

# The Implications, Challenges, and Pathways of Digital Transformation of University Education in China

Xuncheng Miao<sup>1</sup>, Ahmad Yahya Dawod<sup>2</sup> and Aniwat Phaphuangwittayakul<sup>3</sup>

International College of Digital Innovation, Chiang Mai University, Chiang Mai, 50200, Thailand<sup>1</sup>

E mail: xuncheng\_m@cmu.ac.th

International College of Digital Innovation, Chiang Mai University, Chiang Mai, 50200, Thailand<sup>2</sup>

E mail: ahmadyahyadawod.a@cmu.ac.th

International College of Digital Innovation, Chiang Mai University, Chiang Mai, 50200, Thailand<sup>3</sup>

E mail: aniwat.ph@cmu.ac.th

## Abstract

The global outbreak of the Newcastle pneumonia epidemic has resulted in the greatest public crisis that all of humanity is facing since World War II. During the outbreak, it affected about 190 countries worldwide, disrupting the schooling of nearly 1.6 billion students [1]. By the end of 2020, nearly half of the world's schools will still be in full or partial shutdown status, and close to about 1/3 of students will not be able to participate in distance learning. In the flood of schools challenged by education disruption, low- and middle-income developing countries face an even more severe test. In 2020, about 826 million students worldwide will not be able to participate in online learning because they do not have computers at home, and 706 million students will not be able to continue their education because they do not have an Internet connection [2]. With the advent of the post-epidemic era, university education is entering the network society more deeply, and educational resources, teaching activities, and educational governance will be further expanded. Facing the new educational evolution, especially online educational teaching, and educational management, the importance and necessity of digital transformation is more obviously exposed. This paper integrates the survey and analysis method, literature research method, descriptive research method, etc., through data collection and access to relevant literature and policy documents, to gain a comprehensive and correct understanding of them, to understand the existing phenomena, laws, and theories through their own understanding, and also based on the practical experience of UNESCO University Education Innovation Center (Shenzhen, China) and universities in coastal areas, through research and analysis, through analysis, comparison, generalization and conclusion, we can conclude why the digital transformation of university education is necessary? What are the challenges of the transformation? How do we go about the transformation, that is, to find out the transformation path? Through this study, we will find out the diversified, comprehensive, and implementable paths for the digital transformation of university education in China in the post-epidemic era, and put forward reasonable and constructive suggestions to help China and other countries, especially developing countries, to choose the appropriate development paths and ensure the high-quality completion of the digital transformation of university education in the light of their own national conditions and actual situations.

**KEYWORDS:** University Education, Digital Transformation, Challenges; Pathways



## 1 INTRODUCTION

This paper uses digital transformation as a medium to study the basic connotation and meaning of digital transformation of university education in the post-developed era, the challenges faced and the path of sustainable development, and finally gives suggestions for the digital transformation of university education, so as to provide a reference basis for China and other countries in the process of digital transformation, and to support countries in the path of digital transformation to identify problems and analyze the causes in time, so as to provide developing countries in the process of digital transformation, and support them in analyzing the causes and choosing the appropriate path on the path of digital transformation, so as to ensure that the digital transformation of university education in each country can be completed with high quality and speed.

## 2 LITERATURE REVIEW

General Secretary Xi Jinping stressed the need to apply the development of information technology to promote educational change and innovation; to attach great importance to the profound impact of artificial intelligence on education, and actively promote the deep integration of artificial intelligence and education; to summarize the experience of large-scale online education since the response to the new crown pneumonia epidemic, and to use information technology to update the concept of education and change the education model. A country with a large population like China, although not many, but regardless of the size of the population, only making full use of big data, artificial intelligence and other technologies to build a networked, digital, personalized, lifelong education system, in order to achieve a learning society where "everyone learns, can learn everywhere, can learn at all times". In this context, the global public health crisis of the New Pneumonia epidemic has accelerated the process of digital transformation of university education.

At the international level, UNESCO's Center for Innovation in University Education (Shenzhen, China) and Tsinghua University's Institute of Education have joined hands to conduct research and produce a study report on "Digital Transformation of Teaching and Learning in University Education", as well as the related "Handbook on Hybrid Teaching and Learning Reform", "Handbook on Teaching Competence of University Education Teachers" and "Handbook on Teaching Competence of Vocational Education Teachers". The research report focuses on the digital transformation of teaching and learning, attempting to provide international organizations, governments, universities, enterprises, and other stakeholders with ideas, thoughts, methods, challenges, and countermeasures to deal with the digital transformation of teaching and learning; the three handbooks provide theories, standards, methods and strategies on hybrid teaching and learning, teachers' teaching competence and development, highlighting the "last mile" of digital teaching and learning for practitioners. The three handbooks provide theories, standards, methods, and strategies on blended teaching, teachers' competence, and development, highlighting the "last kilometer problem" of digital teaching for practitioners and researchers. At the same time, the UNESCO platform is used to help countries around the world, especially developing countries, to create inclusive, resilient, open, and high-quality university education and teaching systems that are fit for the future as

they move towards the UNESCO 2030 Education Sustainable Development Goals (UNESCO SDG4) through digital technologies.

These realities reflect from the side that many countries are not yet ready for the big test of digital transformation. Accelerating the pace of digital transformation of university education, vigorously promoting the informatization of university education, the digitization of educational resources, the empowerment of educational technology, and the innovation of educational methods, and leading the high-quality development of university education with digital innovation have become the requirements of the times for the reform of university education in China in the present and future. The article takes the basic characteristics of digital transformation as the starting point and proposes the basic connotation of digital transformation of university education; then elaborates on the dilemma faced by the digital transformation of university education under the dual challenges of epidemic and technology; then proposes the implementation path of promoting digital transformation of university education with the practical experience of UNESCO University Education Innovation Center, which provides a development model for the digital transformation of university education in developing countries. Then, with the practical experience of UNESCO's University Education Innovation Center, we propose a new model for the digital transformation of university education in developing countries, and inspire new ideas for the further development of digital transformation of university education in China.

