Research on Curriculum System Construction Based on "BIMC" Technology Under "1+X" Certificate System

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Abstract. The implementation of "1+X" certificate system has played a positive role in promoting the vocational education of application- oriented undergraduate universities in China. Through field investigation, the authors found that current universities' curriculum can neither meet enterprises' needs of information talents, nor match the vocational education related to "Big data, intelligence, mobile Internet, cloud computing" ("BIMC" in abbreviation) information technology. It is difficult to meet the personalized needs of students. Thus, this paper puts forward how to construct course-certificate integrated curriculum system based on "BIMC" technology from the aspect that universities should establish the selection and elimination mechanism of x certificate based on big data analysis, revise the talent cultivation scheme, and by the construction of smart classroom and virtual simulation laboratory develop combined optional courses corresponding to x certificates. The research result is not only of great promoting effect for the x certificate pilot work, but prospective and enlightening for the cultivation of information technology talents in universities.

Keywords: "1+X" Certificate System · "BIMC" Technology · Curriculum System · Big Data Analysis · Application-Oriented Undergraduate Universities

1 Introduction

The concept of the "1+X" certificate system originated from the notice of *the Implementation Plan for the National Vocational Education Reform* issued by the State Council of China on January 24, 2019. The plan clearly stated "Our country will deepen reform of the cultivation model of diverse technology talents. Since 2019, China has implemented a pilot program of the diplomas plus certificates of vocational skill in the vocational colleges and application-oriented undergraduate universities. ('1+X' certificate system pilot in abbreviation)" It is a system that can integrate vocational skill grade certificates and the diplomas. In other words, universities should carry out academic education and vocational skills education simultaneously.

Up to now, 447 vocational skill level certificates have been piloted in four batches in various universities all over the country. After more than two years of pilot reform, many pilot universities have published periodical achievements and produced a lot of

problems encountered in the process of the reform. By the end of 2021, through searching for the "1+X" certificate on CNKI, we found that the total amount of relevant literature is relatively small, which is less than 3000. There were only 181 documents issued by core journals. The current research directions are mostly focus on the necessity of "1+X" certificate system or the discussion on the pilot work of vocational colleges, but the research on the curriculum system construction based on "BIMC" information technology is almost blank. Whereas the 447 vocational level certificates issued are all related with "BIMC" information technology. Therefore, it is a crucial problem that how to construct the curriculum system on the basis of "BIMC" through the model of integrating the course and certificate.

To sum up, on the background of "1+X" certificate system, based on the technology of "BIMC", the study on the construction of the curriculum system of applied undergraduate universities is of great significance. This research will fill the blank of theoretical study on the construction of the "1+X" certificate system in China, push on the pilot work in application-oriented undergraduate universities, and provide systematic ideas and experiences accumulation for the construction of the curriculum system.

2   Problems Existing in the Curriculum System of Universities

Educational reform and development is not only related to social and economic development, but also to high-tech. A large number of emerging technologies represented by "big data, intelligence, mobile internet, cloud computing" ("BIMC" in abbreviation) information technology have emerged in modern society, which are changing the social and economic environment, people's thinking way and enterprise management mode. The university has always stood at the forefront of high-tech research, but the current curriculum system of applied undergraduate universities seriously lags behind modern social and economic development. It does not connect with the development of the industry, nor does it match the implementation of the "1+x" certificate system. There are various problems with course objectives and content setting. The specific performances are as follows:

2.1   Be Disconnected with the Enterprises' Demand of Information Technology Talents

At present, the professional curriculum system of undergraduate universities is drafted by professional teachers and formed after repeated demonstrations by experts in professional fields. For a long time, although there were some adjustments, the core principles have not changed. However, with the emergence of new technologies such as artificial intelligence, block chain, cloud computing, and big data, as well as the transformation of business models, the existing teaching mode is still dominated by traditional theoretical teaching. Therefore, there is a clear deviation between the knowledge imparted by teachers and the skills required by enterprises [3]. The academic curriculum of colleges and universities is far from practice, and is incompatible with the enterprise information management model. The traditional curriculum system usually consists of professional basic courses, professional compulsory courses and professional elective courses, among

which the basic courses and professional compulsory courses that maintain the traditional knowledge system are relatively fixed. In general, most universities have some minor adjustments in the composition of major electives.

