

# Research on the Construction of “3+1” Professional Practice Teaching System of Big Data Management and Application Major

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## ABSTRACT

In this paper, big data management and application major's practice teaching system is presented to train big data analysts in China. As the big data management and application major is established relatively late and there are few types of research on the practical teaching system of training big data analysts in China. We analyzed the capability requirements of the large data analyst through literature research and practical investigation and put forward "3+1" big data management and application major's practice teaching system, taking big data management and application major in City Institute, Dalian University of Technology as an example. The results show that the practical teaching system this paper proposed better meets the demand of social talent and provides a reference for the construction of a similar professional practice teaching system.

**Keywords:** Big Data; Practice Teaching; Big Data Management and Application Major; Data Science

## 1. INTRODUCTION

At present, we have entered the era of "big, cloud, mobile, platform and wisdom", and "big" means big data, which is the primary feature of the current era and has been more and more widely used in the fields of national and local government governance, education, finance, medical care, manufacturing and retail, transportation and logistics, etc..Meanwhile, the development of big data industry has become an important development strategy of national and local governments[1-2] which creates a strong demand for big data talents. The big data talent report in 2017 shows that big data talent gap will be up to 1.5 million people in the next 3 to 5 years in China.

From the perspective of big data talent supply, it appears that the number of big data talents is small, lack of qualified talents and uneven geographical distribution[1-4]. Data science and big data technology majors of domestic undergraduate college, which of 615 colleges and universities has been formally approved by the Ministry of Education from 2016 to July, 2020, are mostly located in the computer college of various universities, and focused on cultivating the big data engineer, including the big data collection, pretreatment, big data platform architecture design and operations, data processing and so on; and yet, to the Big data Management and Application undergraduate major, only 82 universities had been approved by the Ministry of Education from 2018 to July 2020. Different from the majors of data science and Big data technology, the majors of Big data Management and Application are generally located in the management schools or business schools of various universities which focus on cultivating the big data analysts capable of big

data collection, pretreatment, storage management, analysis, visualization and data mining to support decision making in the field of the management. Big data management and application professionals belong to the typical interdisciplinary talents with equal emphasis on theory and practices, who are required to master mathematics, statistics, information technology, management knowledge and skills in various field, and have the largest market demand, highest paid, and more difficult to be cultivated due to its strong compound. At present, there are few practical teaching research on big data professionals in China, most of which are mainly aimed at data science and big data technology professional, such as Weihua OU and et al., who put forward the practice teaching system construction plan of data science and big data technology professional aimed at the existing problems in the specialty construction of local undergraduate colleges, taking Guizhou Normal University as an example[5]. In view of the problems of single form, single technology and insufficient engineering tutors in the practical teaching of big data application-oriented talents training, Wangmin proposed a three-level professional practical training course based on "SPOC + enterprise + campus"[6]. In order to better train the practical ability of big data management and application professionals and make them meet the needs of society and enterprises, this paper intends to build a practical teaching system for undergraduate major of big data management and application according to the skills required by big data analysts positioned from this major through related literature research and the actual investigation, and also provide reference for the practical teaching system construction of big data management and application major in other universities

## 2. SKILLS ANALYSIS OF BIG DATA ANALYST POSITION

Big data analyst refers to practitioners engaged in big data scientific analysis, mining, presentation and application in the decision support process based on various analytical methods[7]. Using grounded theory and content analysis method, XilinHou et studied data analyst's ability structure which is a pyramid composed of professional skills, management skills, practical experience, basic quality, research ability, the ability of lifelong learning and continuous innovation ability taking the open recruitment

information of 10 enterprises as the analysis data, detailed as shown in figure 1[8].

The capability structure of big data analysts is briefly described below:

(1) *professional skills*: the big data analysts are not only proficient in at least one type of data analysis software, such as SPSS, EXCEL and SAS, R, PATHON, Hadoop, graphs, etc., but also understand the cutting-edge data analysis theory and are proficient in using the method of data analysis, such as classification/prediction, clustering, association rules, text mining, etc. to complete the corresponding data analysis task.

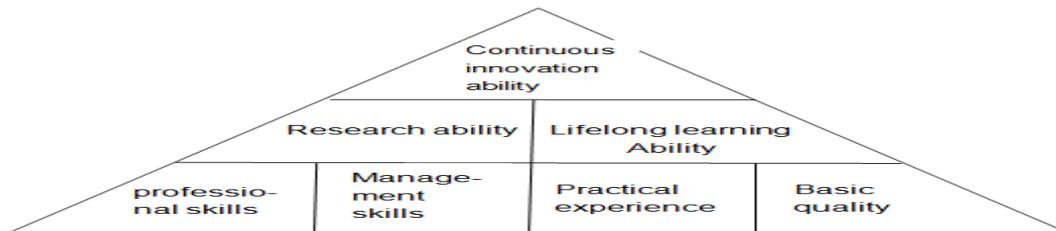


Figure 1. Capability pyramid of big data analyst

(The data is from XilinHou et al., "Capability Analysis of Big Data Analysts and Research on Their Composite Cultivation Model".)

