

# Research on the Restrictive Factors and Strategies for Improving the Teaching Ability of University Teachers under the Background of Education Digitization

Chudi Xu

Moray House School of Education and Sport, The University of Edinburgh, Edinburgh, UK

C.Xu-74@sms.ed.ac.uk

**Abstract.** Education digitization deeply integrates modern information technology with education, innovates the traditional teaching mode of universities, and makes higher education glow with new vitality. At present, the digital transformation of higher education has become a research focus of higher education reform. Therefore, the digital teaching ability of university teachers has become an indispensable force. It is not only conducive to the construction of college teachers but also conducive to the improvement of university teaching quality, which is a key factor related to the quality of higher talent training in the new era. Therefore, whether university teachers can adapt to the development of digitalization and how to improve their digitalized teaching ability are worthy of attention. Based on this research background, this paper tries to summarize the new requirements of digital transformation of education for teachers' teaching ability by reading relevant literature of the Ministry of Education and taking TPACK theory as guidance. Then, combined with the existing investigation and research results, using case analysis and comparative research, this paper summarizes and analyzes the constraints that affect the development of teachers' abilities from both internal and external aspects of teachers. Finally, based on the analysis of the constraints, suggestions are put forward from the perspectives of teachers' teaching cognition, teaching behavior, school training organization, evaluation system, and digital construction.

**Keywords:** Education digitization; university teachers; digital teaching ability.

## 1. Introduction

The development of the Internet has given birth to digital thinking, distributed cognition, virtual space knowledge transmission mode, and interpersonal communication mode, resulting in systematic changes in the concept, mode, and governance system of talent training in universities [1]. Digital transformation of higher education is an inevitable requirement to solve the contradiction between the supply and demand of talent and promote the high-quality development of education, which has become a hot topic in the field of education [2]. Digital education deeply integrates the advantages of traditional education with information technology, makes teaching activities closely revolve around the Internet, and provides a digital, intelligent, and personalized teaching and learning environment for education. Education digitization can innovate traditional teaching modes, realize the reconstruction of teaching content, and make traditional education full of new vitality. The digital transformation of higher education is not only the application of information technology and infrastructure in education and teaching activities, but also emphasizes the deep integration of digital technology and education, including the innovation of educational concepts, management systems, and teaching models.

Therefore, it is urgent to promote the digital development of education and improve the digital literacy and digital teaching ability of university teachers. At present, there is a profound strategic background for China to comprehensively promote the digital transformation of higher education. In 2018, the "Education Informatization 2.0 Action Plan" proposed that efforts should be made to improve teachers' informatization literacy, promote teachers to actively adapt to the changes brought by a series of technologies such as artificial intelligence, big data and informatization to education, and actively carry out education and teaching activities. In 2022, the "14th Five-Year Plan" for the



Development of the Digital Economy proposed to further promote smart education and improve teachers' ability to support online education services [3]. The Ministry of Education launched the National Higher Education Smart Education platform, which puts forward new requirements for teachers' teaching and research abilities. To drive the optimization and transformation of operation modes and strategic directions of universities. Ultimately, an education system adapted to the information age will be formed.

However, the existing research results lack systematic research on the teaching ability of university teachers under the background of a specific digital era. In addition, the development strategies for teachers' teaching ability proposed by researchers generally start from the system level, and the direct operation is not strong enough. This restricts the development of teachers' digital ability to some extent. Based on this research background, this paper attempts to explore the constraints of teachers' digital ability and propose targeted strategies for improving digital ability from both teachers and schools, to enrich the research in the field of college teachers' digital ability.

## **2. Analysis of the Constraints on the Improvement of Teachers' Digital Teaching Ability**

### **2.1. Analysis of Internal Constraints**

#### **2.1.1. Weak teaching beliefs**

According to the existing investigation, under the current trend of digitized education development, many university teachers in China support the digital transformation of education and have a certain sense of mission and responsibility for teaching reform [4]. However, in teaching practice, their teaching ideas are difficult to keep pace with the time. They focus on the teaching design and development of traditional face-to-face courses while lacking enthusiasm for digital teaching methods, and showing a low willingness to participate. The specific manifestation is the concern about the poor effect of digital teaching and its digital teaching ability [5]. As a result, university teachers are rarely willing to actively integrate digital teaching content into their teaching. On the one hand, they are willing to accept digital teaching and improve digital teaching ability. On the other hand, they are struggling to break through themselves. In other words, the belief of teachers to carry out digital education reform is still insufficient, and the lack of deep internal drive makes it difficult to maintain the long-term sound professional development of teachers.

