

# A brief introduction to the application model of big data in higher education subject teaching

Xiaoning Qu

Changsha Vocational College of Commerce and Tourism, Changsha, China

**Abstract.** Big data technology has become a rare and effective tool in many fields, and it is an inevitable trend to introduce it into the teaching of higher vocational subjects. This paper takes this as the basic direction, after discussing its specific impact on subject teaching, it selects subject teaching as the basic entry point and conducts an in-depth analysis of the specific application mode and role paradigm, aiming to comprehensively demonstrate the application value of big data technology in higher vocational subject teaching, hoping to provide the necessary reference for the subsequent introduction of technology and upgrading of subject education.

**Keywords.** Big data, higher education, discipline education, application research.

## 1. Introduction

In recent years, big data technology has been developing rapidly and playing its proper role in various fields. In addition to bringing advantages such as improving the convenience of people's lives, it has also profoundly changed the overall state of some fields, and this is also true in the field of education. Recently, China's Ministry of Education has issued a "double reduction" policy to regulate the behavior of out-of-school tutoring institutions and strengthen the vocational education system. In the foreseeable future, vocational education, with higher education as the core, is bound to further enhance its status in the education system and become a firm force in cultivating qualified talents for society. Based on this, it is particularly important to explore the application value of big data in vocational education.

## 2. Impact of big data on teaching of higher education subjects.

There are three main directions of applying big data technology in the teaching process, which can be summarized as to the classroom, to the students and to the subjects. The application to classroom is simple and more inclined to the application of data, such as using Internet resources as background information or supplement of teaching content, using catechism and micro-lesson as the display material of specific knowledge points, etc. The application to students needs to be built on the corresponding students' personal dynamic database, analyzing and managing students' comprehensive behavior, finding students' learning dynamics and deficiencies, and then providing the necessary basis for the next step of the application for students needs to be built on a database of students' personal dynamics, to analyze and manage their comprehensive behavior, to find out their learning dynamics and deficiencies, and to provide the necessary basis for further management and teaching guidance. The application of the discipline is still in the exploration stage, and it is also a key application of big data in higher education institutions in the future. From the existing application mode, it is easy to find that the application of big data has obvious influence on various aspects.

**Impact on professional construction:** The core of teaching in higher education is employment-oriented, so the dynamic and even predictive requirements for social talent demand are relatively high. To further improve the level of professional construction, it is necessary to interact with the actual needs of the society.

In turn, the teaching activities such as subject teaching, student training and internship arrangement will be reflected, so that the cultivation effect of students can reach a higher level. From this perspective, the introduction of big data can effectively help schools to provide more data parameters in the process of discipline construction, thus ensuring the overall direction of discipline construction and providing a solid basis for the subsequent cultivation of talents.

**Impact on teachers:** The era of big data is an era of high technology and high performance, which requires more and more teachers. Teachers should not only be able to give lectures, but also have the ability to use data to analyze problems and make education more scientific and personalized. First of all, teachers must enhance the awareness of big data, change the concept of education, update the way of thinking, join the wave of new curriculum reform, take the initiative to understand new things, and take advantage of various favorable conditions to strengthen professional knowledge to meet the challenges of the era of big data. Secondly, the focus of teachers' functions should gradually change from lecturing to classroom design, organization, assistance and guidance, which requires teachers to actively develop towards specialization. Teachers need to learn new teaching theories and teaching design to improve their professional ability, cultural and educational literacy, and form their own teaching characteristics. In the era of big data, students have more and more ways to acquire knowledge and a wide range of knowledge, so teachers who do not prepare and teach carefully will gradually be eliminated. Finally, teachers should be good directors of classroom teaching, organize learning materials, collect data resources generated by students in classroom learning, and analyze and use them statistically to understand students' thinking characteristics and real ideas, so as to lay the foundation for improving their own knowledge structure and quality.

**Impact on assessment:** With the continuous promotion of education reform and the transformation of society's definition of talents, the traditional teaching assessment is no longer able to meet the current teaching needs. The introduction of big data into the assessment of students can form the ability corresponding to the results, the usual corresponding to the temporary change of assessment ideas, through big data technology to record the daily learning

behavior of students, with high-frequency, multi-point daily assessment instead of the traditional final "surprise" assessment. The application of big data technology can present the students' ability level more three-dimensionally instead of a single theoretical knowledge system, and then build a more comprehensive and scientific evaluation system.