Thus, Subject to the principle of curriculum construction and limited resources, the professional curriculum system of application-oriented undergraduate universities is seriously disconnected with the demand of enterprises for talents [5]. Moreover, this kind of course arrangement obviously neither highlights the characteristics of professional personnel training, nor can it provide enterprises with a large number of talents with information technology.

2.2   Cannot Match with Vocational Education Related to "BIMC" Technology

In the past, the professional theory was the basis for the construction of the curriculum system. Recently some undergraduate colleges and universities have realized that the talent cultivation mode needs to be transformed from theory to professional ability, and continuously increase the proportion of practical courses related to "BIMC" technology in the talent training plan. At present, a lot of majors of applied-oriented undergraduate universities are trying to establish simulation laboratories and smart classrooms etc., which increase the proportion of practical courses to 30% or even higher. The "1+X" certificate system puts forward higher requirements for talent training goals, and requires the cultivation of compound talents with professional theories and skills that adapt to the information age [10]. The existing curriculum system is still mainly based on theoretical courses, which are set for diploma education, but it is difficult to adapt to the vocational education of the "BIMC" technology.

What are the reasons for these problems? On the one hand, due to the traditional concept of curriculum system construction, many universities teachers habitually keep the tradition and are reluctant to step out of their comfort zone to avoid the consequences of innovation failure; on the other hand, most applied undergraduate universities have limited funds and it is difficult to establish laboratories with high-tech. Therefore, in order to realize a talent cultivation model that emphasizes both theory and ability, applied undergraduate universities need to work with the government and enterprises to solve ideological dilemmas and financial problems.

2.3   Be Difficult to Meet the Personalized Needs of Students

The talent training direction of application-oriented undergraduate universities is relatively single. Generally, there are only 1–2 employment directions for a major. Taking the accounting major of Wuhan Technology and Business University as an example, the directions include financial accounting and management accounting. This kind of cultivation model causes talent homogenization seriously, further intensifies the involution of the employment market. At the same time, this kind of cultivation method that treats all students equally can neither meet the individual requirements of all kinds of students in the current information age, nor meet the training requirements of compound talents advocated by "1+x" certificate system.

Now, the employment situation in China is very grim. In order to improve the employment rate, it is necessary for application-oriented undergraduate universities to

reconstruct the professional curriculum system according to the broad-caliber employment direction. It can flexibly meet the needs of students in various professional fields, fully meet the needs of the job market for high-tech talents such as informatization and intelligence, and improve the employ ability of the graduates [8].

3 Construction of Curriculum System Based on "BIMC" Technology

In view of the above problems, under the background of "1+x" certificate policy, undergraduate application-oriented universities should construct a course-certificate integrated curriculum system based on "BIMC" technology. The specific construction method is as follows:

3.1 Relying on the Big Data Analysis to Establish the X Certificate Selection and Elimination Mechanism

At present, 477 vocational skill level certificates have been formulated in accordance with international and domestic advanced industry standards, reflecting the practical application of "BIMC" technology in various industries. How to establish a selection and elimination mechanism of x certificates in universities will become the core issue in the implementation of the "1+x" certificate system. In the process of selecting and eliminating x certificates, universities mainly consider the following factors:

First, it is necessary to understand the vocational skill level construction standards of the certificates, in order to judge whether the standards reflect the new procedure, new process and new technology. The latest industry standards often adopt the "BIMC" technology [6].

Second, it should be based on the professional construction of various universities. The selected certificate should be suitable for the characteristics of the majors, and then consider whether the teaching facilities such as the practice places of universities can meet the implementation of the x certificates. At present, the pilot colleges and universities must prepare special laboratories for the x certificates examination, which the hardware of these laboratories have to be able to meet the requirements of the cloud platform for downloading data, debugging and online exams.