Before writing this paper, through China Knowledge Network and web search, a large number of literature search, at present, domestic and foreign journals published about only 40 scientific research results related to the digital transformation of university education, but 30,819 related to digital transformation, it can be seen that digital transformation in the economy, finance, industry, manufacturing, and other industries are quite a research and in the development of digital transformation, university. The digital transformation of education is a necessary path, and at the same time, we must speed up and complete the transformation and reform with high quality. For this paper, that is, it is an opportunity and a challenge, in the global epidemic outbreak induced by the digital transformation of university education also shows that the inevitability of the digital transformation of university education, while university education has been affected by the industrial revolution 4.0 brought about by technological advances, but also forced university education in promoting the digital transformation of education in the change, but also with the rapid development of artificial intelligence, big data, blockchain, and other new technologies. More emphasis is placed on the digitalization, networking, and intelligence of university education, and digital transformation must be carried out in a holistic manner. For this reason, exploring the digital transformation of university education has become an emerging field and has attracted widespread attention from scholars.

### **3 RESEARCH METHODOLOGY**

This paper adopts the literature research method, survey analysis method, and descriptive research method to conduct research on related issues. We have conducted a comprehensive discussion and analysis by combining UNESCO's practical experience with various systems, policies, and reports such as "Digital Transformation of University Education", summariz-

ing why digital transformation of university education should be carried out, the challenges China faces in the road of digital transformation, exploring the path of digital transformation, and studying how China should carry out digital transformation. The results of the above study will provide reference and actionable suggestions for China and other countries on the path of digital transformation of university education.

#### **4 SIGNIFICANCE AND PURPOSE OF THE STUDY**

In China, from the policy perspective, digital transformation is a strategic requirement and an innovative path for university education to achieve from a learning revolution to a quality revolution to high-quality development during the 14th Five-Year Plan. The 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Vision 2035 clearly put forward that "accelerating digital development and building a digital China"; the 14th Five-Year Plan for the Development of Digital Economy includes smart education among the top ten digital application fields. In January 2022, the National Education Work Conference proposed the implementation of strategic actions for education digitization; in March 2022, the National Public Service Platform for Smart Education was officially launched; in April 2022, the Ministry of Education and eight other departments issued the "Plan for Strong Teachers in Basic Education in the New Era", proposing the in-depth implementation of pilot actions for artificial intelligence to help build the teaching force; in October 2022, the Party's XX report explicitly calls for promoting the digitization of education and building a learning society and learning power with lifelong learning for all people; in November 2022, the Ministry of Education issued the education industry standard "Teachers' Digital Literacy" to standardize the training and evaluation of teachers' digital literacy and create a teacher force that can adapt to the strategic needs of education digital transformation. This year can be considered as the opening year of the national education digital strategy initiative, and the digital transformation of education has been effective. Looking ahead, the prospects are even brighter, especially when the promotion of education digitization is written into the report of the 20th Party Congress, which can be considered significant and far-reaching. As a major educational strategic decision of the Party, educators have to understand the educational significance and important mission of the strategic action of education digitization.

It can be found that the digital transformation of university education in China is a fundamental change to realize the school education model and talent cultivation, and it also puts forward new requirements for university workers, especially teachers, as the main promoters of the digital transformation of university education, should build digital literacy and develop their own corresponding information and communication technology (ICT) capabilities. The significance of conducting the digital transformation of Chinese university education is mainly.

**Table 1:** *Implications of Digital Transformation of University Education in China*

Implication	Description
Increased access	Making educational materials, resources, and programs available to students and teachers
Improved teaching and learning	Promoting collaboration between students and educators, and making e-learning capabilities more effective
Enhanced connectivity	Connecting with other universities, businesses, and organizations to share information and resources
Increased efficiency	Streamlining administrative processes and improving operational efficiency

## 5 5. CONNOTATION OF DIGITAL TRANSFORMATION IN UNIVERSITY EDUCATION

### 5.1 Definition and Characteristics of Digital Transformation

To gain an in-depth understanding of the connotation of digital transformation in university education, it is necessary to study the basic features of digital transformation as an entry point. The basic features of digital transformation can be divided into new elements of data intervention and digital empowerment. Among them, digital new element intervention emphasizes digital-related innovation, which corresponds to incremental innovation generated by digital industrialization, etc.; while digital empowerment is an innovation under digital technology, which corresponds to empowering innovation to realize industrial digitization, etc. [3]. For this reason, this study divides the connotation of the digital transformation of university education into two levels: the digital technology-driven transformation of university education and digital innovation for university education transformation. Also understood at a superficial level, digital transformation refers to the use of digital technologies and data by organizations to transform their core business to better meet user needs. As a university education, whose primary target users are students, the underlying motivation for university education institutions to adopt digital transformation strategies is to provide the highest quality education, deliver a world-class educational experience, and adapt students to the demands of a globalized industry.

Foreign scholars are also trying to explain the definition and characteristics of digital transformation from different perspectives. Digital transformation of university education is a "digital disruption" in the age of information technology, which requires the application of information technology to change the mindset and rebuild the digital activities integrated into learning, teaching, and organization [4]. Thus, digital transformation is a social "elemental disruptor" that fundamentally changes the behavior of entire industries, organizations, and individuals. It is the process of optimizing and transforming institutional operations, strategic direction, and value proposition through a deep and coordinated shift in culture, workforce, and technology."