### 3. The construction of big data application system

#### (1) Determine the construction orientation

The application of big data technology is not simply the use of digital technology to manage the relevant information, but needs to be clarified through a clear directional design in the process of applying big data technology, such as what problems need to be solved, what application mode needs to be adopted, what difficulties are encountered when the technology is introduced and what solutions are adopted. Only after the above questions are clearly answered can we ensure the science and compliance of the subsequent application. In the overall context of higher vocational education, the core orientation is to use big data system to assist the teaching of subjects, which will inevitably carry out deep excavation of teaching objectives and core content, so as to adjust the compliance of education content through the collection of market demand information by big data system, and then enhance the core competitiveness of students.

#### (2) Building data model

On the basis of the general oriented design, it is necessary to establish the necessary models to realize the analysis of specific data. The so-called data model establishment is to process the indescribable or quantitative information into a data system that can be compared horizontally and vertically, so as to achieve the fundamental goal of subsequent analysis. Take the student employment information closely related to the quality of higher education as an example, what kind of talents the society needs is a problem that cannot be described quantitatively, and it is necessary to effectively decompose the problem and establish a quantitative relationship system in the process of applying big data technology. In the specific construction process, we can build a collection of jobs, the number of which indicates the type of jobs and job differences; under a, we can add subsets of A-X, which are the matrix of competency requirements corresponding to the jobs, and the factors in the matrix are based on the weight of frequency statistics as the core index, so as to realize the evaluation of "job, competency and importance". The subset is the competency requirement matrix corresponding to the job, and the factors in the matrix are weighted based on frequency statistics as the core indexes, thus realizing the evaluation system of "job, competency and importance". In the same way, the set 0 is established, which is the set of the school's current teaching and learning process capacity building. The matching degree is evaluated and analyzed through the co-efficient calculation between the a and B sets, and the shortcomings of the current subject education system and the future improvement direction are found.

#### (3) Dynamic monitoring of data

After establishing a good data model, it is necessary to monitor the data in real time through the retrieval of data. The big data technology under the data model is only the completion of the framework.

To provide conclusions and functions in a real sense, it needs to be realized by continuously analyzing the data. This requires determining the effective data acquisition path according to the actual application scenario. From the current big data application system, the acquisition of data is divided into two kinds of special data and public data. The special data mainly refers to the data system provided independently for the analysis of a class of problems, such as the application of big data system for the portrayal of student learning behavior requires the special collection of our students' behavior data. Public data mainly refers to the "crawling" of Internet data (crawling with crawler software) in a specific range according to certain data rules. The big data system of higher education science education needs to grasp the data of occupational competency requirements and provide guidance for the construction of our school subjects, so it is suitable to use public data. Professional recruitment websites are an effective source of data.

#### (4) Effective information mining

The general conclusion can be obtained after the effective data is obtained and brought into the big data model. From the design of the big data system in this paper, we can find that the general conclusions in the field of subject education include the following three aspects: one is the macro conclusion of employment, i.e., the current market demand for different jobs and the prediction of the scale of employment. This data can guide the enrollment scale of different majors in schools and facilitate students' effective career planning; the second is the conclusion of core competency of employment, which can analyze the competency and skill requirements of different jobs and give guidance ranking according to the importance; the third is the conclusion of subject education matching, which can analyze the current subject education by matching the competency requirements of employment and the competency of school subject education and give guidance. The third is the conclusion of subject education matching, which analyzes the effectiveness of current subject education and gives guidance by the degree of matching between the demand for employability and the ability of school subject education. Based on the above three basic conclusions, it is necessary to dig deeper into the data to provide more information, such as career development under different core skills mastery, salary difference of different positions/positions, paths and effective ways of competency development, construction mode and realization method of

subject education, and so on. The deep excavation of these data and information can realize the effective connection from data to reality, and correspond the obtained big data conclusions to the actual school's discipline construction and discipline teaching, so as to effectively change the organization and teaching content of the discipline, and truly achieve the teaching goal of technology serving teaching, teaching serving employment, and employment serving students' personal growth.

