school administrators could create an educational technology research team that helps the teachers understand how to use technological resources to solve common teaching problems.

Future Research

Firstly, the research scope may be extended further. The teachers who participated in this study are from certain areas. The results are constrained to particular regions, individuals, and groups. To obtain a more representative sample size, future studies should survey more teachers from various regions.

Additionally, advanced educational technologies like artificial intelligence and big data can be wholly harnessed to enhance present research practices. This study solely employs the research method of combining the questionnaire survey and interview. It does not use trained interview data processing tools in data analysis. The growing utilization of advanced information technologies, such as Artificial Intelligence and Big Data, in education can enable better data collection. Hence, professional interview data processing tools can be employed to systematically summarize and categorize the interview data to gain deeper insights into the differences of teachers' educational technology literacy across dimensions. This can enhance the scope and depth of data and findings for future research.

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Appendixes

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List of Specialists and Letters of Specialists Invitation for IOC Verification

No	Name	Degree	Position	Positional titles
1	Ma Huanling	Doctor of education	Guangxi Normal University	Professor
2	Li Guanghai	Doctor of education	Guangxi Normal University	Professor
3	Yuan Lei	Doctor of education	Guangxi Normal University	Professor

Ref. No. 0643.14/ 530

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request letter for instrument validation

Dear Professor Dr. Ma Huanling, Guangxi Normal University

Attachment 1 questionnaire

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to check the content validity of the instrument to get the most complete research instrument. Knowing your experience in the field of the said research, the researcher would like to ask for your assistance in validating the said instrument. Your suggestions will be useful for improving the quality and suitability of research instruments for use in collecting data for this research.

Sincerely,

(Assistant Professor Dr. Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/ 5303

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request letter for instrument validation

Dear Professor Dr. Li Guanghai, Guangxi Normal University

Attachment 1 questionnaire

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to check the content validity of the instrument to get the most complete research instrument. Knowing your experience in the field of the said research, the researcher would like to ask for your assistance in validating the said instrument. Your suggestions will be useful for improving the quality and suitability of research instruments for use in collecting data for this research.

Sincerely,

(Assistant Professor Dr. Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request letter for instrument validation

Dear Professor Dr. Yuan Lei, Guangxi Normal University

Attachment 1 questionnaire

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to check the content validity of the instrument to get the most complete research instrument. Knowing your experience in the field of the said research, the researcher would like to ask for your assistance in validating the said instrument. Your suggestions will be useful for improving the quality and suitability of research instruments for use in collecting data for this research.

Sincerely,

(Assistant Professor Dr. Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Appendix B

Official Letter

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for data collection

Dear President of Guangxi Normal University

Attachment 1. 111 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for data collection

Dear President of Guilin University of Electronic Science and Technology

Attachment 1. 93 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for data collection

Dear President of Guilin University of Technology

Attachment 1. 71 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/ 5015

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for data collection

Dear President of Guilin Institute of Aerospace Industry

Attachment 1. 72 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for data collection

Dear President of Guilin Institute of Tourism

Attachment 1. 24 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

9 July 2023

Subject Request for data collection

Dear President of Guilin Medical College

Attachment 1. 32 copies of the questionnaire
2. Structured interview

Regarding Mrs. Wang Liliwith student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Assistant Professor Dr. Patchara Dechhome Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

In this research, the researcher requires to collect data for the said research. Therefore, the researcher requested to collect the data to be used in the research.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for evaluation of strategies

Dear President of Guangxi Normal University
Attachment Evaluation sheets

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

The strategies for improving the level of educational technology literacy of teachers will be developed in this research. Knowing administrators in your university have experience in the field of the said research, the researcher would like to ask for their assistance in evaluating the strategies. The researcher is glad to hear their suggestions for the improvement of the strategies for improving the level of educational technology literacy of teachers. their positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/ [illegible]

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for evaluation of strategies

Dear President of Guilin University of Electronic Science and Technology

Attachment Evaluation sheets

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

The strategies for improving the level of educational technology literacy of teachers will be developed in this research. Knowing administrators in your university have experience in the field of the said research, the researcher would like to ask for their assistance in evaluating the strategies. The researcher is glad to hear their suggestions for the improvement of the strategies for improving the level of educational technology literacy of teachers. their positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

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Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for evaluation of strategies

Dear President of Guilin University of Technology

Attachment Evaluation sheets

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

1. Associate Professor Dr. Jittawisut Wimuttipanya Advisor
2. Associate Professor Dr. Niran Sutheeniran Co-advisor
3. Assistant Professor Dr. Kulsirin Aphiratvoradej Co-Advisor

The strategies for improving the level of educational technology literacy of teachers will be developed in this research. Knowing administrators in your university have experience in the field of the said research, the researcher would like to ask for their assistance in evaluating the strategies. The researcher is glad to hear their suggestions for the improvement of the strategies for improving the level of educational technology literacy of teachers. their positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate school
Bansomdejchaopraya Rajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for evaluation of strategies