## 5.2 The Locality of Digital Transformation of University Education

In recent years, the issue of digital transformation of university education has received strong attention from countries and scholars around the world, and has become a prominent issue in the reform and development of university education during the epidemic period. At the national level, countries around the world have begun to pay attention to the impact of information technology and digital technology on university education. For example, the United States emphasizes the significant role of information technology in supporting and facilitating the digitization of university education [2]; France is committed to the implementation of "digital campus" and "digital university" strategies [5]; and Germany focuses on the implementation of the digital transformation of university education and vocational education [1]. Germany focuses on the digital transformation of university education and vocational education [6]; Russia proposes a series of digital transformation development strategies in order to improve the quality of university education and its international competitiveness, and in response to the development trend of the digital era [4]; while European countries emphasize the enabling role of data for educational transformation and actively build digital education systems from a systemic perspective to facilitate digital education ecology [6]. Thus, it can be seen that developed and developing countries differ greatly in facing the digital transformation process of university education. After the development of industrial and information technology revolutions, European and American countries have accumulated a deep industrial economic foundation and first-mover advantages in the information field, and new forms of university education organization have emerged. Compared with the disruptive and substantial digital revolution in developed countries, the digital transformation of university education in many developing countries is still in the early stage of experimental development. For example, scholars examining digital transformation practices in Southern European and South American countries found that schools are still stuck in using new technologies to intervene in teaching and learning activities before understanding students' and teachers' wishes and conducting digital transformation awareness campaigns in order to prepare students for the digital transformation era [6]; universities in Ukraine, when exploring further upgrades of digital transformation, suggest the need to develop transformation strategies, explore the construction of modern IT architecture, using blockchain technology, and creating a cloud platform [7]. Many universities in China have made great improvements in digital tools and modern applications after years of transformation and development, but there is still room for improvement in digitally radiating a broader community and building research capacity for technology increase [8].

## 5.3 Key Enablers of Digital Transformation in University Education

Digital transformation of university education is not only a matter for universities themselves, but we need a "leader" to lead global universities, especially developing countries, to accomplish our digital transformation task and achieve a digitally empowered university education. UNESCO is a key driver of our digital transformation in university education, highlighting the importance of Information and Communication Technology (ICT) for teachers in several key documents and guidelines. In order to achieve the equity and universality of quality education emphasized in the UN Sustainable Development Goals 2030, UNESCO

proposes to provide the necessary support for teachers' information and communication technology (ICT) competency enhancement, including IT teaching support, incentives, web-based platforms, user experiences, and methodologies. In 2019, UNESCO released the UNESCO Teacher ICT Competency Framework, 3rd edition, which proposes six practice perspectives for teachers' ICT (ICT) competency development, including understanding the application of ICT in education, curriculum and assessment, teaching methods, applying digital skills, organizational management, and professional learning; it also explores three tiers of teachers' ICT (ICT) competency development: knowledge learning ( KnowledgeAcquisition), KnowledgeDeepening) and KnowledgeCreation [9]. These three tiers correspond to the phased requirements of teachers' ICT competencies. Knowledge acquisition requires an understanding of basic hardware and software operations, for example, mastering the operation and functions of basic software, presentation software, and application software; knowledge deepening requires teachers' ICT competencies to be upgraded to familiarity and flexibility in using tools and programs to facilitate students' analysis and Knowledge creation requires teachers to be able to design IT-based knowledge communities to foster students' continuous thinking and creativity

## **6 THE CHALLENGES OF DIGITAL TRANSFORMATION IN UNIVERSITY EDUCATION**

The emergence of the new pneumonia epidemic has exposed the development of university education to great uncertainty and risk, and the educational and teaching activities of teachers and students have been seriously affected and hindered, which has had a profound impact on the digital transformation of university education and reshaped the development of university education and its inevitable path. As part of the "epidemic" of war, digital transformation has not only catalyzed the reshaping of university education by digital technology based on the new generation of information technology, but also given rise to new organizational forms of university education. The role of teachers is changing, and the learning experience of learners is being disrupted by the new pneumonia epidemic, leading to an obvious sense of alienation and challenging the quality of education and teaching. For university education institutions, the development of their own digital transformation is somewhat delayed or hindered by the dual challenges brought about by the epidemic and technological change. Most developing countries, in addition to coping with the public health crisis, also face the dual challenges brought about by the epidemic and technological revolution, and these common challenges also delay or hinder the digital transformation of university education to a certain extent. After a comprehensive and comparative analysis of a large amount of domestic and foreign literature, the connotation of digital transformation, and the digital transformation in foreign countries, the challenges faced by digital transformation in university education are specifically manifested in the following aspects.

### **6.1 Increase Global Resource Inequality**

There is a strong correlation between the development of university education and the level of economic development of each country. Generally speaking, regions with a high level of economic development also have a relatively high level of university education. However,

the existing university education presents the problem of a low level of synergistic integration in the development process, which is the weak side shown by many local universities.

In April 2020, Philip G. Altbach and Hans Dewit, renowned scholars in the United States, published "The Future of University Education in the Post-Epidemic Era: The Poorest Regions Are the Darkest", in which they mentioned that the epidemic "will have a huge and mostly negative impact on university education, widening the disparities and inequalities among learners, institutions, and countries. The global picture will be very different, with universities in the poorest parts of the world likely to be more severely affected" [19]. The global market for university education will undergo a new round of survival of the fittest. For low- and middle-income developing countries with insufficient educational resources, this round of reshuffling will put underfunded and less influential institutions of higher education in a very precarious position and will further exacerbate the "rich-poor gap" in the global university education community. In the new pneumonia epidemic and post-epidemic era, the resources required for the digital transformation of university education include hardware facilities, infrastructure, financial investment, and faculty manpower.