(2) *Management skills*: Big data analysts are typical inter-disciplinary talents, who in addition to technical skills, also need to make good use of data mining and analysis results to provide suggestions and analysis conclusions for business decisions in various management fields, which is also the real value of big data. Meanwhile, big data mining analysis is also a project of a certain scale that needs to be completed by the team, so it also requires good team communication and project management skills.

(3) *Practical experience*: Big data analysts generally require at least one year of practical experience in big data analysis and processing.

(4) *Basic quality*: bachelor degree or above is generally required, with relevant professional background in statistics, applied mathematics, computer information management, electronic information technology, etc.

(5) *Research ability*: Big data analysts should be able to analyze and mine the data with the help of certain model tools, so as to analyze and judge the problems in the enterprise operation. On this basis, they should be able to independently write data analysis reports and propose solutions with their own good writing ability.

(6) *Lifelong learning ability*: Big data analysts are required to have an active learning attitude, pay close attention to the changes of technology and industry, and have the ability of lifelong learning and organizing team learning.

(7) *Continuous innovation ability*: Big data analysts should have strong innovative thinking and independent modeling ability, who are able to creatively use (develop) existing models or develop new models to solve practical problems, and gradually improve decision-making accuracy.

Among the seven abilities required by big data analysts, professional skills, management skills, practical experience and basic qualities are located at the bottom of the ability pyramid and constitute the analyst's ability base; Research ability and lifelong learning ability are at the middle level of the pyramid, a level higher than the bottom; Moreover, the continuous innovation ability is at the top of the pyramid, which is the highest level of big data analysts. Three layers of capability rise layer by layer, and the next layer supports the realization of the higher layer capability[8].

## 3. RESULTS AND DISCUSSION

Approved by the Ministry of Education in March 2019, big data management and application major in City Institute, Dalian University of Technology is committed to training the big data analysts and relevant application-oriented compound talents in urgent need of the society, based on the existing majors of the college including information management and information system, marketing, business administration and other majors of the college.

In the specific training mode, the "3+1" training mode of school-enterprise cooperation is adopted, that is, the four-year college learning period, in which 3 years are cultivated on campus and the remaining 1 year is internship and graduation design in enterprises with cooperative relationship with the school. This training mode can effectively integrate the resources of both schools and enterprises, so that students can obtain a year of practical experience in enterprises, and also promote the employment of students.

The professional practice teaching system studied in this paper includes internal practice (curriculum practice),

specialized professional practice (professional practice), innovation and entrepreneurship practice, graduation practice and graduation design. The following is an example of the Big data Management and Application undergraduate major in City College, Dalian University of Technology which explore the practical teaching system

construction of big data management and application major, in order to achieve the ability of effective docking and foster qualified talents needed by social enterprises, as shown in table 1, based on the above ability requirements for the position of data analyst to be cultivated by the major of big data management and application.

**Table 1.** Practical Teaching System of Big Data Management and Application Major

Academic year	Practice project	Practice project description	Professional skill	Management/Research skills	Practical experience	Lifelong learning ability	Continuous innovation ability
1	course practice	Data structure and database	√		√	√	
	professional practice	Programming with Java Language	√		√	√	
2	course practice	Analysis and Statistics	√		√	√	
	professional practice	Python language and data mining practices	√		√	√	
3	course practice	Big data platform technology NoSQL database Business data analysis IT project-management R language foundation	√	√	√	√	
	professional practice	ERP sand table-simulation integrated practice of big data platform		√	√	√	
	Innovation and Entrepreneurship Practice	Participate in big data Innovation and Entrepreneurship competition	√	√	√	√	√
4	professional practice	Enterprise management digital operation comprehensive practice (Directional progress according to two professional directions including the big data marketing and finance)	√	√	√	√	√
	Graduation practice and design	School-enterprise cooperation	√	√	√	√	√

In Table 1, the first column indicates the academic year the student is in; the second column is the name of our practice project. The third column is a brief description of

specific practical projects. The fourth to eighth columns are the specific capability names of big data analysts.

As this major is based on the undergraduate major of Information Management and Information System, its

professional background meets the basic quality requirements of big data analysts. Therefore, the basic quality of big data analysts is not included in Table 1.

As can be seen from Table 1, as the training of single skills in the lower grades enters into the training of comprehensive skills in the higher grades, the ability of big data analysts covered is becoming more and more comprehensive and the level of ability covered is gradually rising, which is completely consistent with the hierarchical relationship of the big data analysts' ability pyramid.

At present, the major of Big Data Management and Application is a new one in China. The above research is only the exploratory practice in our college, which still needs to be improved in future teaching practice.

#### 4. CONCLUSION

Big data analyst is a compound talent with both theory and practice who is in short supply at present and for a period of time in the future. It is also the training target of Big Data Management and Application major in the future. By reference to the domestic-related research and practical investigation, the paper designs a "3+1" practical teaching system based on school-enterprise cooperation that meets its seven capability requirements according to the capacity requirements of the large data analyst so as to better meet the needs of the society and enterprises, as well as provides reference for the practical teaching system construction of big data management and application major in relevant colleges and universities.

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