#### **2.1.2. Unintegrated teaching knowledge and competence**

The development trend of education digitization has higher requirements for the teaching knowledge and competence of university teachers. The TPACK theory that was proposed by American scholars Koehler and Mishra, emphasizes teachers should possess "Technological Pedagogical Content Knowledge", that is, the competence to effectively integrate technology into the class anytime and anywhere [6]. This theory holds that the stored knowledge of teachers is complex, multi-faceted, and contextual. TPACK theory also indicates that pedagogical knowledge, technical knowledge, and subject content knowledge are all indispensable parts of technology integration. These three kinds of knowledge and their constituent structures are interactive and inseparable, to help teachers guide students to learn by using technology. This theory holds that TPACK should be the knowledge that teachers must possess. And in the process of implementation, teachers are the leaders of implementation. Secondly, these three knowledge elements are not simply superimposed but should be cleverly integrated. This requires teachers to pay more attention to the application of teaching theories and methods rather than simply focusing on technology. Ultimately, teachers of different disciplines and levels should integrate the three knowledge elements in teaching, and carefully choose the appropriate combination of the three elements.

In recent years, the teaching level of information technology among Chinese university teachers has improved significantly. In particular, teachers have made great progress in the use of information technology for teaching communication, courseware-making, electronic teaching plan writing, and so on. However, even if teachers have some technical progress in the analysis of teaching evaluation

data, the use of computer software (such as installing plug-ins or programs), and the use of computer hardware (such as connecting to the network), there is still a lot of space for their teaching technology to grow and improve [7]. It can be seen that most teachers are still lacking in the mastery of technical knowledge. For most teachers, rich research experience and profound academic accumulation enable them to have an accurate grasp of the content knowledge of the teaching subject. However, it is difficult for them to use appropriate pedagogical knowledge and technical knowledge to deliver teaching content to students on this basis.

Further research shows that the integration of the three technologies poses a considerable challenge to teachers. After the integration of technology, teachers have less confidence in the control of teaching forms than in the control of subject content [8]. This also reflects that teachers still need to improve in the use of technology to carry out teaching activities, to improve classroom teaching effects, and to select different technologies for teaching activities.

### **2.1.3. Lack of Innovative Teaching**

In the development of teaching methods and teaching content, most teachers in universities ignore the significance of innovation. According to the survey, in the choice of teaching methods, teachers still follow the traditional teaching methods. This is particularly evident in the allocation of teaching hours. In most university classes, it is very common for teachers to teach in one direction. While the use of discussion and inquiry teaching methods is less common. The former accounts for more than 85% of the teaching time, while the latter accounts for less than 24% [5]. In terms of the choice of teaching means, more than 64% of teachers are accustomed to using multimedia PPT to assist in teaching. And even less than 1.6% of teachers use digital means such as online course resources to carry out teaching. Teaching content is mainly based on professional characteristics (49.2%) and talent training plans (39.1%) [9]. Many students said that in their academic career, there are many lesson plans and PPTs of their courses that are fixed year-round, which means the professor can use them for several years. At the same time, students mostly acquired professional knowledge through textbooks, only about 11.6% of teachers said they would expand their teaching content by organizing related practical activities and conducting online courses [10].

At the same time, the level of teachers' teaching innovation is also affected by demographic variables. Comparatively speaking, teachers with higher education and professional titles have stronger knowledge integration abilities and are more innovative in teaching [11]. Young teachers with 1-5 years of teaching experience are more interested in education digitization and have higher acceptance and, a stronger ability to use various teaching software. Meanwhile, they are more proficient in information technology operations and obtain a stronger willingness to use information technology to carry out teaching. Teachers with long teaching experience are the main force of the teaching team, but their teaching methods have been relatively formed. They are much less receptive to digital teaching methods and even less willing to change existing teaching methods.