## **6.2 Increased Cost of Education and Access to Education**

The sudden test of the new crown pneumonia epidemic added additional costs to the education of schools and the education of students. During this period, many universities revealed weak infrastructure development, confusion in the market of online education platforms, lack of planning of online materials and teaching materials, and failure of teaching rules [11]. Schools need to bear the costs and expenses incurred by online education development, online course recording, and online education tools use. For relatively poor and less developed regions, the most basic hardware tools for online learning computers and the Internet have become major barriers for many students to access online education opportunities. Infrastructure constraints, particularly the quality and cost of Internet connectivity, are common issues for schools and students. For example, the University of the Philippines mentioned in the "2020 Annual Conference of the International Academy for Online Education" organized by the UNESCO Center for university education Innovation that they face a lack of equipment resources for digital transformation under the new pneumonia epidemic, with only 56% stability of their Internet network and much important information technology. The lack of many important information technology equipment has brought a severe test [12]. From the supply side of the school, the investment and upgrading of basic hardware facilities require a large amount of capital investment; from the receiving side of the students, it requires personal expenses for computers, cell phones, Internet, materials, etc., but many remote areas of the country may face problems such as slow or no Internet access.

## **6.3 Strategies of Existing Inertia Constraints in University Education Teaching System**

university education policymakers, managers of educational institutions, researchers, and practitioners need to think beyond the limitations of "industrial society technology enables education teaching" and "digital transformation of education is limited to the field of education" and deeply understand the nature of the transformation of university education system from

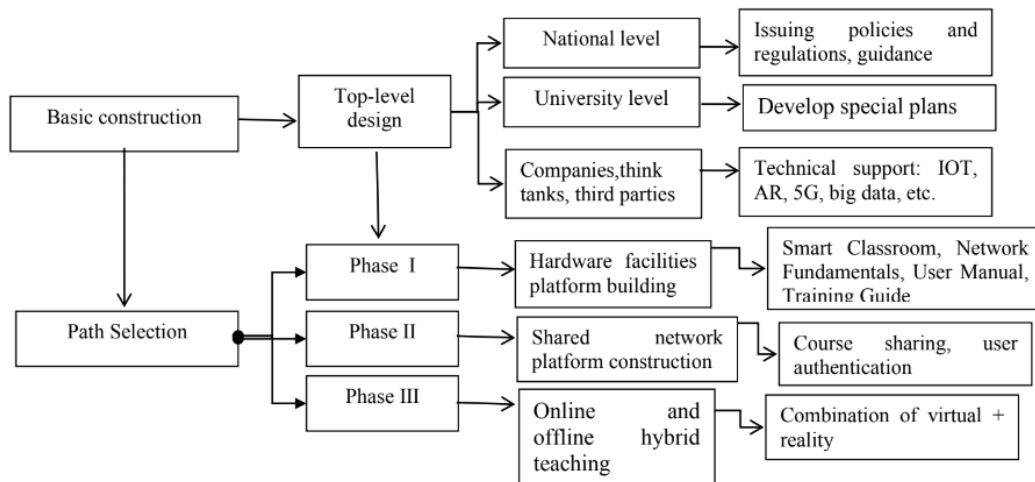


the industrial era to the digital era. They need to understand the nature of the transformation of the university education system from the industrial era to the digital era, understand the relationship between university education and other systems such as society, economy, politics, and technology, and jointly develop a vision and path for the digital transformation of university education that reflects the concerns of all parties, integrate resources and services from other areas of society based on cyberspace, and promote the systemic transformation of university education.

#### **6.4 Testing Teachers' Ability for Digital Transformation**

Before the New Crown Pneumonia epidemic, most of the global concepts of digital literacy and digital teaching were still in the early stages of exploration, and few teaching departments and teachers paid enough attention to and used digital teaching, and did not know enough about various digital devices, or only understood the basic technology to achieve high-quality teaching. After the new crown pneumonia epidemic, many teachers were forced to approach online teaching and learning by doing to gradually improve their information and communication technology (ICT) skills. In addition, there is a serious shortage of teachers in schools who can produce high-quality online courses, which requires schools to provide teachers with more digital resources, business competency training, and reasonable performance incentives to guarantee a higher-quality educational content output that enhances students' learning interests and experiences, such as teachers need to learn how to produce courses that are better suited for online teaching and learning. Many universities in developing countries, such as Bandung University of Technology in Indonesia, Lahore University of Engineering and Technology in Pakistan, and University of Colombo in Sri Lanka, have tried to provide training for faculty members on various teaching tools, including LearningManagementSystem, Zoom meetings, GoogleMeet), GoogleClassroom, and other common international software tools.

Also for China, one, although China's economic level is very high in the world, there is still a regional imbalance, China because of the large population base, vast territory, just completed a comprehensive poverty eradication, economic differentiation is more obvious, from the economically developed coastal areas to the inland part of the region, the economic level gap is still very large, which also presents a serious challenge to the digital transformation of the inland part of the university; second, the new crown pneumonia The outbreak of the epidemic has led to the uninterrupted suspension of classes and home-based work in various schools, which also poses requirements for online education and teaching, online education management, and challenges for educated people and educators, network requirements, digital technology requirements, and invisible increase in education costs; thirdly, although the connection and synergy among universities in China have been strengthened to provide technology and experience, because of the geographical differentiation, our universities There are also differences in funding, hindering the infrastructure and infrastructure also exist in the differentiation, especially for private institutions, infrastructure for financial reasons, will also present a challenge to digital transformation; fourth is that at present, because digital is an emerging technology, in the university education system, there are still inevitable backward thinking, and thinking limitations; fifth is that in China more use Tencent meeting, nail, etc., digital Most of the concepts of digital literacy and digital teaching are still in the initial explo-



**Figure 1:** Digital transformation of university education

ration stage, but as far as the information and communication technology (ICT) competence of university teachers is concerned, there is still a general lack of more effective practical experience from the operation of basic knowledge learning tools to the second stage of knowledge deepening and then to higher-order knowledge creation. Most teachers have strong professional literacy, but digital literacy still needs to be improved. In the context of our country, by analyzing the above challenges, we are currently facing the following challenges as well.