Dear President of Guilin Institute of Aerospace Industry

Attachment Evaluation sheets

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Bansomdejchaopraya Rajabhat University
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7 July 2023

Subject Request for evaluation of strategies

Dear President of Guilin Institute of Tourism

Attachment Evaluation sheets

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

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Ref. No. 0643.14/

Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

7 July 2023

Subject Request for evaluation of strategies

Dear President of Guilin Medical College

Attachment Evaluation sheets

Regarding Mrs. Wang Lili with student code 6373104012, a doctoral student majoring in the Educational Administration program at Bansomdejchaopraya Rajabhat University. The thesis is entitled "The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi". The thesis committee is as follows:

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Sincerely,

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Dean of Graduate school
Bansomdejchaopraya Rajabhat University

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Fax. (662) 4737000

Appendix C

Research Instruments

Questionnaire

Dear teacher:

Hello, welcome to participate in the questionnaire survey of "the current situation of the educational technology literacy level of university teachers in Guangxi". The purpose of this questionnaire is to understand the current situation of the educational technology literacy of university teachers in Guangxi under the background of educational informatization in Guangxi, so as to help study the strategy of improving the educational technology literacy of university teachers in Guangxi. There is no right or wrong in the answer to each question. I hope you can take time out of your busy schedule to give support, and make a choice based on your actual situation. This questionnaire survey is only used as a reference for academic research. Any information you provide is strictly confidential. Please rest assured that you can fill it out. Thank you for your assistance!!

Part I: respondent status (personal information)

1. Gender

(1) Male

(2) Female

2. The highest degree

(1) Bachelor's degree

(2) Master's degree

(3) Doctor's degree

3. Your teaching discipline

(1) Liberal arts (including philosophy, economics, law, education, literature, history, management, art, military science)

(2) Science (including Science)

(3) Engineering (including engineering, agriculture, and medicine)

4. Your age

(1) From 20-30 years old

(2) From 31-40 years old

(3) From 41-50 years old

(4) Over 51 years old

5. Your title

(1) Professor

(2) Associate professor

(3) Lecturer

(4) Teaching assistant

6. Your university

(1) Guangxi Normal University

(2) Guilin University of Electronic Technology

(3) Guilin University of Technology

(4) Guilin Institute of Aerospace Technology

(5) Guilin Medical College

(6) Guilin Tourism College

Part 2: Questionnaire: The status quo survey of the educational technical literacy level of universities teachers in Guangxi

5 express is very consistent

4 express is more consistent line

3 express is uncertainty

2 express is nonconformity

1 express is Very non-compliant

	The status quo of the educational technical literacy level of university teachers in Guangxi	5	4	3	2	1
	Educational technology awareness					
1	You have the willingness to actively learn and use educational technology resources					
2	You have the initiative to carry out educational technology practice, exploration and innovation					
3	You have the confidence and determination to overcome the difficulties and challenges encountered in the practice of educational technology					

Questionnaire(continue)

	The status quo of the educational technical literacy level of university teachers in Guangxi	5	4	3	2	1
	Educational technology knowledge and skills					
4	You understand the connotation and characteristics of common educational technologies, and the procedures and methods to solve problems					
5	You can master the principles and methods of choosing educational technology, equipment, software and platform in education and teaching					
6	You can skillfully operate and use educational technology equipment, software, platform, to solve common problems					
7	You can skillfully solve the problems of using educational technology					
	Educational technology application					
8	You can use educational technology evaluation tools to analyze students' learning conditions					
9	You can collect through multiple channels, and according to the teaching needs to select, manage, and produce the educational resources of educational technology					
10	You can design teaching activities that integrate the resources of educational technology according to the teaching objectives					
11	You can use the resources of educational technology to break through the time and space constraints, and create a combined online and offline learning environment					
12	You can use the resources of educational technology to organize orderly teaching activities to enhance student participation and communication initiative					
13	You can use educational technology tools to collect student feedback in real time, improve teaching behavior, optimize teaching links, and regulate the teaching process					

Questionnaire(continue)

	The status quo of the educational technical literacy level of university teachers in Guangxi	5	4	3	2	1
	Social responsibility for educational technology					
14	You abide by the Internet laws and regulations, consciously regulate the online behavior					
15	You can guide students to properly choose and use the resources of educational technology to support learning, focusing on cultivating students' sense of social responsibility					
16	You use educational technology products and services by following the principles of proper necessity, informed consent, clear purpose and security, and respect intellectual property rights					
17	In the education and teaching work, you should pay attention to the security management and maintenance of the information and privacy data of individuals, students, parents and others					
18	You can identify, prevent and deal with the network risk behavior					
	Educational technology professional development					
19	You can use educational technology resources to learn according to your personal development needs					
20	You can use educational technology resources to analyze your personal teaching practice and support teaching reflection and improvement					
21	You can take the initiative to participate in or host the network research community, learn together, share experience, seek help and solve problems					
22	You can use educational technology resources to support educational research activities according to the teaching problems of educational technology					