## **2.2. Analysis of External Constraints**

### **2.2.1. Inadequately organized training**

Under the background of digital education, modern information technology and education tend to integrate. Teachers must constantly improve their teaching ability to adapt to new requirements and challenges. Correspondingly, the training content of teachers' teaching ability should also be updated to reflect the requirements of the time. However, through the analysis of the teaching ability training content of teachers in universities [12], it is found that the current teaching ability training content of teachers is not updated in time, which still takes traditional teaching ability as the main training content, while ignores the new requirements of education digitization on teachers' teaching ability. If teacher training only focuses on professional knowledge but ignores teaching skills and practical ability, it will lead to unbalanced development of teachers' professional ability. As a result, the content of teaching ability training is outdated and can not be targeted to improve the teaching ability of teachers in the Internet era, which greatly reduces the training effect.

At present, the way of training teachers' teaching ability in universities is mainly offline training, which does not make full use of online training platforms and online training resources. Some universities have not yet established a dedicated in-school online training platform, so the online training method is limited. Some universities make insufficient use of online training resources and fail to give full play to the positive role of online resources in training teachers' teaching ability. Some training systems are relatively simple, resulting in a "one-size-fits-all" situation, but not according to the different requirements of different disciplines of teachers' training. In some universities, the training of teachers' teaching ability is mostly short-term and temporary, lacking planning and systematicness [13]. The imperfect vocational training mechanism of teachers hinders the development of the teaching ability of college teachers to a certain extent.

Improving the training of teachers' teaching ability is a long-term and complex task, but the existing survey and statistical results show that the training of teachers' teaching ability in universities is mostly short-term. The training group is mostly new young teachers, without considering the training needs of the whole school teachers. Moreover, the content of teaching ability training in some universities has not changed according to the changes and requirements of the time. The lack of a normal teaching ability training system directly affects the effect of teacher teaching ability training. Generally speaking, there is still room to improve the training effect of the teaching ability of university teachers.

### **2.2.2. Lack of evaluation of teachers' teaching ability**

At present, the evaluation system standards for teachers in universities are often based on scientific research and administrative achievements, which results in teachers being bound by cumbersome scientific research and administrative affairs and unable to allocate too much energy to education and teaching, let alone invest time and energy in innovative digital teaching. In the long run, the invariable teaching content and form have become the norm.

At the same time, it is a common practice in universities to evaluate teachers' teaching ability based on the evaluation of rewards and punishments, that is, the evaluation results directly affect the development of teachers' careers, such as job evaluation and promotion. However, little consideration is given to whether this can promote the improvement of teachers' teaching ability and teachers' professional development. Such evaluation has become a pure means of supervision and management. Under such a "baton", teachers can only be exhausted to cope with and cater to, and rarely reflect on their teaching and improve teaching according to the evaluation results, which can not be transformed into a driving force to improve teaching ability. The improper use of evaluation results makes it difficult for teachers to focus on teaching, and it is difficult to guarantee the quality of teaching.

### **2.2.3. Insufficient digital construction of the campus**

The construction of digital education information platforms in universities is not perfect now, which brings the limitation and obstacle of equipment and technology to digital education. The digital campus takes the highly developed computer network technology as the core, takes the communication and sharing of various information resources and knowledge resources as the means, emphasizes the characteristics of cooperation, communication, and sharing, and is a new overall educational environment for learning, education and research that integrates digitalization, networking, and intelligence. This new and open education model can not only provide learners with a learning environment that meets the needs of individual growth and development but also enable learners to independently choose learning resources with a variety of media combinations according to the different needs of learners. And learners can use and create resources innovatively on this basis.

The construction of a digital campus mainly includes two aspects: the construction of a basic campus information teaching environment and the construction of a campus application platform and system. The construction of a basic campus information teaching environment includes campus network environment, campus network construction, basic information terminal construction, and digital classroom construction. Campus application system and platform should include a network teaching

platform and functional application system. In the Internet era, the improvement of teachers' teaching ability cannot be separated from the support of digital campuses. On the one hand, teachers' teaching activities cannot be separated from the support of the network environment; on the other hand, the improvement of teachers' teaching ability cannot be separated from the assistance of network platforms and digital resources. Therefore, the construction of a digital campus is an important guarantee for teachers to improve their teaching ability. It can be seen that the construction of a digital campus is a huge system project, which requires a lot of material resources, financial resources, and manpower.

