






Research on the Construction of Students' Vocational Core Literacy Evaluation System of Big Data Analysis

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Abstract. At present, with the wide application of big data in the field of education, especially through the big data scraping class and individual students' homework, test scores and other learning results for statistical analysis, to gain the conclusion of the whole data can help teachers diagnose teaching effect and improve teaching quality. With the development of post-industrial market economy, the demand for professional talents is not only to stay at the level of academic achievement, but also to consider students' professional accomplishment. It can be predicted that in the future, big data analysis will be more widely used in personnel training, and the core literacy indicators of students will be defined by data. This paper through research and practice, compares and analyzes the definition of professional core literacy by different organizations and scholars, determines the standard of digital core literacy, discusses the construction of digital evaluation system, and explores the application of big data in future education area.

Keywords: Big data · Vocational core literacy · Evaluation system

1 The Definition of Vocational Core Literacy and Lifelong Learning

“Key Competencies” is one of the topics of great concern in the educational field. According to its definition, there are four main representative views:

1.1 Definition for EU

In 2006, the European Union defined the concept of core literacy as: “Is a range of portable, multi-functional knowledge, skills and attitudes, It is necessary for individuals to obtain personal achievement and self-development, integrate into society and be competent for work. It emphasizes that these qualities should be realized in compulsory education as the basis of lifelong education. Thus, the European Union has put forward eight qualities of lifelong learning: mother tongue communication skills, foreign language exchange skills, mathematics literacy, science and technology literacy, learning ability, social citizenship literacy, innovation awareness, cultural awareness and expression.

1.2 Definition by the Organization for Economic Cooperation and Development

In 1997, the organization stated that core literacy should cover many aspects of life and be a comprehensive reflection of both life and social competence. Through the integration of multiple disciplines, the core literacy of three aspects are: can learn and use tools, can communicate in different situations, can control themselves.

1.3 The “21st Century Literacy” Framework of the United States

It proposes three “R” skills in American schools, namely “Reading, Writing, Arithmetic.” Later by extension of the 4 “C,” that is, critical thinking and problem solving, Communication and collaboration, creativity and innovation. Until 2007, the framework theory was updated to three core skills: 1, learning skills and innovation skills; Information, media and technical skills; 3. Life and Career Skills.

1.4 Research of Core Literacy in Japan

Japan has built a model of “21st century competence,” and put forward curriculum reform around “basic competence” and “thinking ability” to enhance the international competitiveness of talents.

The development process of vocational quality education in China is a process of constantly learning and renewing the concept of “core literacy.” As early as in the early 1980s of the 20th worlds, the goal of educational system reform was to improve national quality. In the 1990s, it was emphasized that exam-oriented education should turn to the overall improvement of national quality, and in 1994 the concept of “quality education” was formally used. On the basis of achieving core literacy, and then extended out on the personal “life-long education” new concept, and pay more attention on the basis of knowledge, develop their own skills and attitudes, combine with the needs of society to improve survival ability, practical ability and innovation ability, in order to achieve a healthy state of lifelong learning. Core literacy is the integration of knowledge, skills and attitudes. It is the sustainable development stage of all-round quality education and serves as the educational policy of our country today.

2 The Problems Existing in the Educational Index System of Our Country

With the wide application of big data technology in the field of education, as well as the continuous innovation of educational technology means, the classroom teaching in universities has changed dramatically. The MOOC boom, which began to prevail in China in 2012, is a typical online education model, which uses a lot of information technology to support the realization of online education. Overcome the time and space constraints of learning, let the national and even global quality education resources in a wider space to be shared, so that educational services are reconfigured to maximize the role and value of education.

In 2016, Shanghai Jiao Tong University has opened more than 100 MOOCs and built an online learning platform called “Good University Online,” providing a high-quality education platform for universities at home and abroad. The platform expects 24 universities to open courses, and a large number of courses, about 400. More than 400,000 students studied on the platform and more than 40,000 completed MOOCs study. It has created the first cross-university MOOC resource sharing in China and realized the mutual recognition of credits. This exploration of online education has made a major breakthrough. If we want to measure the role and value of such online learning platform, it is obviously biased to use the traditional evaluation index to measure it. Traditional education evaluation tends to consider students’ achievements, mostly using a single evaluation index, such as scores, this traditional evaluation index system is difficult to effectively measure students’ vocational core literacy. However, the traditional evaluation criteria appear to be vague and unstable. In the evaluation process, more emotional factors are mixed, resulting in inaccurate and unfair evaluation results, making the final educational decision-making biased. The realization of the former needs to rely on a perfect education big data system, including information disclosure between family, school, government and society, that is, data disclosure, data interface should also be made public, to achieve the integration of big data in education.