Part 3: Influencing factors and promotion ways

1 .Do you think the main factors that affect your use of educational technology in process the teaching?)multiple choice(

A. Lack of necessary educational information equipment and environmental support

B.The teaching management does not pay enough attention , and lacks the corresponding intelligent teaching atmosphere

C. cational technology operation skills and knowledge theoryLack of necessary modern edu

D. Traditional teaching methods and concepts are deeply rooted

E. Unable to use a variety of strategies to regulate the time duration, rhythm and sequence of technology application and non-y application in real time to technolog maintain students' interest and attention

F. Lack of contingency plans to deal with emergencies arising in teaching

2 .What do you think are the factors that affect the improvement of teachers' educational technical literacy?) multiple choice(

A. Development of national policies on teachers' education technology and literacy

B. Environment and atmosphere of educational technology in colleges and universities

C. university Perfect the training system of educational technology literacy for teachers

D.Colleges and universities attach great importance to the specific implementation and attention of the policies related to teachers' education and technical literacy

E. sGuarantee related resources to promote the development of teacher' educational technology literacy, such as teaching resources, educational technology literacy improvement courses, educational technology platform, etc

F. Intellectual support from the educational technology literacy research team

G.rt from the teacher education technology professional Organizational suppo development community

H.Incentive mechanism of colleges and universities for teachers to use educational technology in teaching

I.Technical support from the society and enterprises

J.Teacher 'asons own re

Interview

Strategies for Improving the Educational Technical Quality Level of College Teachers in Guangxi

Interview outline:

1. What do you think are the problems in the cultivation of teachers' educational technical literacy in your school?

2. What do you think are the factors that affect your own educational technology literacy level?

3. What suggestions do you have to improve the educational and technical literacy level of the teachers in your university? (From the government, universities, teachers and other aspects of the proposal)

Assessment Form

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	Suitability				
		5	4	3	2	1
1. Government aspects						
1	The state formulates relevant policies for the improvement of educational technology literacy					
2	The state has formulated a management system for educational technology information in colleges and universities to ensure the security of educational technology information and standardize the safety behavior of educational technology					
3	The state establishes the supervision mechanism of educational technology literacy and evaluates the moral behavior of educational technology					
4	The state to strengthen the improvement of educational technology literacy funds input					
5	The state has built and improved a platform for resource sharing and information exchange conducive to the improvement of educational technology literacy					

Assessment Form (continue)

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	Suitability				
		5	4	3	2	1
2. University aspect						
6	Colleges and universities actively improve and implement the relevant supporting policies for the improvement of teachers' education technology literacy					
7	Create a full-coverage and multi-level systematic training mode that combines overall improvement and classified guidance					
8	Establish a multi-functional digital literacy platform integrating skill evaluation, online courses, self-study platform, skill training, skill assessment and so on					
9	We will improve the level of educational information infrastructure construction					
10	Simplify the process of using educational technology tools					
11	To build a cooperative community of teacher education and technical literacy learning					
12	Build an educational technology literacy research team					
13	Colleges and universities hold various educational informatization competitions					

Assessment Form (continue)

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	Suitability				
		5	4	3	2	1
3. Teacher's own development aspect						
14	Teachers should improve own educational technology awareness, improve their awareness of independent learning, and stimulate the internal driving force of educational technology development					
15	Teachers should strengthen their own educational technology knowledge and skills, and actively try the use of educational technology tools in teaching					
16	Teachers should consolidate their own educational technology application, and actively design the teaching activities integrating the resources of educational technology according to the teaching objectives					
17	Teachers should enhance their own educational technology social responsibility, abide by Internet laws and regulations, consciously regulate various online behaviors, and pay attention to the management and protection of personal and students' information and private data					
18	Teachers should strengthen their own planning of educational technology professional development and pursue the professional development of educational technology literacy					

Appendix D

The Results of the Quality Analysis of Research Instruments

The Results of the Quality Analysis of Research Instruments

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	**IOC**	**Validity**
	Educational technology consciousness		
1	You have the willingness to actively learn and use educational technology resources	1	Valid
2	You have the initiative to carry out educational technology practice, exploration and innovation	1	Valid
3	You have the confidence and determination to overcome the difficulties and challenges encountered in the practice of educational technology	1	Valid
	Educational technology knowledge and skills		
4	You understand the connotation and characteristics of common educational technologies, and the procedures and methods to solve problems	1	Valid
5	You master the principles and methods of choosing educational software and platform in education ,equipment ,technology chingand tea	1	Valid
6	,You are proficient in using educational technology equipment and platforms ,software	1	Valid
7	You can skillfully solve the problems of using educational technology	1	Valid
	Educational technology Application	1	Valid
8	You can use the educational technology evaluation tools to analyze the students' learning conditions	1	Valid
9	You can collect through multiple channels, and according to the teaching needs to select, manage, and produce the educational resources of educational technology	1	Valid
10	You can design teaching activities that integrate the resources of educational technology according to the teaching objectives	1	Valid

