The Collaboration of Universities with Primary and Secondary Schools Empowered by Information Technology in Promoting Teachers' Professional Innovation Development

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Abstract. Information technology plays a very important role in promoting the construction of teachers, solving the imbalance of educational resources supply, and promoting education fairness. In view of the current problems of insufficient teachers' professional ability, single traditional professional development model, and unbalanced inter-school development in schools, a professional innovation development model of universities in collaboration with primary and secondary school teachers is constructed under the empowerment of information technology. Through the characteristics of the cross-domain communication of information technology, this model aims to improve the professional ability of teachers, focuses on the dimensions of the three collaborative mechanisms of courses, classrooms and topics, and promotes the professional development of teachers. The practice and effect analysis show that the professional development model of teachers in universities in collaboration with primary and secondary schools under the empowerment of information technology can effectively promote the professional and high-quality development of the teaching staff.

Keywords: Information technology · Artificial intelligence · Big data · Teacher professional development

1 Introduction

Teachers are the first resource of education. Making full use of current resources and building an excellent team of teachers has played a key role in driving the overall improvement of student education and school education, and it is also an important pursuit of countries in the world in the competition of comprehensive national strength. Universities have advanced teaching technology and have a more accurate grasp of the development trend of education. At the same time, they can keenly find problems in the process of education and teaching, and use corresponding theoretical research to solve them. This can provide a solid theoretical foundation and practical guidance for the professional development of teachers in basic education.

In recent years, though universities and primary and secondary schools have undergone changes from isolation to straying, from remote viewing to observation, and from conflict to cooperation, the promotion of teachers' professional development by making full use of the advantages of universities in relation to their theoretical research, advanced technology and expert talents has also received increasing attention. Due to the constraints of geographical location, economic level, social support and management mechanism of primary and secondary schools, the promotion of professional development of teachers in primary and secondary schools by universities is still more in the aspect of teacher training. A few teachers will cooperate with each other, but the cooperation is personal and limi ted by their good relationship. The emergence of new generation information technology such as artificial intelligence, big data and 5G has provided convenient conditions for universities to promote professional development of primary and secondary school teachers, which can break through the limitations of time, space and geography and share high-quality educational resources. Therefore, from the perspective of teacher professional development empowered by information technology, it has become a common focus of education circles to build a cooperation model between universities and basic education schools based on the advantages of information technology, to explore an effective way of professional development of universities in collaboration with primary and secondary school teachers, and to establish a mutually beneficial and win-win cooperation mechanism. This study was conducted based on this practical need, hoping to promote teachers' professional and personalized development by constructing a new model of professional development of university and primary and secondary school teachers under the empowerment of information technology.

2   Research Status

In the early days, Fluller and others divided the professional development of teachers into three stages: focus on survival, focus on situation and focus on students [1]. This provides ideas for the direction of subsequent teachers' professional ability improvement. H argreaves and Fullan believe that the professional development of teachers includes three aspects: the development of knowledge and skills, the development of self-understanding, and the development of ecological change [2]. According to the classification of teaching activities, Wang Zhuo and others believe that teachers should have the ability to design teaching activities, implement teaching activities, organize teaching process and evaluate education [3]. Li Hairong defines the professional competence of teachers as the sum of the characteristics that teachers possess in the process of education and teaching based on certain professional knowledge and basic skills, and which can help them successfully complete the tasks of educational and teaching activities [4]. Liu Yibing believes that teachers' professional development is achieved from multiple levels and that teachers should not only continuously accumulate theoretical knowledge and practical skills, but also continuously develop their professional skills [5]. Scholars' research on teacher learning supported by information technology is more reflected in teachers' classroom practice research. They mainly focused on the role of information technology in improving teaching effectiveness, and the support of information technology on teachers' occupations or disciplines. For example, Liu Zhe

et al. took the teaching examples in the smart classroom environment as the object, and used the classroom observation method to analyze the teaching interaction behavior in the classroom, so as to provide some reference for improving teachers' effective teaching ability in the smart classroom environment [6]. Mirian Cents-Boontra explored the relationship between teachers' motivational teaching behaviors and students' participation in the classroom, and found that motivational teaching behaviors can increase the possibility of students' active participation [7]. Hasan Unal and others' research on teachers' professional development activities in improving students' mathematics learning effect found that providing in-service teachers with content training such as subject content, teaching methods and problem-solving skills can have a positive impact on their students' mathematics learning [8].