## 7 A VIABLE PATH FOR DIGITAL TRANSFORMATION OF UNIVERSITY EDUCATION

Digital transformation faces challenges and obstacles in various aspects, how to do a good job of digital transformation of university education, after the preliminary search and study to understand, the absorption of relevant information, combined with my own knowledge of digital construction, I summarized and designed the digital transformation path of university education, we need to strengthen the top-level design, develop a macro strategic plan, while according to their own development, choose a suitable and effective path to promote the digital transformation of university education, and finally need to improve the digital literacy of all teachers and students.

### 7.1 Strengthen Top-Level Design and Develop Macro-Level Strategic Planning

Digital transformation is systematic, complex, and overall work, especially the digital transformation of university education is an educational transformation process involving culture, labor force, and digital technology, which requires the formulation and support of national policies and regulations at the macro level and the transformation planning of universities themselves at the micro level, both of which are indispensable. From the macro level, it is urgent for China's education administration to strengthen the top-level design of the digital transformation of university education according to the current reality and future development trends, and to formulate special policies and regulations for the digital transformation

**Table 2: Challenges of Digital Transformation of University Education in China**

<b>Challenge</b>	<b>Description</b>
Inequality in District Digital Resources	China is divided into four regions, east, west, central, and northeast, among which the east has the highest economic level, because of the imbalance of regional economic level, resulting in the appearance of unequal digital resources.
Increasing the cost of education and access to education	From the supply side of the school, the investment and upgrading of basic hardware facilities require a large amount of capital investment; from the receiving side of the students, it requires personal expenses for computers, cell phones, internet, materials, etc.
Differentiation of university education funding	The transformation of university education must be integrated with the local economy, and the two are complementary. Universities located in regions and cities with faster economic development are more likely to receive sufficient operating funds to quickly realize digital transformation.
Strategies for the already inertial constraints of the university education and teaching system	University education policymakers, managers, researchers, and practitioners need to think beyond the limitations of "industrial society technology enables education teaching" and "digital transformation of education is limited to the education field".
Testing the ability of teachers to make digital transformation	the early stage of exploration, and few teaching departments and teachers pay enough attention to digital teaching and use it, and they do not know enough about various digital devices, or they only know the basic technology to realize high-quality teaching.

of university education while guaranteeing by laws and regulations and local policies, and leave a gap for the development space of heterogeneous transformation paths. Encourage all kinds of subjects (such as enterprises, think tanks, third-party institutions, etc.) to actively participate in the construction of standards and systems for the digital transformation of university education, improve the digital infrastructure of university education through various ways, and provide guarantee and collaborative support for the digital transformation of university education.

## 7.2 Selecting Effective Paths in Different Development Stages

Digital transformation of university education is roughly divided into three different development stages: digital conversion, digital upgrading, and digital transformation. The first digital conversion stage focuses on the conversion of physical information to digital information, which mainly corresponds to the construction of hardware and software platforms; the second digital upgrading stage focuses on the management and operation of a digital information system, which mainly corresponds to the construction of shared network platforms; the third digital transformation stage is to explore new effective operation modes and explore various development modes based on their own situation and advantages. countries in different development stages should take corresponding measures in line with their development status and laws.

Phase I: Building hardware facilities and platforms for digital conversion. For the first phase of the fledgling digital conversion of university education, the building of hardware facilities and platforms is a top priority. A key focus of the UNESCO Centre for Innovation in university education is to coordinate multilateral cooperation between universities and companies to help partner institutions worldwide to build smart classrooms and provide hardware infrastructure support. The goal of smart classroom construction is to provide an intelligent interactive space for online teaching activities with the help of learning management systems and learning analysis systems, including the provision of touch-sensitive smart interactive all-in-one machines, display terminals (laptops, all-in-one computers or cloud desktops), servers, uninterruptible power supplies, recording and broadcasting systems (cameras, recording hosts, sound pick-up devices, positioning sensors, and mixing consoles), and a variety of other hardware.

The stakeholders are the partner companies, including the company's network switches and related accessories. The stakeholder is the partner enterprise, including the responsibility for providing a site that meets the specifications for the smart classroom, providing the required equipment, user manuals, and training documents, supporting the installation and training of the equipment, ensuring the smooth operation of the equipment, and ultimately achieving independent use. The other party of interest is the partner institution, the recipient of the smart classroom.