The Results of the Quality Analysis of Research Instruments (continue)

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	**IOC**	**Validity**
12	You can use the resources of educational technology to break through the limitation of time and space and create a learning environment integrating network learning space and physical learning space	1	Valid
13	You can use the resources of educational technology to organize orderly teaching activities to enhance student participation and communication initiative	1	Valid
14	You can use educational technology tools to collect student feedback in real time, improve teaching behavior, optimize teaching links, and regulate the teaching process	1	Valid
	Educational Technology Social Responsibility		
15	You abide by the Internet laws and regulations, consciously regulate the online behavior	1	Valid
16	You can guide students to properly choose and use the resources of educational technology to support learning, focusing on cultivating students' sense of social responsibility	1	Valid
17	You use educational technology products and services by following the principles of proper necessity, informed consent, clear purpose and security, and respect intellectual property rights	1	Valid
18	In the education and teaching work, you should pay attention to the security management and maintenance of the information and privacy data of individuals, students, parents and others	1	Valid
19	You can identify, prevent and deal with the network risk behavior	1	Valid

The Results of the Quality Analysis of Research Instruments (continue)

	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi	**IOC**	**Validity**
	Educational technology professional development		Valid
20	You can use the educational technology resources to learn according to your personal development needs	1	Valid
21	You can use educational technology resources to analyze your personal teaching practice and support teaching reflection and improvement	1	Valid
22	You can take the initiative to participate in or host the network research community, learn together, share experience, seek help and solve problems	1	Valid
23	You can use educational technology resources to support educational research activities according to the teaching problems of educational technology	1	Valid

The Results of reliability tests of the questionnaire

Dimension	Cronbach's Alpha coefficient
Total	0.965

The Results of tests for KMO and Bartlett

	Sample a sufficient Kaiser-Meyer-Olkin metric	The sphericity test of Bartlett approximates the chi-square	df	Sig
Total	0.957	8167.93	231	.000

The Results of interview

Personal information of interviewee

Interviewee	Education background	Interview Date	Interview Time
Interviewee 1	Education: Doctor's degree Expertise: Education management Work experience: 30 years Interview subjects: Managers	June 15st ,2023	9:00 am GMT +8 30 minutes
Interviewee 2	Education: Doctor's degree Expertise: Measurement and evaluation Work experience: 25 years Interview subjects: Managers	June 15st ,2023	9:30 am GMT +8 30 minutes
Interviewee 3	Education: Doctor's degree Expertise: Human recourses management Work experience: 20 years Interview subjects :Managers	June 15st ,2023	10:00 am GMT +8 30 minutes
Interviewee 4	Education: Doctor's degree Expertise: Marketing management Work experience: 11 years Interview subjects: Managers	June 15st ,2023	10:30 am GMT +8 30 minutes
Interviewee 5	Education: Doctor's degree Expertise: Educational technology Work experience: 20years Interview subjects: Managers	June 15st ,2023	11:00 am GMT +8 30 minutes
Interviewee 6	Education: Doctor's degree Expertise: Public Service Administration Work experience: 8years Interview subjects: Managers	June 15st ,2023	11:30 am GMT +8 30 minutes

Personal information of interviewee (continued)

Interviewee	Education background	Interview Date	Interview Time
Interviewee 7	Education: Doctor's degree Expertise: Clinical medicine Work experience: 20 years Interview subjects: Full-time teachers	June 15st ,2023	12:00 am GMT +8 30 minutes
Interviewee 8	Education: Doctor's degree Expertise: Management of the economy Work experience: 10 years Interview subjects: Full-time teachers	June 15st ,2023	14:00 am GMT +8 30 minutes
Interviewee 9	Education: Doctor's degree Expertise: Mathematic Work experience: 6 years Interview subjects: Full-time teachers	June 15st ,2023	14:30 am GMT +8 30 minutes
Interviewee 10	Education: Doctor's degree Expertise: Physics Work experience: 12 years Interview subjects: Full-time teachers	June 15st ,2023	15:00 am GMT +8 30 minutes
Interviewee 11	Education: Doctor's degree Expertise: Industrial intelligence Work experience: 5 years Interview subjects: Full-time teachers	June 15st ,2023	15:30 am GMT +8 30 minutes
Interviewee 12	Education: Doctor's degree Expertise: Geographical science Work experience: 30 years Interview subjects: Full-time teachers	June 15st ,2023	16:00 am GMT +8 30 minutes

Original transcript of the interview

Interviewee 1

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

(1) The dynamic mechanism for teachers to improve educational technology literacy is not perfect. The incentive and guarantee measures for teachers' educational technology literacy in schools are not unclear. And the investment in the cultivation of teachers' educational technology literacy is insufficient and lack of driving force. Therefore, most teachers seem content with their existing information technology skills, and hence, adhere to archaic teaching models.