3   The Model Design of Universities Collaborating with Primary and Secondary Schools

3.1   Design Principles

The design of the model can provide teachers with personalized and professional services. Firstly, driven by the internal driving force of self-professional ability improvement, teachers can selectively shape and evaluate themselves in combination with their own professional characteristics, and realize themselves in the process of practice and reflection. Secondly, due to the different development needs of school subjects and teaching concepts between institutions of higher learning and primary and secondary schools, in the process of development, institutions of higher learning need to provide help for the individual needs of primary and secondary school teachers. Teacher professional development is a dynamic and continuous process. In this process, teachers need to continuously expand and complete their professional knowledge and improve their professional skills.

The communication and cooperation between teachers in universities and primary and secondary schools should be laid a great emphasis. Because teachers in college and university have a wealth of theoretical knowledge and are interdependent with primary and secondary schools. The scientific research carried out by universities requires practical support from primary and secondary schools. In terms of professional development of teachers in primary and secondary schools, they need theoretical help and practical guidance from teachers in universities. Therefore, strengthening the communication between higher education institutions and primary and secondary schools can better and faster identify the need points between each other, and thus build an inter-school community of mutually beneficial coexistence between universities and primary and secondary schools.

A shared resource library should be built for the high-quality education and teaching. Because education and teaching resources are important learning resources for teachers in the learning process. The collaborative development of higher education and primary and secondary schools must provide necessary and sufficient learning resources for teachers' professional development, so that teachers can find corresponding learning resources in the process of collaborative development. At the same time, the teacher
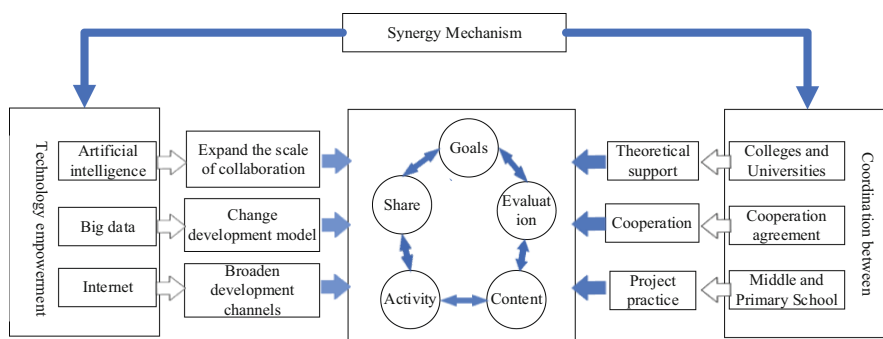
Fig. 1. The professional development model of teachers in universities in collaboration with primary and secondary schools under the empowerment of information technology [Owner-draw]

resource sharing function is opened, and each teacher can share his or her own learning resources, allowing participating teachers to gain a sense of accomplishment while continuously enriching and improving the shared resource library.

3.2 Model Design

On the basis of summarizing the previous analysis, this study dissects the elements, resources, contents, environment and evaluation system in the process of professional development of universities assisting primary and secondary school teachers from multiple dimensions. Then, based on this, a new model of collaborative development from mutual isolation between universities and primary and secondary schools toward openness, integration and innovation is constructed with new generation information technology such as artificial intelligence, big data and Internet, as shown in Fig. 1.

The professional development model of universities in collaboration with primary and secondary school teachers under the empowerment of information technology uses the three major information technologies of artificial intelligence, big data and the Internet to empower universities to develop in collaboration with primary and secondary schools, expand the scale of teachers' organizations, change the development model, broaden the development channels, and promote the high-quality professional development of teachers. At the same time, teacher portraits were drawn and explored through a series of operations such as data collection, classification and correlation of the teacher's professional growth process.