Phase 2: Building a shared network platform for digital upgrading countries in the second stage of development needs to build and upgrade a more open and efficient network platform based on the vast amount of digital information. In December 2019, the UNESCO Center for Innovation in university education, together with 11 partner institutions in Asia and Africa, four Chinese institutions, and nine enterprises, launched the International Institute for Online



Education ( IIOE), which aims to establish a platform for program sharing and accreditation, and provide quality university education resources, especially to enhance the information and communication technology (ICT) literacy and competencies of teachers and university education workers. Subject courses, professional education courses, and teacher education courses are offered. Subject courses include the direction of cloud computing, data science, artificial intelligence, etc.; vocational education courses include the direction of intelligent robotics, machine vision, e-commerce, etc.; teacher education courses include the direction of digital skills application, understanding ICT in education, curriculum assessment, etc. In 2020, the International Institute of Online Education (IIOE) has built more than 280 courses in Chinese, English, and French, covering computer ethics, Artificial Intelligence, Big Data, Cloud Computing, the Internet of Things, and Blockchain. In response to the outbreak of Newcastle Pneumonia, it organized 10 training sessions for developing countries on the topic of combating the epidemic in English and French, with the participation of 307 institutions of university education and some government agencies in 46 countries, including a total of 2,108 university teachers and experts. on September 30, 2022, IIOE organized a webinar for university education professionals worldwide on building a digital infrastructure for university education Workshops. A total of 468 university education experts, academics, faculty, and administrators from 44 different countries registered, and 212 people participated in the global webinar. Speakers included representatives from partner universities and companies; the webinar featured lively discussions on core issues such as international multilateral partnerships, industry-academia-research collaboration, and digital transformation of universities. The presentations focused on the development trend and prospect of digital transformation of university education, industry-university-research cooperation solutions, corporate public welfare responsibilities, various teaching development channels, etc. In-depth assessments and empirical reflections were made. The webinar demonstrated the value and belief of international multilateral cooperation and the contribution of the private sector to university education in developing countries in empowering the digital transformation of university education and empowering university faculty to bridge the digital divide.

In China, in January this year, the State Council issued the "14th Five-Year Plan" for the development of the digital economy, proposing to further promote intelligent education and promote the sustainable and healthy development of "Internet + education". The platform provides high-quality digital education resources for basic education, vocational education, and university education, as well as employment services for college students, with the basic criteria of serving students' overall development, teachers' teaching and education, and society's overall progress, and integrating education digitalization into the whole process of talent training, teaching reform, education management, and social services. Upholding the principles of demand-driven, application-oriented, service-oriented, economical and efficient, the platform has gathered 34,000 basic education curriculum resources, 6,628 online high-quality courses for vocational education, and 27,000 high-quality courses for university education. According to the data released by the Ministry of Education, the platform has now launched 111 public service live classes of "Internet + Career Guidance", with 310 million viewers. Meanwhile, the launch of the National Public Service Platform for Intelligent Education has achieved the following functions: first, to facilitate the convergence of high-quality educational resources and accelerate the development of quality and balanced education; second,

to empower the improvement of education and teaching quality and help the formation of a lifelong learning system; third, to enhance the ability to deal with unexpected situations and create a digital education solution for China.

The third stage: the exploration of online and offline hybrid teaching models, is that each developing country, based on its own development stage and advantages, continues to explore and innovate to develop new operation models, showing diversity and characteristics. For example, with the development of information technology and the double test of epidemic pressure, the combined online and offline teaching model began to play a greater role. China has explored online and offline hybrid teaching models quite a bit, and before the epidemic, China began to experiment with hybrid teaching and blended learning model that combines online and offline based on the expansion of the catechism system in colleges and universities. This model is usually based on online catechism (MOOC) learning and face-to-face teaching, and adopts a flipped classroom approach, including online learning before face-to-face teaching, face-to-face teaching, and online learning after face-to-face teaching [13]. The basic features of the blended teaching model include the diversification of course platform functions, the diversification of online resource construction, the autonomy and flexibility of student learning, the spatial and temporal extension of the teaching process, and the multidimensional assessment methods [14]. In the face of the impact of the epidemic and also along with the increasing maturity of information technology, the teaching mode of online and offline integration is more widely used. The teaching mode of online and offline integration refers to the new situation of personalized teaching and learning services through the integration of online and offline, the combination of virtual and real learning scenarios by means of information technology, and the formation of various structures and levels of scenario ecology, with students as the center [15]. The advantage of this model is that it facilitates students' access to educational resources from the external environment while meeting their personalized learning needs with the help of educational scenarios in the classroom, school, and home, as well as seamless links to virtual simulation labs, smart classrooms, and online platforms.

### **7.3 Tiered Development of Information and Communication Technology (ICT) Competence of University Teachers**

Realizing the change in people's concepts is the fundamental guarantee of implementing digital transformation in university education, and the key to digital transformation is cultivating talents. The ultimate point of carrying out digital transformation in university education is people, and improving the digital literacy of teachers and students in university education is the guarantee that the work can move toward sustainable development. One is to promote both teachers and students. For teachers, they should pay attention to the development of professional digital literacy and competence, cultivate digital competence, and help teachers develop professionalism and digital integration; for students, they should pay attention to the use of digital technology to develop assessment tools and standards for students' digital literacy, so as to help students find their own weaknesses and correct them. Secondly, to improve the digital teaching competency of university teachers. The role of technology for people is shown in the improvement of their own performance.

Improving the information and communication technology (ICT) competencies of university education teachers is a priority to be addressed at every stage of the digital transformation of university education. The UNESCO Centre for Innovation in university education defines the ICT competencies of university education teachers as primary, intermediate, and advanced according to the UNESCO ICT Competency Framework for Teachers, 3rd edition, and the three levels are identified based on three main competency dimensions: first, online and blended teaching competencies; second, the use of ICT technology to empower educational administration; and third, the Information and communication technology (ICT) industry cutting-edge knowledge and competencies. The primary competency certification focuses on the understanding and awareness of basic knowledge, the intermediate competency certification concentrates on the basic application of skills in analysis, while the advanced competency certification is the creation and innovation of knowledge.