Third, the universities should fully consider the regional job market. The students trained by the application-oriented undergraduate universities should be connected with the local employment needs [9], but the employment needs of enterprises are not fixed. Therefore, when applied universities build the selection and elimination mechanism of x-certificates, they should consider the job demand of regional enterprises for the professional direction and the recognition of x certificates in the job market. Therefore, the core question is how to evaluate the recognition of x certificates in the employment enterprises.

According to Fig. 1, the authors plan to construct a x certificate evaluation mechanism model based on the credit bank, graduates and enterprises. Universities share the data of x certificates of graduates to the platform, where China launched a "Credit Bank" platform supporting the x certificates system in December 2021. While the enterprises
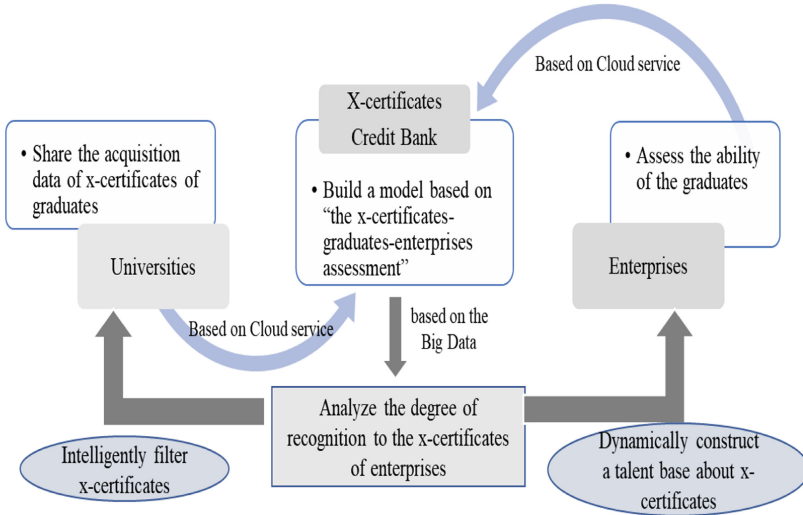
Fig. 1. Construction framework of x certificate evaluation mechanism based on "BIMC" technology.

can evaluate the ability of the graduates on the same platform through the cloud service. The "Credit Bank" platform can analyze the degree of recognition of the x-certificate by job market based on the big data provided by universities and enterprises. On the one hand, the analysis results can be used to intelligently filter x certificates for universities, and on the other hand help enterprises to dynamically construct a talent database about x certificates.

3.2   Revise the Talent Cultivation Scheme According to the Technology Standards of X Certificates

The selection for x certificate is only the first step in the process of curriculum system reconstruction. Whether the universities can integrate the vocational skill level standards into the professional talent cultivation plan is the most important for the construction. Since the "1+x" certificate pilot work led by the Ministry of Education in 2019, many universities have set up "1" courses and "X" courses separately in the talent cultivation plans. In fact, the method does not achieve the integration of the "1" and "x", just combines "1" and "x" simply and crudely. The "1" courses, which represent academic education, are usually traditional and conservative, while the "x" courses, which represent industry standards, reflect the application of the latest technology and are compatible with current enterprise information systems. Therefore, in order to achieve the synergistic effect of "1+x" certificate system, universities should clarify the goal of the professional talent cultivation plan at the beginning, understand the latest industry standards reflected in the x certificates, and master the application of "BIMC" technology [4].

How to effectively integrate professional skills standards into professional talent cultivation scheme? On the basis of research on employment demand, universities must cooperate with enterprises to formulate the talent cultivation scheme. Course-certificate

integrated mode does not mean that universities simply replace some diploma courses with certificates courses, but consider the overall composition of the curriculum system and reconstruct a system by transferring the industry standards into course standards [1]. By cultivating a thinking mode based on big data and skilled application of high-tech information technologies such as mobile Internet and digital economy, it can help universities to improve the consistency of talent training direction with the industry demand for senior talents.

3.3   Explore the Combination of X Certificate Electives Based on the "BIMC" Technology

How to build x certificate curriculum system according to the revised talent cultivation program? Universities can combine some similar majors into a group according to the category of majors, and then select some x certificates according to different groups. Mo S. proposed that "Universities should develop different course packages, each consisting of 2–3 courses related to the X certificate for different students to choose [2]." Figure 2 takes Wuhan Technology and Business University as an example, showing different combinations of elective courses corresponding to some x certificates and relevant BIMC technology corresponding to these elective courses.