(2) The training system of teachers' educational technology literacy has not been normalized and systematized. Every year, the school will provide training for the improvement of teachers' educational technology literacy. Its scope of the training can cover all the teachers in the school. However, the training theme and training content are relatively general. The training form is single and not deep enough, so it is unable to carry out targeted and accurate training according to the actual needs of teachers. Moreover, the quality of training is inadequate, rendering it insufficient in enhancing teachers' educational technology literacy competencies. In addition, the lack of consistency in training cannot run through all aspects of teachers' teaching, assessment, evaluation and so on, and there is no unified evaluation standard.

(3) The support of school hardware and software and other resources is insufficient. At present, the school has been basically equipped with intelligent classroom equipment, but most of the classrooms are used for daily classroom teaching. It has not yet formed a cluster; teachers cannot timely deploy various intelligent teaching resources according to the needs. Most of the existing software and hardware resources are not unified, and the functions of different technical equipment are also different. The teachers are unable to achieve a variety of teaching effects by mastering only one kind of educational technology. And they are also hindered in the selection and use of resources. To a certain extent, it will reduce teachers' enthusiasm to improve educational technology literacy.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

The support and importance of the school incentive and security mechanism. The level of campus infrastructure construction. The subject content of the relevant training and the allocation of experts. The atmosphere of the Application of Educational Technology and Teachers' Awareness of Educational Technology.

3.What suggestions do you have to improve the educational and technical literacy level of college teachers?(From the government, universities, teachers and other aspects of the proposal)

(1) The government should have a high profile, and the top-level strategy should be optimized. Study the relevant policies, content construction, and development direction for improving teachers' educational technology literacy. This will help in integrating university teachers, educational technology and higher education teaching into the wider context of regional education development. The layout and planning should consider the relationship between education and technology, differences in the development of colleges and universities, as well as the enthusiasm and practical abilities of teachers to improve their educational technology literacy. This will help in optimizing and enhancing the overall plan for improving teachers' educational literacy.

(2) Colleges and universities ought to enhance their internal systems' architecture and refine the guarantee mechanism to promote teachers' educational technology literacy. Under the guidance of the national policy, we should establish and improve the management system and working norms related to the improvement of teachers' educational technology literacy, increase the support of special funds to ensure that full-time people are responsible for the special work. According to the orientation of the school, we should establish the path to improve the construction and development of teachers' educational technology literacy, and formulate an information literacy assessment, evaluation and incentive mechanism in line with the actual needs of schoolteachers. That is aiming to improve teachers' enthusiasm to actively improve educational technology literacy, to improve the construction of various infrastructure, especially to integrate new technologies, new

applications and new resources, to build a platform for teachers to carry out information-based teaching, and to optimize the software and hardware environment for the application of modern information technology, to provide strong support for the promotion of teachers' educational technology literacy, and finally to pay attention to strengthen publicity and guidance, strengthen teachers' awareness of the promotion of educational technology literacy. The school carries out the relevant training of teachers' educational technology literacy from time to time. Based on the guidance and support of the school, the teaching and research departments carry out mixed teaching method reform training on this professional discipline.

(3) The teachers should do correcting their thinking, strengthening the consciousness of the integration of teaching and educational technology, being good at innovation, changing the traditional teaching mode, absorbing advanced educational technology ideas, and making use of educational technology to carry out teaching activities. At the same time, the teachers should improve their own educational technology teaching knowledge and skills, actively improve the application ability of educational technology, and actively improve personal educational technology literacy by participating in training, online training videos and other ways. To create a strong atmosphere for teachers is to improve their educational technology literacy. Encouraging the teachers is to improve their educational technology literacy in the form of teaching research or competitions, such as encouraging teachers to implement online curriculum construction every year. Organizing teachers' information-based teaching ability competitions, teachers' micro-lesson production competitions, etc. are to guide teachers to improve the level of educational technology literacy.

Interviewee 2

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

The acceptance of some teachers is not high. The sense of innovation is not strong enough. And the enthusiasm of literacy training is not high.

There are no special documents and regulations. The main measures are to introduce training for teachers to study voluntarily free of charge , to hold some lectures to help teachers raise their awareness.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

Teachers are so complicated that they can't settle down and concentrate on teaching. There is no awareness of the improvement of the level of educational technology literacy, there is not much active improvement, passive improvement, waiting, relying on push, to move forward.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

Reduce some of the work of teachers, encourage teachers to participate in training, raise awareness and improve their level.

Interviewee 3

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

(1) It is easy to cultivate at the technical level, but difficult to change the concept.

(2) The cultivation of conventional technology is easy, but the cultivation of advanced technology is difficult.