However, the survey of some local universities shows that there are still some problems in the construction of the digital campus, which can be divided into two categories: one is the construction of a basic information environment on campus, such as the basic information terminal such as multimedia classroom, micro classroom, virtual simulation laboratory, VR laboratory, and other hardware facilities are not enough or the utilization rate is not high. There is also the lack of software construction such as network teaching platforms and functional application systems, and the lack of self-developed network teaching platforms and functional application systems in universities. These problems have affected the improvement of teachers' teaching ability to a certain extent.

### **3. Implementation Strategies for Improving Teachers' Teaching Ability**

#### **3.1. Teachers' Level**

##### **3.1.1. Enhance teachers' self-efficacy and strengthen their belief in digital teaching**

Firstly, the digital ability of university teachers can be improved by stimulating their self-efficacy. On the one hand, digital teaching ability has high requirements on teachers' knowledge, quality, skills, and other aspects, which can easily cause low self-efficacy. Universities should organize various digital teaching development activities so that teachers can experience success in various activities, to improve their self-efficacy. On the other hand, the profession of university teachers is full of great pressure. In addition to the pressure of school work and academic research, there is also pressure from their development, family, society, and other aspects. Teachers in universities are surrounded by various pressures for a long time and are easy to lose their vitality. Universities should show concern for their work and life, and reduce their fatigue. At the same time, it is also necessary to provide opportunities for teachers to exchange and study, to encourage them to broaden their horizons and improve themselves. It will make them full of enthusiasm and motivation for teaching, relieve the pressure and negative emotions gathered by work, and thus improve their vitality and self-efficacy level.

Secondly, it is necessary to help teachers accept digital teaching tools psychologically, endorse digital teaching from the bottom of their hearts, and eliminate their resistance to digital teaching. Only in this way can the digital ability of teachers be improved from the source. Fundamentally, teachers need to raise their awareness of digital teaching. It is necessary to realize that with the rapid development of digital technology today, the integration of digital technology and teaching has been the general trend and cannot be changed. To adapt to the rapid development of digital technology, teachers should actively learn and master the cutting-edge knowledge of digital teaching.

##### **3.1.2. Improve teachers' information-based teaching ability**

Teachers should evaluate their own digital and information-based teaching ability objectively, give full play to the advantages of teaching, and make up for the shortcomings of teaching. They should not be satisfied with the status quo, overcome behavioral inertia, and improve their teaching behavior ability according to their reality. It is necessary to establish the concept of lifelong learning and actively participate in relevant training and research activities. Improve the teaching methods, pay attention to the pre-class information teaching design, guidance, and cooperation for students' learning during class, and pay attention to the diversified interaction of teaching and all-around assessment evaluation after class, which can cultivate students' innovative ability and exercise their

independent learning ability. It is also instrumental to make effective use of information technology means and information exchange platforms, to complement each other's advantages through cooperation, discussion, and communication among teachers, and quickly improve teaching research ability. Teaching reflection can also help teachers summarize teaching experience, and then they can share and exchange experiences in the teaching group, forming a channel for collaborative work, communication, sharing, and reflection. Ultimately, they will become intelligent teachers who conform to the development of the era.

### **3.1.3. Enhance teachers' ability to integrate information technology and innovate**

The digital transformation of education has given new connotations to teachers' professional ability, and the improvement of teachers' information integration and innovation ability is of great significance. Teachers must update their educational concepts, innovate their teaching modes, and transform their teaching methods. However, the digital transformation of education is not simply the use of digital education infrastructure to assist teaching, but the use of "education + digital" thinking, mode, and technology, to build an intelligent and personalized teaching environment, to provide students with intelligent and customized learning programs, which has brought certain challenges to teachers. Therefore, teachers need to continue to carry out the integration and innovation of educational technology, and combine scientific research and teaching, to realize their mutual promotion. Meanwhile, universities should encourage teachers to integrate scientific research methods with educational teaching methods and scientific results with teaching results, to guide and promote teachers to consciously strengthen the reflection and research on teaching itself. At the same time, teachers should also boldly try to actively integrate curriculum research and information technology, and innovate teaching modes. It is necessary to realize the transformation of teaching structure and deeply develop educational information technology, to fully mobilize students' learning enthusiasm. Finally, in the organic integration of information technology and curriculum, a new teaching model of flexibility, diversity, use, and innovation is constructed.