3 The Establishment of Professional Core Quality Evaluation Indicators

The situation of education has changed greatly. The evaluation standard based on big data will record students’ learning behavior more accurately and effectively, collect and accumulate students’ activity data, realize data integration and analysis, achieve visual management. This kind of indicator developed through mass data collection is more reliable and objective. Not only the students’ curriculum learning information is accurately recorded, but also a collection of school evaluation, social commentary, education environment related factors into the scope of evaluation, so as to obtain scientific and humane educational management decision-making. Therefore, different intelligent terminals should be used in teaching, using real-time face recognition, text recognition, emotion recognition, behavior recognition, speech recognition and other technologies. We will promote data evaluation indicators for monitoring 5G + smart education and establish a sound evaluation index system for vocational education.

3.1 Establish Evaluation Indexes for Online Learning

Online Learning, that means students receive online education through open online resources. The flexible mobile online learning mode, which is called “OL” mode, can be realized without the limitation of time and space. In view of the development of evaluation indicators for this online learning model, this paper argues that the evaluation indicators of big data should be a series of comprehensive quantitative indicators that are digital, measurable and can be used to evaluate students’ learning activities and behaviors. Specifically, should include these:

PV (Page Views) means the number of page views, can show students in a learning platform page hit, students visit a website page counts a PV. Through the PV analysis, we can understand all the students for the course preferences and study interest tendency, help to formulate students' personalized needs of the study curriculum and teaching arrangements. This data metric can compare how attractive different courses are to students by how many times they log in on the page.

LT (Learning Time) means time spent studying. Refers to the amount of time students spend on course content, can be specific to the minute, in order to accumulate the student's course study time, the course study length can determine the overall learning attitude of students.

FOL (Feedback Of Learning) means the learning feedback. In this paper refers to students' reaction to the results of learning activities in the course content, such as students' rating of the course, teachers' evaluation, and other meaningful behavioral activities. Through the design of knowledge map of online courses, we can see the number and time of students' interaction and help to judge students' enthusiasm. The database of the learning platform will record these, and further dig out the students' attention to the problem and the type of attention, so as to understand the student's personality characteristics, effectively make a targeted teaching design and curriculum.

The above big data evaluation indicators are mainly for OL learning model, then the offline learning model how to evaluate, the following will be further elaborated.

3.2 The Characteristics and Establishment of Offline Learning Indicators

Online To Offline, this article does not refer to business models here, but refers to online and offline learning models. Offline learning behavior activities mainly refer to students' social behavior performance in daily life, which will also be included in their personal core literacy assessment. It is related to traditional teaching practice evaluation, but it also has some differences.

In the education environment of big data, this offline behavior pattern needs to rely on other nodes outside the school to provide data support, such as community, government, public welfare organizations and so on. When a student participates in volunteer activities in the community, the specific time, place and form of the activity should be provided by his community to prove the reliability of the data generated into the data platform. This offline behavior is more localized, and the accuracy of its description requires the organization or government to produce a unified public official certificate. Therefore, it can be accepted as a kind of reliable data information, as one of the evaluation indicators of family or community learning.

The evaluation index of offline learning revolves around the core qualities of students, including comprehensive education that is not limited to science, technology, engineering, art and mathematics. Around these learning indicators, in order to develop students' core literacy and core ability of comprehensive development. Students' learning process is broken down into specific indicators, such as being able to identify problems, designing solutions, solving problems using knowledge such as science, technology,

engineering, mathematics, and the arts, and using rational methods to verify the effectiveness of solutions. The above four indicators give different weights to measure the effectiveness of students’ participation in learning activities. Weights are determined using the standard deviation method, as follows:

The original data matrix $X_{ij}(i = 1, 2, \dots, n; j = 1, 2, \dots, m)$ is processed without quantity, and the formula of no scale is used by extreme value method:

$$Z_{ij} = (X_{ij} - X_{min}) / (X_{max} - X_{min}) \tag{1}$$

Find the mean of a random variable:

$$Z_{ij} = \frac{1}{n} \sum_{i=1}^n Z_{ij} \tag{2}$$

Find the mean variance (standard deviation) of the indicator:

$$\delta_j = \sqrt{\sum_{i=1}^n (Z_{ij} - Z_j)^2} \tag{3}$$

Finally, the weights of each indicator are calculated using the mean variance (standard deviation) (Table 1):

$$W_j = \delta_j / \sum_{j=1}^m \delta_j \tag{4}$$

Table 1. Weight allocation table.