(3) New technology is being accepted slowly, and the frequency of usage is insufficient. The level of integration between new technology and teaching needs to be improved.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

(1) Psychological factors: the development and application of technology are endless, and the excessive pursuit of technology leads to a sense of tiredness. So, when the existing technical means can maintain normal teaching, there is no motivation for further improvement. Technology is an auxiliary means after all. In the final analysis, how good the class is depending on the teachers' knowledge and teaching art level.

(2) conditional factors: the existing network environment and classroom conditions of the school are not ideal. And the teachers encounter difficulties in using technology, which hinders the application of educational technology.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

It is suggested to set up a systematic training program, from concept to technology to application.

It is to carry out relevant training, stipulate the credit requirements for the improvement of information-based teaching ability. Carrying out the construction of information-based education and teaching projects to reward teachers who have won prizes in the information-based teaching competition at or above the provincial level.

Development of relevant documents.

Interviewee 4

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

Mainly in terms of rational application, teachers are lack of creativity;

Lack of a systematic training program;

The use of software tools still needs to be strengthened.

The learning, use and mastery of the software system need a certain amount of time and energy, such as the unstable operation of the teaching management system (such as the class signing system), the existence of several systems and poor function integration will cause a certain degree of trouble to themselves.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

The lack of enthusiasm of teachers in teaching and research is mainly due to the lack of motivation for teaching.

University system and platform construction.

The teacher's own practical skills.

Personal awareness, preference, acceptance ability, use effect;

Training method, training intensity and assessment requirements

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

Policy guidance should be strengthened. The schools should be guided and encouraged from the promotion of professional titles and rewards. And the teachers need to devote more energy to teaching and research. The teachers are required to voluntarily participate in all kinds of training and learning.

Interviewee 5

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

It is lacking training and technical support for specialized organizations and professionals.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

The breadth and depth of training. The support of professionals.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

Full-time research and technical support departments for modern educational technology will be established to enable colleges and universities to share resources and help each other. It is more likely to cooperate with educational technology companies, with the help of their platforms and technical support.

Interviewee 6

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

Firstly, the investment in teachers' educational technology training is insufficient. Secondly, the training means are single. The school carries on the modern educational technology training to the teacher, and the main development mode is an expert to speak. The teacher listens, uses the traditional lecture type training method. This training model does not take into account the individual needs of teachers, many teachers think that just listen to quickly forget. Their own application level still cannot be improved, the training effect is not ideal. Thirdly, teachers' theory of educational technology is relatively weak, like the core competence of educational technology, and the integration of information technology and curriculum. They stay on the surface, lacking the ability of teaching design with modern educational theory, and cannot combine information technology with their own teaching organically. The ability to master new technology is not enough, especially the ability to develop and design teaching systems and teaching resources is not enough, and the teaching methods are relatively old.

2. What do you think are the factors that affect the improvement of teachers' educational technology literacy in your school?

Information environment and resource facilities in colleges and universities; teachers' own subjective initiative.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

The government: we should attach importance to the level of modern educational technology of teachers, issue corresponding policies, formulate unified training standards, and standardize the training activities of modern educational technology These points are to purpose that the content of the training activities can be more scientific and perfect. Only by participating in modern educational technology training activities, can the teachers effectively improve their modern educational technology literacy.

Colleges and universities: firstly, we should pay attention to the construction of educational information environment, materialization information environment, and improve the multimedia teaching equipment system and network system. That have teachers caried out teaching practice activities using information technology. The second place is to formulate policies to encourage teachers to use educational technology to optimize teaching and reform the teaching model. The third one is to set up training institutions specially for training teachers' information technology literacy and educational technology literacy, uniformly coordinate the human, material and intellectual resources needed in the process of cultivating educational technology literacy, and provide support for teachers' educational technology training funds. Organizing a team of educational technology training experts is to earnestly implement the cultivation and promotion of teachers' educational technology literacy.

Increasing investment in equipment and constantly optimizes the information environment of the campus. Schools can fully realize the important role of information environment in educational informatization and increase the investment and construction of information equipment such as multimedia classrooms, intelligent classrooms and computer rooms, so as to facilitate the teaching and learning of teachers and students.

Teachers: teachers must adapt to the new requirements of the information society, change teaching concepts, and strengthen the cultivation of their own information technology literacy and educational technology literacy, to meet the needs of educational informatization.

Interviewee 7

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

(1) The teachers lack educational technology knowledge and skills and unable to skillfully apply educational technology tools to support teaching.

(2) The connection is vacant between educational technology and curriculum design. It is impossible to combine educational technology with curriculum design organically and to design interactive and interesting teaching links to stimulate

students' interest and enthusiasm in learning.

(3) They are not familiar with the use of educational information technology (such as software use, equipment setting, etc.) and lack of corresponding technical knowledge and skills.

(4) How to design interactive and interesting teaching links with the combination of educational information technology and teaching content? Achieve the desired teaching effect?

(5) The teachers lack corresponding training and support and unskilled in the use of technology, unwilling to try.

(6) The teacher’s training is not comprehensive enough, lack of relevant training, and cannot make full use of educational technology to support teaching.