## **3.2. Universities' Level**

### **3.2.1. Strengthen systematic training and promote professional development**

The transformation of college education digital teaching team needs to establish a scientific, reasonable, and diversified training system. Firstly, universities can carry out targeted training. The professional knowledge, skill level, and subject needs of teachers with different ages and degrees are different. Therefore, the training of college teachers' digital ability should fully consider the age, educational characteristics, actual professional needs, and digital ability level of teachers, and adopt targeted training to meet the needs of different teacher groups. Secondly, universities can carry out practical training. The development of the digital ability of teachers begins with their understanding of the practical situation. Therefore, the training should provide targeted teaching guidance based on theoretical knowledge. The content of digital ability training should not only be limited to the introduction of digital technology and the publicity of digital teaching methods and means but should apply digital knowledge and skills to practice. The content of the training should originate from the application problems of digital technology encountered by teachers in the process of teaching, which can stimulate their enthusiasm. Training based on real classroom analysis is conducive to promoting the learning and development of young teachers, breaking the mindset of experienced old teachers, and promoting the development of the digital ability of all college teachers in real classroom observation analysis, and discussion. In practice, it encourages college teachers to transform theoretical knowledge into personal ability. Finally, schools can carry out diversity training. Today, with the rapid development of information technology, training can be carried out with the help of online platforms while carrying out offline training. This can make full use of online learning resources, overcome the limitations of time and space, and ensure the continuity of training.

### **3.2.2. Improve the evaluation system and guarantee the incentive mechanism**

First of all, the university should establish a reasonable teaching evaluation system, and improve the index system and feedback procedures. The university should change the single and template quantitative standards, take the diversified and all-round evaluation as the direction, and conduct a systematic evaluation in combination with the evaluation of fellow teachers, students, and colleges, to build a scientific and reasonable teaching evaluation system. At the same time, it is necessary to strengthen the research on the evaluation index system of teaching quality, fully consider the complexity of teaching activities and multi-factor constraints as well as the limitations of evaluation techniques and means, and take into account the influence of different disciplines, colleges, types of teachers and other factors to develop accurate and objective quantitative indicators. Strengthen the feedback of evaluation results and peer listening, strengthen the combination of process evaluation and result evaluation, mobilize the enthusiasm of teachers to participate in teaching evaluation, ensure the combination of student evaluation, teacher self-evaluation, and peer evaluation, and ensure the scientific, objective, effective and diagnostic evaluation.

Secondly, the university should pay attention to the policy and system orientation to ensure the long-term development of teachers' teaching ability. More financial support and preferential policies should be given in teaching practice, teaching competition, teaching research, etc., to mobilize teachers' enthusiasm for innovative teaching work; Secondly, the university should pay attention to spiritual motivation, strengthen the training of informatization teaching leaders and teaching team construction, and play a demonstration and radiation role; College leaders should establish the central position of talent training in college work in concept and behavior, initiate and promote major education and teaching reform, and guide teachers to sincerely love education and teaching work.

### **3.2.3. Strengthen the quality and construction of digital resources**

First of all, universities should provide high-quality material support and improve both hardware and software facilities. Clarify the teaching needs of different disciplines, increase capital investment, and develop digital resources to meet the needs of different teachers, such as interactive teaching materials, virtual simulation resources, etc. Construct multimedia classrooms, smart classrooms, network teaching classrooms, mobile campus networks, and other facilities, gradually improve the digital teaching environment. Secondly, universities can create digital resource management departments to provide targeted guidance services for teachers to integrate digital teaching resources. Set up a special digital resource manager, responsible for the connection between digital resources and curriculum teaching, and help them timely solve the problem of the use of digital resources. Establish a special digital resource funding channel to provide material support for teachers to use digital resources. Thirdly, establish and improve the system guarantee of digital resources, set up a special charter and behavior plan, and guide teachers to use digital resources rationally in teaching. Form a reward system, and create a good atmosphere for the utilization of digital resources. Finally, interaction between university teachers should be strengthened, a community of digital resource applications should be created, and teachers should be helped to integrate high-quality digital resources. For example, excellent cases of the use of digital resources should be introduced, and experience-sharing meetings on the use of digital resources should be held.