Evaluation indicators	Be able to identify problems	Design solutions	Use knowledge to solve problems	Verify the effect of the resolution
Weight	0.4	0.3	0.2	0.1
Score	1.6	0.6	0.8	0.3

The results are calculated based on weights and reflect each student’s offline learning (see Fig. 1).

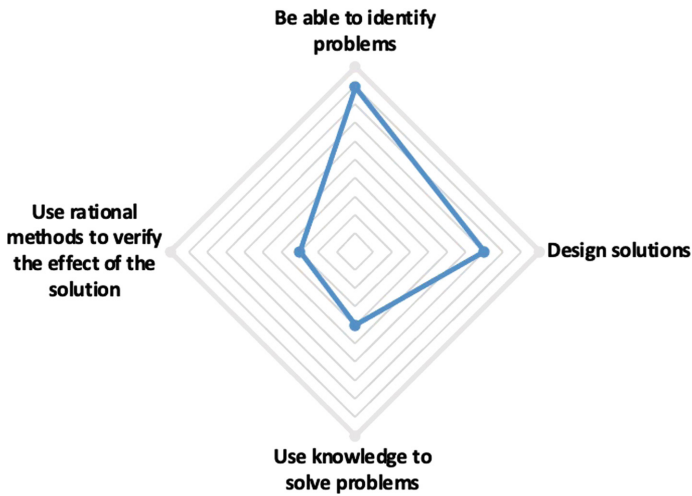


Fig. 1. Each student's offline learning.

At last, the online and offline indicators for weight division, such as the usual study performance accounted for 60%, test scores accounted for 40%, give the relevant weight distribution, make online courses more reasonable and flexible. It can take into account the basic level of most students, and at the same time provide more challenging learning content for more efficient students. This evaluation system will evaluate students' core literacy in the whole learning cycle, help students to realize self-analysis, and provide reliable reference when they choose a school or major. Or employment key links to make a significant role in reference. This kind of educational reform helps society to export more suitable talents and realize the balance of educational resources, which is the value and significance of big data education.

4 The Construction Model of Evaluating Index System of Big Data Information Technology

4.1 Gather Information to Build a "User Portrait" of Students

"User portrait" in the field of data analysis refers to the use of user information in the database records, through this information to enrich and constantly improve the description of users, similar to the process of sketch. In fact, the establishment of "user portrait" of students is to analyze the learning behavior of students, through the database records, tracking and mining students in the course of learning dynamics and course selection tendency. According to the data records of knowledge points, students are classified to understand their mastery degree and behavior personality, so that teachers can adjust teaching methods and progress to achieve the purpose of teaching students in accordance of their aptitude.

4.2 Store Information to Build a Database

All the information that happens around students will become the original data of the big data platform, including students' family background, learning experience, growing up experience, medical records, etc. These original data are not all useful information, and need to be analyzed and filtered to preserve valid data. When this data enters a data center, it can be stored in a low-cost open-source solution such as HDFS or CEPH. Considering the cost, you should choose the right server based on the amount of data.

4.3 Comb Relations to Conduct Data Structural Modeling

How to get useful information from massive data requires technical analysis and screening of data in memory, which is called structural modeling. The logic of the evaluation system of students should be realized by data structuring modeling, eliminating some repetition, error and data, and formatting the original data in a unified way to facilitate inquiry and use. We need computers, RFID and sensor networks, and technical support, including which language to use, such as Python, Java or SQL, and database applications and processing, statistics, mining. Especially data analysis, through keyword modeling, regression analysis and classification, the data will be filtered to get effective data and establish logical relationship.

After the database is established, how to make effective data easy to read? This requires data analysis and mining, with the help of current technology, such as IBM's SPSS and Microsoft's SSRS, of course, are charged. If cost is considered, look for free software such as Spark ML Lib, although they don't work as well. In the presentation way, 3D multimedia information technology and simulation technology can be used to close the distance between virtual and reality. More and more new technical means are used in the design and optimization of platform structure, and educational resources can be fully utilized. The platform, technology, equipment and resources are integrated to realize the evaluation system of data structure, which supports the implementation of big data education platform.

4.4 Establish Quantifiable Data Evaluation Indexes

Formulate unified evaluation indexes according to different online learning models. The menu learning mode, game learning mode and card learning mode should be equipped with uniform evaluation index.

4.4.1 Establish Indicators of Learning Time Dimensions

For example, an online learning platform, the database in the background records and statistics each registered student's total learning time in the platform. Including the time spent on each course and the number of hits on the platform website, each knowledge module and assessment results, the distribution of students' grades, etc. This information is technically processed to become visual indicators of how long a student has spent in a course.