So far, the Ministry of Education has announced four batches of 447 skill level certificates, including more than 10 finance-related certificates. It is not difficult to find from Fig. 2 that the names of these certificates include intelligence, financial sharing, big data, information, RPA, etc. [7], which will inevitably lead to an increase in the proportion of practical courses and introductory courses related to "BIMC" technology. In the process of building the new curriculum system of application-oriented undergraduate universities.
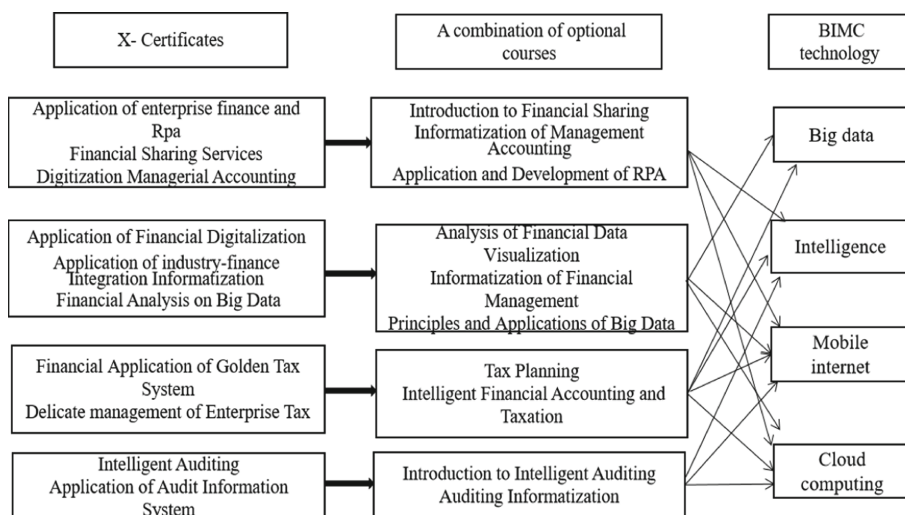

Fig. 2. List of x-certificate electives combination about financial accounting major based on "BIMC" technology.

In addition, x certificates often reflect the latest technology standards. As showing in Fig. 2, many x certificates courses require establishing courses situations based on BIMC technology. The x-certificate courses systems need to be installed on the cloud service platform, which can directly host the operating system and memory data packages. The systems can implement a process: After students log in to the platform, the system can simultaneously transmit data and push tasks in real time. Then, according to the different operations of students, the system will intelligently select different tasks, and the results of the examination will be automatically uploaded to the cloud platform and recorded. Therefore, the development of such courses systems cannot be undertaken independently by applied universities. It is necessary for application-oriented undergraduate universities to cooperate with enterprises that develop x-certificates, with the help of "BIMC" technology, to construct curriculum conditions by building smart classrooms, online classrooms, and financial sharing virtual simulation laboratories etc.

4   Conclusions

In conclusion, the implementation of the "1+X" certificate system in China promotes the transformation from professional theory-oriented to professional ability-oriented of talent cultivation. According field research for a lot of application-oriented undergraduate universities, the authors found that there are many problems in the existing curriculum system, including the disconnection between the talent demand of enterprises for information technology and direction of the vocational ability training in applied universities, the mismatch with vocational education related to "BIMC" technology, and dissatisfaction with the personalized needs of various students in the information society.

In response to these problems, this paper proposes some countermeasures to reconstruct the curriculum system of applied universities based on "BIMC" technology. Firstly, application-oriented universities should establish an x-certificate evaluation mechanism and rely on big data analysis to select appropriate certificates. After, according selected certificates, universities should revise the professional talents training plan, and explore x certificates elective courses combination based on "BIMC" technology. Through above measurements, applied undergraduate universities can construct course-certificate integrated curriculum system which can ensure the effective connection between diploma education and certificates education, and improve the competitiveness of application-oriented undergraduate universities' graduates in the employment market.

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