#### 4. Application practice based on the goal of employability

In order to further show the application and value of big data technology in higher vocational education, the author takes information technology discipline as an example to explore its application process and the conclusions achieved. Information technology is one of the more popular subjects nowadays, and its employment scope, employment scale and employment prospect are relatively good. Unlike the traditional programming teaching, the current society has more comprehensive requirements for information technology professionals, so effective market analysis and big data mining can help determine the next teaching direction of the subject, and also help improve students' core literacy.

##### (1) Determine the data model and collect data comprehensively

The two sets of social needs and students' abilities are determined in the way above and matched with the relevant data models. According to the data model requirements, it is mainly necessary to collect market employment information, competency demand information and student competency information. For this purpose, using the subject of information technology as a specific case, the data on job entries and competency needs were collected using the fetch data collection tool, using the 58 Tongcheng job site as the data source. The data analysis of students' competency levels was conducted using a simple multiplicative evaluation model in which the competency score = whether it involves (0/1) \* subjective rating \* performance weighting.

##### (2) Results of IT subject education market match

Based on the completion of the basic data collection, the following results were obtained by using Citespace software for in-depth analysis and statistics of the data:

**Table 1.** Statistical table of competency demand and teaching matching results

Competency Levels	Competency	Weights	Matching Results
Basic Capabilities	Document Processing	0.20	8.6
	Data Processing	0.20	7.4
	PPT Presentation	0.20	7.9
	Information Searching	0.15	8.2
	Information Security	0.10	6.3
	Internet Technology	0.16	7.7
Core Literacy	Project Management	0.07	3.1
	AI algorithm	0.15	5.3
	Big Data	0.16	4.2
	Cloud Computing	0.13	7.8
	IoT	0.12	3.9
	AR Technology	0.04	6.7
	Topology	0.03	1.6
	Digital Media	0.13	7.1
	Block Chain	0.04	5.7
	Communications	0.11	6.8

In the above table, the weights of basic competency and core literacy were calculated separately, and the items that match the results are considered to be more than 6 points as the current teaching system can meet the needs of the society, the school has invested more in the education of the subject, and the students have good mastery; 3-6 points (not included) are considered to have certain deficiencies in the subject, and there are areas that can be strengthened; below 3 points represent the major deficiencies in the construction of the subject, and there is a need to fill this gap in order to enhance students' core competitiveness. If the score is below 3, it means that there is a major gap in the discipline construction, and the gap needs to be filled in order to improve the core competitiveness of students. From the data mining results, it is easy to find that the curriculum system of this major in higher vocational institutions is more effective in cultivating students' basic skills, and there is the phenomenon of students' self-learning in such contents as document processing, general data processing and information retrieval. In terms of core literacy, there is a serious lack of topological algorithms in the construction of the discipline, and there is also a large lack of project management, big data, Internet of Things and other items, which need to be strengthened in the subsequent education of the discipline. At the same time, we found that cloud computing, AR technology, digital media and communication technology are the strong points of the discipline, which can provide sufficient competitiveness for students' subsequent employment competition.

### (3) Suggestions for optimization of IT subject education

The above analysis only takes the recruitment information of a single major as the actual data source, and its focus is to show how the big data system is applied in the discipline education. In fact, some majors or some positions have a great crossover and integration in the demand for students' abilities, which requires schools to provide more elective courses under the traditional subject education system, so that students can purposefully supplement their own ability shortcomings, and then perform more outstandingly in the future competition for jobs. At the same time, the subject education in school should also be close to the market demand, part of the traditional skills, such as B/S programming, should be incorporated into the basic curriculum a for project management, AR technology, cloud computing and other more cutting-edge and social demand for skills, we should further invest in teaching to ensure that the effective play of students' competitiveness.

## 5. Conclusion

The employment-oriented teaching goal of higher education will occupy a higher and higher position in China's future education system. The introduction of big data technology into the subject education system of higher education institutions can effectively clarify the demand of society for talents, so as to match with the existing subject teaching and further improve the teaching system. With this as the basic goal, this paper firstly discusses the specific impact of the application of big data technology on professional education, teachers and assessment, and then discusses in detail the application mode and method of big data technology in the field of subject education on behalf of subject education, and takes information technology subject as an example to show the application results of big data technology and its function and effect on subject construction, which provides necessary guidance for the construction of subject education system in higher vocational institutions. It provides necessary guidance for the construction of disciplinary education system in higher education institutions. The author hopes that the research of this paper can help more decision makers to realize the application prospect of big data in education and help the promotion and use of big data technology in this field.

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