4.4.2 Establish Knowledge Map Progress Indicators

Most of the online learning platforms have been able to design a perfect knowledge map to adapt to the personalized and fragmented learning style. Use knowledge cards or knowledge of the form of small units bearing a knowledge point, as long as the student completed the course content can see their own progress in a course, generally with “%” to show. At the same time, you can see the progress of the student's other elective courses and the percentage of study tasks remaining to be completed.

4.4.3 Establish Student Attitude Indicators

This kind of index corresponds to students' attitude, including study attitude, life attitude and humanistic attitude, which are difficult to quantify. Such indicators must be combined with offline interaction to make a decision, and the main interaction with students can be teachers, parents, classmates or others, their evaluation will be the main reference for such indicators. For example, discussions between students and teachers in class, group work with classmates, participation in competitions or tours, etc. These data records are first completed offline, and then uploaded to the platform by the responsible person to become data retention, to establish students' learning attitude indicators.

4.5 Establish a Transferable Digital Certificate Authentication System

Digital certificate can have several ways, the first, is “credit bank,” through the establishment of the “credit banking” system, the accumulation of student learning results, record credits. The second one is to establish the electronic voucher of learning results. The traditional certificates are stored electronically and can be downloaded and passed to prove the learning behavior and results. The above two digital certificates must be established on the basis of educational certification system before they can be circulated. The establishment of the system needs to rely on the strength of many, not a single platform can be achieved. It needs the connection of school, government and society, based on information technology and database construction to support the realization of this authentication mode. This certification system, through the whole process of life-long learning, retains the process of curriculum learning and comprehensive evaluation results. These digital certificates also have a certain effect if they want to continue to study after they have completed their studies and entered the workplace.

Through the above five technical aspects of the framework, to establish a more objective and scientific core literacy evaluation index system for students, to promote the transformation of classroom teaching and evaluation methods to provide a certain practical significance, promote vocational education high-quality development (see Fig. 2).

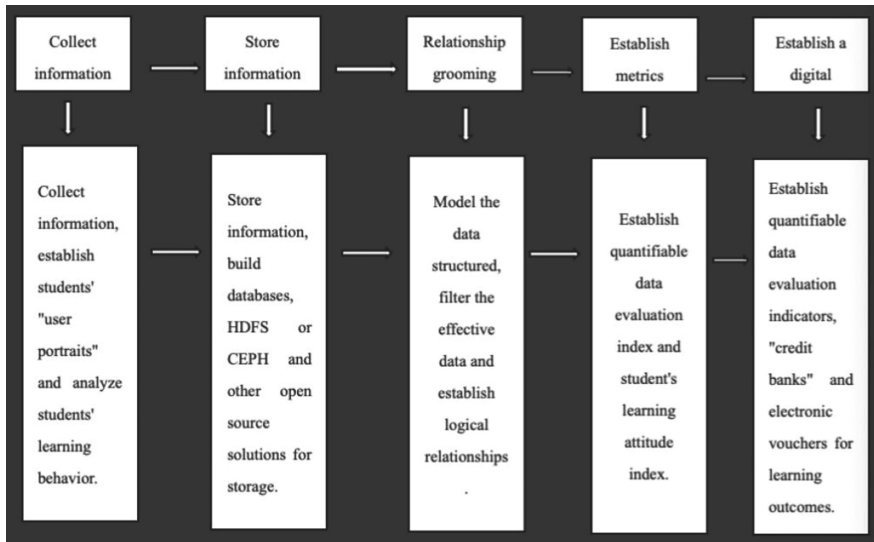


Fig. 2. The construction model of the evaluation index system of big data information technology.

5 The Development Trend of Vocational Education Information

In the future, big data in the field of education scenarios will be more and more popular. The new generation of communications and network technology base, using 5G low delay, high bandwidth, wide connectivity technology, It will promote the deep integration of 5G, Hongmeng, artificial intelligence, big data, cloud computing and education teaching, and promote the co-construction and sharing of quality educational resources. It has become common for students to complete relevant courses at home with the support of information technology platform. For example, in the online live classroom, teachers can choose online live APP to teach, students complete the course independently; Platform curriculum resources can repeatedly learn, and also can accommodate more than 100 people online at the same time, breaking the educational space limitations. Online education platform will become a new way in the field of vocational education in the future, students online learning will also become a normal and traditional teaching methods co-exist, therefore, the implementation of the data-based vocational core literacy evaluation system is an inevitable development trend.

Acknowledgement. This work was supported by grant of No. 2020ZDZX1092 from the Department of Education of Guangdong Province, China.

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