#### **7.4 Analysis of the current situation of digital transformation of university education in China**

In response to the digital transformation dilemma faced by our country, combined with the actual situation in China, at present we need to continue to do a good job in addition to infrastructure construction, but also in accordance with policies and regulations to develop special programs, while strengthening cooperation and resource sharing, for teachers to strengthen learning and upgrading, in addition, due to the economic level and investment inconsistencies, because there are differences and imbalances, etc., China also needs to follow the "one district, one policy" to The digital transformation work against the standard.

### **8 RECOMMENDATIONS FOR DIGITAL TRANSFORMATION OF UNIVERSITY EDUCATION IN CHINA**

Combined with the challenges China is currently facing, we should, first, narrow the geographical gap, accelerate the construction of network communication infrastructure through national means, expand the sustainable supply and application of high-quality resources, and allow the unimpeded flow of digital education resources; expand the openness of education public service platforms and the coverage of digital education resources; second, allow high-quality education resources to help more universities in less developed areas to improve the quality of education, eliminate the divide and create an environment; third, strengthen cooperation between industry, academia and research, enhance research and technical transformation of the application of big data, artificial intelligence and other technologies in the field of education, and promote the construction and development of education public service platforms and smart education tools to provide a more immersive and realistic online learning experience; fourth, continuously cultivate the digital literacy of all teachers and students and focus on capacity building, so as to truly realize digital transformation.

**Table 3:** Pathways of Digital Transformation of University Education in China

Paths	Description
Seek cooperation and share resources	Universities should actively explore the mechanism of establishing multilateral cooperation between government, enterprises, and universities in the public interest, which will help the deployment of resources.
Develop policies and focus on quality	As an important step in digital transformation, online teaching and learning changes should establish a more comprehensive quality assurance system.
Bridging the gap and creating an environment	University education should be able to provide equal access to technology resources, information access rights, and educational opportunities for every learner
Continuous learning, focus on capacity building	As digital enablers, we need to provide training courses on information and communication technology (ICT)-related knowledge and skills for university workers to improve their information literacy and competence.

### 8.1 Seeking Multilateral Cooperation Mechanisms to Share Quality University Education Resources

The transformation of university education digitalization needs corresponding software and hardware infrastructure. First of all, universities should actively explore the mechanism of establishing multilateral cooperation among government, enterprises, and universities in the public interest, which will help the deployment of resources. Meanwhile, cooperation and dialogue among academia, industry, and government are encouraged to provide necessary financial resources for Chinese universities through innovative funding mechanisms. Developing countries that are relatively short of resources, can also try to seek quality university education resources and support from international organizations and other platforms from various parties. The UNESCO Center for Innovation in University Education has partnered with global enterprises for public benefit to establish smart classrooms supported by big data, cloud computing, face recognition, and artificial intelligence for Chinese universities to support multimedia teaching, localized curriculum resource construction, cross-campus resource sharing, intelligent analysis of learning, and integrated teaching management to meet the basic needs in the process of digital transformation.



## **8.2 Develop Personalized Policies and Systems That Focus on the Quality of Online Teaching**

All digital transformation in higher education requires educational policies that are in line with national conditions, and implementation plans that can provide effective guidelines for practical work. The online teaching changes conducted as an important step in digital transformation should establish a more complete quality assurance system. Adopt blockchain and other technologies to promote the adoption of cross-school and cross-professional micro-certifications and micro-credentials, and pay more attention to and promote the degree certification and mutual trust and recognition of online teaching programs, so as to explore the development of more mutually recognized "micro-certifications" and "online degrees", etc. The product of digital transformation. Teachers and teaching designers need to improve their data literacy and develop the ability to apply technology in an intelligent teaching environment, to fully integrate big data, AI teaching aids, and other technologies into the curriculum and teaching process, to expand teaching time and space, to achieve accurate analysis of the whole process of learners, accurate prediction of teaching results, and accurate control of the teaching process, and to meet the personalized learning needs of learners.

## **8.3 Provide Continuous Learning Programs That Focus on Building the Capacity of University Education Practitioners**

UNESCO's World Teachers' Day in 2020 reaffirmed that teachers as "leaders in crisis, reshapers of the future" are central to providing continuous educational support during the epidemic [30]. University educators, represented by university administrators, university teachers, administrators, and relevant government officials, have the important responsibility of training digital talents, driving research and innovation, and driving the digital economy for the country. We need to provide continuous learning programs, focus on capacity building of university workers, and make digital literacy one of the core literacies in the 21st century, especially to cultivate the rational spirit, empathy, creativity, and interrogative thinking among teachers and students in the digital space to resist the risks of the digital society. We can also initiate the establishment of an International Institute of Online Education (IIOE) platform to provide training courses on information and communication technology (ICT)-related knowledge and skills for university workers to improve their information literacy and capabilities.

## **8.4 Bridging The Digital Divide and Providing an Equal Digital Environment**

International organizations, governments, universities, and businesses need to work together to continuously build the infrastructure for the digital transformation of teaching and learning to ensure that university education provides equal access to technological resources, information access rights, and educational opportunities for every learner, as well as to accommodate differences in access to educational technologies, usage habits and social culture in different regions. In the process of digital transformation, efforts should be made to ensure that digital technologies, tools, and platforms applied in education evolve in a direction that supports human rights, enhance human capabilities, and promotes human dignity and

humanism, thereby maintaining peace, justice, and sustainability in digital societies.