4 Practice and Effectiveness

4.1 Project Practice

In 2018, H University was listed as a co-construction unit of the "National Experimental Zone for Teacher Education Innovation". In recent years, H universities have adhered to the principle of "big education" and formed a collaborative network with 36 primary and secondary schools to give full play to the educational concept of education informatization 2.0 and innovate the ways and contents of collaborative education and teaching, so
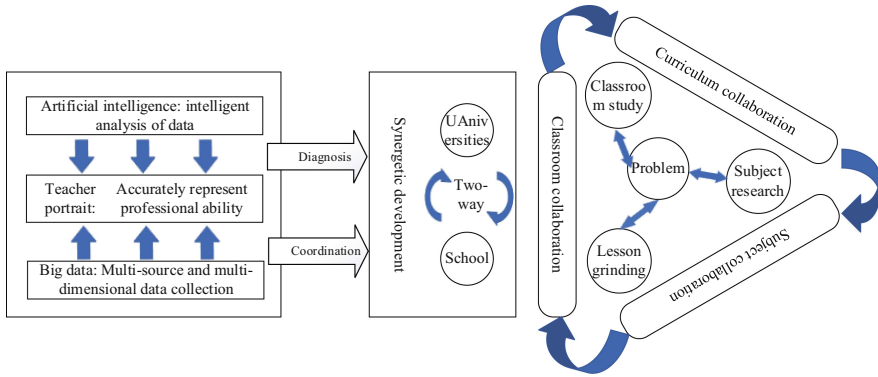
Fig. 2. The professional development strategy of teachers in universities in collaboration with primary and secondary schools under the empowerment of information technology [Owner-draw]

as to realize collaborative classroom, collaborative curriculum and collaborative teaching and research, and effectively collaborate with teachers to improve their professional capacity. The implementation process is shown in Fig. 2.

This program continuously improves teachers' professional theories by systematically assisting them with curriculum training. For example, by analyzing teachers' professional development needs, we have constructed a curriculum system for teachers' professional development and a framework for professional competence enhancement. Then, the classroom is used as a practice carrier to implement teachers' professional practice. For example, we have relied on the Internet, 5G and ICT technologies to offer online famous teacher work visits, online remote coordinated teaching, and use virtual simulation and artificial intelligence technologies for classroom teaching case design. Finally, in the way of collaboratively declare relevant education and teaching topics and carry out research on them, the teachers are guided to continuously enhance their professional competence and professionalism through the topic research approach.

During the project practice, the new generation of information technology, such as big data and artificial intelligence, is used to systematically collect course, classroom, project and other teacher professional growth process data. By analyzing and modeling the data, we can achieve an intelligent portrait of teachers and accurately diagnose the pain and difficulties of teachers' professional development.

4.2   Practice Effectiveness

Under the empowerment of information technology, this project has achieved certain results through the coordinated professional development of teachers in universities and primary and secondary schools. For example, during the period of "suspending classes but not learning" during the COVID-19 epidemic, the "cloud mode" was used to conduct teaching and research activities and educational teaching resources sharing activities for teachers across the province, opening 49 regular classes and more than 400 micro-lessons, which were well received by the society and the on-demand volume exceeded 23 million people. In terms of curriculum construction, thesis publication and project

research, as of August 2022, 27 school-based courses have been jointly completed, 32 academic papers have been published and 11 projects have been approved.

5   Conclusion

Using information technology to support teachers' professional development is an effective way to realize the professional development of teachers in the information society. This project applies new-generation information technologies such as artificial intelligence, big data, and 5G to realize the normalized interactive exchange of courses, classrooms, and teaching and research between universities and primary and secondary schools. Through the big data management platform, according to the needs of different teachers' teaching ability improvement, it meets the professional development needs of teachers at different levels, such as new teachers and backbone teachers, and realizes the refined and personalized professional development of teachers.

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