(7) Due to the lack of the application of educational technology, many teachers lack the experience and knowledge of applying educational technology to practical teaching.

(8) They lack evaluation mechanism: many educational technology training lack evaluation mechanism to evaluate the effectiveness of training and provide feedback.

2. What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

(1) Support from schools and related departments. Provide necessary technical support and resource input for teachers and provide training courses and resources for teachers.

(2) Evaluation and feedback mechanism. Understand the level of teachers' educational technology literacy and provide feedback and suggestions to help teachers to continuously improve and improve their educational technology literacy.

(3) Learning atmosphere and culture. Create a positive learning atmosphere and culture, establish an educational technology community, promote communication and sharing among teachers, and strengthen interaction and support among teachers.

(4) Technical knowledge and skills. Possess the necessary technical knowledge and skills and be able to flexibly apply educational technology tools to support teaching.

(5) Practical experience. Being familiar with the teaching scene and students' needs, can organically combine educational technology with curriculum design, and design interactive and interesting teaching links.

(6) Studying attitude and habit. Have a positive learning attitude and habits, willing to continue to learn and explore new educational technology applications, and constantly improve their own educational technology literacy level.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

(1) Strengthen the training of educational technology. Provide teachers with diversified and flexible educational technology training, including online learning, face-to-face lectures, seminars, etc., to keep teachers abreast of the latest development and application of educational technology.

(2) To organize the sharing of educational technology application cases. Organize the sharing of educational technology application cases, let teachers learn and communicate with each other, and share their experiences and experiences in the application of educational technology.

(3) Provide necessary technical support and resources. Provide teachers with the necessary technical support and resource input, including educational technology equipment, software tools, technical services, etc., so that teachers can more easily use educational technology to support teaching.

Interviewee 8

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

(1) It takes a certain amount of time and energy to learn, use and master software systems. For example, the unstable operation of the teaching management system (such as the lesson marking system), the existence of several systems and poor functional integration will cause a certain degree of trouble to themselves.

(2) The use of software tools needs to be strengthened.

(3) The teachers Lack a systematic training plan.

(4) The teachers are not skilled enough in mastering the technology. For example, in class tests and interactions, use less.

2. What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

System and platform construction. Practical skills.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

The era of technology requires that the teachers themselves must learn to master the use of a variety of related software and hardware in order to better adapt to the development of the times.

Interviewee 9

1.What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

(1) Some information technology has requirements for hardware, but school facilities and students' tools cannot keep up. For example, the school's wisdom classroom is limited. Some multimedia classroom equipment needs to be updated, and many students only have mobile phones. It is not convenient to use information technology to learn. (2) The large class teaching of some courses is not conducive to the use of new technologies and new tools in teaching.

(3) There are deficiencies in designing effective teaching activities according to students' characteristics and teaching conditions.

(4) There are deficiencies in carrying out the integration of information technology and curriculum and exploring the effective ways of the integration of information technology and curriculum.

(5) There are deficiencies in providing students with opportunities to practice with various technologies and targeted guidance.

(6) Colleges fail to guide teachers to actively carry out the integration of information technology and curriculum, and to explore effective ways to integrate information technology and curriculum.

(7) Colleges fail to guide teachers to conduct research on the application of educational technology combined with subject teaching.

(8) Colleges fail to make full use of information technology to learn professional knowledge and develop teachers' professional ability.

(9) Colleges unable to cooperate and communicate with technicians in the design, selection and development of teaching resources.

2. What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

(1) The school does not pay enough attention to the cultivation of teachers' educational technology literacy.

(2) The school lacks opportunities to communicate and cooperate with subject experts and educational technology experts on the application of educational technology.

(3) The hardware and software conditions are insufficient.

(4) The colleges and universities attach importance to the cultivation of teachers' educational technology literacy.

(5) The teachers lack opportunities to communicate and cooperate with subject experts and educational technology experts on the application of educational technology.

(6) The hardware and software conditions are insufficient.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

The government should start from the overall situation, build some open courses for teachers' educational technology literacy level, and give some funding to related research in the form of projects.

According to the actual situation and needs of teachers, the schools should organize teacher training to improve teachers' ability to apply information technology. The goal of teacher training should be divided into two levels: popularizing and improving. At the popularization level, it is mainly to cultivate the general teachers' basic knowledge and skills of information technology, so that they can use

information technology in their own disciplines; the two can integrate and complement each other to improve the quality of subject teaching. To improve the level, it is mainly aimed at the teachers of information technology courses and the backbone of educational technology, and the purpose is to train the leaders of information science and technology. Among them, it is further to guide the general teachers' further study of information technology. To promote the teaching of information technology courses in schools and the level of integration with other disciplines. In addition, the training of information technology should be targeted and effective. On the one hand, it is necessary to carry out targeted training on the combination of information technology and curriculum teaching. On the other hand, it is necessary to formulate a practical training plan according to the existing technical level of teachers and the actual needs of teaching.