## 9 CONCLUSION

Through this study, we can find that accelerating the digital transformation of education is an inevitable choice for China, and also for developing countries to achieve an education from basic balance to high balance, from a large education country to a strong education country, and the digital transformation of university education brings digital disruptive changes, showing multi-dimensional, multi-level and multi-geographical development characteristics. At the same time, in the rapid shuffle of the digital revolution, global inequality of education resources is increasing, and developing countries are facing difficulties such as increased capital investment, higher requirements for hardware and software, and higher requirements for teachers' competence. However, government departments, higher education institutions, social organizations, and enterprises around the world are seeking effective ways to transform. Among them, the improvement of information and communication technology (ICT) competence of university teachers is the core work of digital transformation. As an influential international organization in the world, the UNESCO Center for Innovation in University Education, the overall strategic plan formulated, the online education institute initiated, the training courses and certificates provided, the quality assurance system of university education established and the quality assessment tools developed are some effective practical experiences. Accelerating the pace of digital transformation of university education, vigorously promoting the informatization of university education, digitalization of educational resources, empowerment of educational technology and innovation of educational methods, and leading high-quality development of university education with digital innovation have become the requirements of the times for university education reform in various countries in the present and future, and deserve great attention and extensive focus. For China, we are in the critical period of digital transformation and upgrading of university education, we should further vigorously promote the opening and sharing of digital education resources, and promote the exchange and cooperation among teachers, universities, and platforms as well as globally.

## REFERENCES

- [1] United Nations. United Nations Policy Brief [EB/OL]. (2020-08-04) [2021-06-06]. [https://www.un.org/sites/un2.un.org/files/policy\\_brief-education\\_during\\_covid-19\\_and\\_beyond\\_chinese.pdf](https://www.un.org/sites/un2.un.org/files/policy_brief-education_during_covid-19_and_beyond_chinese.pdf).
- [2] UNESCO. (2020). Startling Digital Divides in Distance Learning Emerge, April 21. Available at: <https://en.unesco.org/news/startling-digital-divides-distance-learning-emerge>.
- [3] Chao Zhang, Kaihua Chen, Rongping Mu. Digital innovation ecosystem: theoretical construction and future research[J]. *Scientific Research Management*,2021,42(3):1-11.

- [4] FERREIRA M,SANTOS-PEREIRA C M,MOREIRA F et al Digital transformation at high education:are professors of the South European and South American countries prepared for that[M]//Proceeding of INTED 2019 Conference Valencia, 2019.
- [5] Thomas Kuhn. The Structure of Scientific Revolutions [M]. Jin Gulun, Hu Xinhe, Translated. Beijing: Peking University Press, 2012: 145.
- [6] RIEMER K,GAL U,HAMANN J, et al. Digital disruptive intermediaries [EB/OL]. (2015-03-31) 2021-06-06. [https://ses.library.usyd.edu.au/bitstream/handle/2123/12761/ADTL\\_Digital%20Disruptive%20Intermediariesfinalpdf?sequence=7&isAllowed=7](https://ses.library.usyd.edu.au/bitstream/handle/2123/12761/ADTL_Digital%20Disruptive%20Intermediariesfinalpdf?sequence=7&isAllowed=7)
- [7] KAMINSKYIOY, YERESHKOYO, KYRYCHENKOSO. Digital transformation of university education in Ukraine: trajectories of development in the conditions of new technological and economic order [J]. Information Technologies and Learning Tools,2018,64(2) : 128-137.
- [8] XIAO J. Digital transformation in university education: critiquing the five-year development plans (20162020) of 75 Chinese universities [J]. Distance Education,2019,40(4).
- [9] Version. UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS.
- [10] ALTBACH P G, DEWIT H. Post pandemic outlook for HE is bleakest for the poorest [EB/OL]. <https://www.univeristyworldnews.com/post.php?story=20200402152914362>.
- [11] Zhong Binglin, Zhu Dequan, Li Ligu, et al. Educational governance under the major epidemic (in writing) [J]. Chongqing university education Research, 2020, 8(2) : 5-24.
- [12] UNESCO Centre for Innovation in university education. 2020 Annual Conference of the International Academy of Network Education [EB/OL]. (2020-12-09) [2021-06-06]. <https://www.ichei.org/dist/index.html#/FocusNewsDetail?id=381>
- [13] Jiang Chong, Fei Hongxiao. Research on the design and application of MOOC-based hybrid teaching model [J]. Higher Science Education, 2015(3): 120-125.
- [14] Tan Yongping. Basic features of hybrid teaching mode and implementation strategies [J]. China Vocational and Technical Education, 2018(32) : 5-9.
- [15] Zhu Zhiting, Hu Jiao. Technology-enabled post-epidemic education creation: a new model of online and offline integrated teaching [J]. Open Education Research, 2021, 27(1): 13-23.
- [16] UNESCO. World Teachers' Day [EB/OL]. (2020-10-05) [2021-06-06]. <https://zh.unesco.org/commemorations/worldteachersday>
- [17] Lan G. Shuai, Wei J. C., Huang C. Y., et al. (2022). International digital transformation of university education and the implementation path in China[J]. Open Education Research, 28(3):25-38.



*Proceeding of the 7<sup>th</sup> TICC International Conference 2023  
Toward Sustainable Development Goals: Transformation and Beyond  
February 4-5<sup>th</sup>, 2023, Chiang Mai, Thailand*

- [18] Lan Guoshuai,Zhang Yi,Guo Qian et al.(2020). Driving Digital Transformation in university education:Optimization, Continuity and Innovation–Interpretation and Insights from the Report of "Top Ten IT Issues in 2020"[J]. Open Education Research,26(5):12-25.
- [19] Li M, Han Xibin, Li Meng et al. (2022). Vision, challenges and countermeasures of digital transformation of university education teaching and learning[J]. China e-learning,(7):23-30.
- [20] "2020 university education International Forum Annual Conference Series | Feng Siyuan: Digitalization of university education in Developing Countries in the Context of the New Epidemic - <https://www.163.com/dy/article/G197S76C0516RJ0M.html>