## **4. Conclusion**

This paper gives targeted and feasible strategies on how to improve the teaching ability of university teachers under the background of education digitalization, it is helpful to the construction and talent training of college teachers to a certain extent. It analyzes the internal and external factors that restrict teachers' digital teaching ability. From the perspective of teachers themselves, there are problems such as weak teaching beliefs, insufficient integration of teaching knowledge and ability, and lack of innovative teaching. From the perspective of the university, there are some problems such as insufficient organizational training, an unscientific evaluation system, and imperfect digital construction. Therefore, it is proposed that teachers should enhance self-efficacy and belief in digital

teaching, improve information-based teaching ability, enhance the ability to integrate information technology and innovate. Universities should strengthen systematic training and promote professional development, improve the evaluation system, and guarantee the incentive mechanism. However, the research data that can be collected in this paper is limited. Although many countermeasures and suggestions are put forward for the improvement of teachers' teaching ability, it is still not enough to prove the feasibility and effectiveness of all relevant strategies. In the future, it is necessary to further test the usability and scientificity of countermeasures and learn more about the development status of universities.

## References

- [1] Li Ming, Han Xibin, Li Meng, et al. Vision, challenges, and countermeasures of digital transformation of higher education teaching. *China Audio-Visual Education*, 2022, 7, 23-30.
- [2] Wu Di, Li Huan, Wei Xiaorong, et al. Education digital transformation: the international background, development needs and promote the path. *China Distance Education*, 2022, 7, 21-27 + 58 + 79.
- [3] Lin Kun, Li Yanling, Huang Zhenjin, et al. Research on university teachers' Ability to use digital teaching resources in the era of "Internet + Education". *Jiangsu Higher Education*, 2017, 10, 56-59.
- [4] Han Xibin, Ge Wenshuang, et al. Investigation and research on informatization teaching ability of Chinese university teachers. *China Higher Education Research*, 2018, 7, 53-59.
- [5] Xu Zileng. Research on strategies for improving the teaching ability of university teachers under the background of informatization. Wuhan: Huazhong Agricultural University, 2018.
- [6] Koehler MJ, Mishra P, et al. What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research*, 2005, 32, 131-152.
- [7] Wang Yanan, Wang Jinghua, Han Hongmei, et al. A survey on the current situation of informatization teaching ability of Chinese university English teachers. *Foreign Language Circle*, 2023, 2, 54-61.
- [8] Wang Xuemei, Xiong Yiwen, et al. A study on TPACK level of college English teachers and its influencing factors under the background of "Internet Plus". *Shandong Foreign Language Teaching*, 2018, 39(06), 40-51.
- [9] Wu Guoli. Research on the development of Informatization teaching ability of university teachers from the perspective of TPACK. Shijiazhuang: Hebei Normal University, 2019.
- [10] Sui Xinghua, Zhao Guodong, Wang Jingxin, et al. An empirical study on the influencing factors of university teachers' information-based teaching ability -- A case study of some universities in Hunan Province. *China Audio-visual Education*, 2020, 5, 128-134.
- [11] Xu Chunhua, Fu Gangshan, Hou Xiaojun, et al. TPACK level and development strategy of Chinese university teachers. *Modern Educational Technology*, 2018, 28(01), 59-65.
- [12] Mo Jiafeng. How to improve the teaching ability of university teachers in the era of MOOC. *Journal of China University of Geosciences (Social Sciences Edition)*, 2014, 14(03), 129-133+140.
- [13] Shen Wenhui, Xie Youru, Ke Qingchao, et al. The mechanism and model of promoting the development of teachers' teaching ability by teaching development centers in universities. *China Audio-visual Education*, 2019, 12, 66-70.