Every teacher in the information age should learn new skills, acquire new understanding and establish new beliefs with the spirit of exploration and continuous learning. First of all, the teachers must enhance their awareness of self-development. To be the teachers, they should apply network technology for learning, teaching and scientific research, otherwise. They will just take a look at this new tool. Secondly, they should strengthen the application of information technology and accumulate experience and increase talents in the practice of integration. Teachers' professional knowledge and skills should be based on "practical knowledge". Finally, in order to make the integration more effective, teachers must reflect on their own integration practice as researchers and strive to improve their teaching behavior and teaching level.

Interviewee 10

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

There are so many routine tasks that the teachers spend less energy on teaching.

Teacher in the study of homework assignment has a good effect, but it will seriously affect the teaching progress. The assignment of objective questions is easy to plagiarize. The assignment of subjective questions teachers' teaching tasks is aggravated. It is not well balanced.

Teachers lack the skills of educational technology and use them less frequently.

In addition, some students will use network resources to search for answers, resulting in poor teaching results. Informatization is a double-edged sword, in the student side, the disadvantages outweigh the advantages. How to make good use of the information platform is a problem that teachers need to think deeply when teaching.

2.What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

Information consciousness, information accomplishment, information ability and information creation. Self-consciousness, personal technical ability, information processing ability.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

Increase the construction of intelligent classrooms. The government can provide some relevant supporting funds, the schools can increase the proportion of teaching effectiveness in the promotion of professional titles and enhance the enthusiasm of teachers. In this way, teachers may invest more time to reform teaching methods and improve teaching effectiveness.

The government can provide some relevant supporting funds, and schools can increase the proportion of teaching effectiveness in terms of promotion of professional titles to enhance the enthusiasm of teachers. In this way, teachers may invest more time in reforming teaching methods and improving teaching effectiveness. It is necessary to enrich teaching resources.

Interviewee 11

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

There are still many training activities for teachers' educational technology literacy, but the form of activities is relatively single, and many forms of activities can be carried out.

At present, it is mainly the use of multimedia network, which can help teachers to get the latest and diverse teaching information. However, the network information is uneven, true and false, which needs to be strictly reviewed by teachers.

Teacher had few kinds of educational technology mastered, and only one or two are skillfully mastered.

2.What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

Educational technology literacy training and other related activities organized by the school.

The learning of school teachers improves the atmosphere of educational technology.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

From the perspective of colleges and universities, the teachers can strengthen the links between universities and universities, carry out cooperative training, exchanges and other forms of activities to improve the level of educational technology literacy among colleges and universities.

As far as teachers are concerned, it is the self-learning situation, the mastery of resources. The second one is to participate in the training activities. In addition to, the training organized by schools, they can make use of the characteristics of the information age, online search and collection of relevant teachers' educational technology literacy knowledge, comprehensive use of various resources to improve self-level.

Interviewee 12

1. What problems do you think exist in the cultivation of teachers' educational technology literacy in your school at present?

The popularity is not high enough, and most teachers are unwilling to change the original education model.

The teachers are not familiar with the operation of the platform, and then

some of the functions are not comprehensive. The specific difficulty is that some students feel that they have increased their learning burden and are reluctant to cooperate.

2. What factors do you think affect the improvement of teachers' overall educational technology literacy in your school?

The awareness of educational technology, learning attitude, learning methods and strategies, self-reflection and continuous learning need to be improved.

3. Do you have any suggestions to improve the educational technology literacy of teachers in your school? (put forward suggestions from the government, universities, teachers, etc.).

(1) The government: formulate relevant educational technology policies, provide corresponding resources and infrastructure, organize educational training and seminars, and provide more training and support for educators.

(2) In colleges and universities, educational technology courses are set up, teachers are trained and supported in many aspects. Teachers are encouraged to carry out educational technology research and innovation.

(3) The teachers: improve the ability of continuous learning and have a clear plan for personal self-development. Keep up with the development of educational technology and strive to improve personal skills and practical application. Awareness of educational technology, learning attitude, access to learning resources and opportunities, learning methods and strategies, practical application and so on.

The platform and techniques used are relatively simple. The teachers also need to learn a variety of educational technology tools to better serve teaching. Fewer opportunities to participate in courses, training and seminars.

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mrs.Lili Wang

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 13th February 2022

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Accept Research / Full Paper

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Acceptance Letter

Dear Author(s): **Wang Lili, Jittawisut Wimuttipanya, Niran Sutheeniran, Kulsirin Aphiratvoradej, Patchara Dechhome**

Paper ID	JHEU_284
Paper Title	The Strategies for Improving the Level of Educational Technology Literacy of Teachers in Universities in Guangxi

This is to enlighten you that the above manuscript was reviewed and appraised by the review committee members of **IFERP** and it is accepted for the purpose of publication in the **"Journal of Harbin Engineering University (JHEU)"**.
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