Application of Big Data Technology in Software Engineering Education

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Abstract. With the rapid development of human civilization and the rapid progress of society, everything must closely follow the trend of the times, because once the pace of development is slowed down, it is likely to be eliminated by the times. In this era of big data, there is a great impact on the teaching of software engineering education. Big data technology is closely combined with software engineering specialty. Therefore, in order to better develop the application of software engineering education in teaching in the new era, we should take the big data technology as the basis, through the research and analysis of big data to develop software engineering education and teaching more efficiently. Therefore, this paper studies the application of big data technology in software engineering education and teaching. In this research, this paper mainly aims at the impact of the development of big data technology on the education and teaching of software engineering major in the current era. This paper analyzes the current situation of software engineering education and teaching in the era of big data, and deeply studies how to apply big data technology in the education and teaching of software engineering specialty.

Keywords: Big Data, Software Engineering, Teaching Status, Education and Teaching

1. Introduction

Big data, or a large amount of information, refers to a large amount of information that cannot be collected, managed and processed by the current mainstream software tools in a reasonable time, and the more positive purpose is to help enterprises make business decisions. The term "big data" first mentioned can be traced back to nutch, an open-source big data project of the Apache foundation. At that time, big data was widely used to analyze and describe a large number of data sets that need to be processed or analyzed in batches at the same time, so as to update the search index of apawebop.
With the official release of apple and Google's MapReduce, GFS (Google File System) and maphadoop, big data is no longer simply used to analyze and describe a large amount of data, but also represents the speed of data processing. Macon, a world-famous consulting company, points out that "today, data has penetrated into all walks of life and business functions, and has become an important factor of production." The mining and application of a large amount of data indicates the coming of a new round of productivity growth and consumer surplus tide.

Software engineering\cite{3-5} is a comprehensive and practical specialty, and is one of the fastest growing branches in the information field\cite{6-8}. It is required to master the basic theory of software engineering, software development technology and software engineering testing and management technology; to cultivate high-quality practical engineering talents who have the ability of computer software development and software engineering management, and can be engaged in the demand analysis, design, development, testing, implementation and management of software field. In the context of the continuous development of information industry and software industry, the market demand standards for software talents are also constantly improving: on the one hand, the rapid change of technology requires software engineers to have a solid foundation; on the other hand, enterprises first focus on whether graduates can quickly integrate into the software industry development environment in the future to solve practical problems. Therefore, how to cultivate a group of high-quality application-oriented software and engineering related professionals to meet the needs of the software industry market has become the top priority of the application-oriented software and engineering related majors. According to the talent cultivation concept of software engineering specialty, how to adjust the original teaching concept of software engineering specialty can not only consolidate students' basic knowledge and skills, but also cultivate students' ability of software system analysis and design. Software engineering management and innovation is the primary task plan in Software Engineering Teaching Reform\cite{9-10}, which is also a serious problem, We have to face it and seriously consider it.

This paper mainly studies the application of big data technology in the education and teaching of software engineering specialty in today's era, because in this era of rapid development of information, everything should follow the development of the times. If the development pace is slowed down slightly and can not meet the needs of the times, it is likely to be eliminated by the times, so the education and teaching of software engineering specialty also needs to follow the times development. In order to better develop the education and teaching of software engineering specialty, we need the technology of big data for research and analysis, and then combine the education and teaching requirements of software engineering specialty in the current era to develop this major more effectively.

2. Reform Method of Big Data Technology in Software Engineering Teaching

2.1. Reform of Teaching Content

Its development needs to fully adapt to the needs and development of modern industry and information technology. In the context of the development of Internet big data, the undergraduate education and teaching system construction of software and Engineering Statistics specialty should fully adapt to the development needs of Internet big data technology and industry, pay attention to the key issues of Internet big data ecosystem infrastructure, cultivate and guide students to design
statistical software and application programs in the field of Internet big data, And fully consider to 
meet the students' practical application needs of big data technology and ecosystem construction and 
other big data operation in the Internet industry. At present, the first Internet big data ecosystem 
platform widely recognized and used by the industry is based on the system storage and data 
processing of well-known Internet companies at home and abroad such as twitter. Hadoop ecosystem 
is used for system storage and data processing. The software engineering curriculum needs to add the 
most widely used hive and zookeeper, big data is the search and e-commerce project management 
practice and other important contents in the Hadoop ecosystem of the existing curriculum system in 
China, so as to realize the project of search and e-commerce back-end data analysis application course. 
The distributed big data experiment course must be supported by the platform of distributed big data 
experiment course environment. In order to better achieve the expected teaching effect of e-commerce, 
it may also be necessary to establish a distributed big data laboratory with distributed big data 
experimental environment and platform for students to provide experimental conditions for graduate 
students, so as to better learn and complete the experiment of e-commerce major.

2.2. Introducing the Concept of Hierarchical Teaching

Compared with other big data talents in IT industry, big data needs more compound talents. On the 
basis of in-depth research on software and engineering related majors and disciplines, undergraduate 
grades with profound knowledge of mathematics and statistics will have broad employment 
prospects in the field of big data and statistics in China. In order to make students achieve better 
undergraduate teaching effect, a hierarchical teaching method can be adopted for students: the 
software and engineering big data major of Peking University requires students to learn basic theory 
and statistical knowledge for one year, and combine the actual situation of theoretical learning of 
major and students, Other students are divided into high difficulty elite ordinary class and software 
engineering ordinary class through the examination conducted by the elite class. A small number of 
elite students with excellent test scores are directly assigned to the ordinary class of big data 
technology difficulty to the advanced and difficult software engineering elite ordinary class of big data 
Senior Application Engineer and software system development engineer, The rest of senior high 
school students are directly assigned to the advanced big data technology software and application 
software engineering ordinary classes. In addition to learning the basic courses of big data software 
advanced application engineering and technology difficult big data in software engineering ordinary 
class, the high difficulty elite ordinary class has also added practical courses for learning Hadoop big 
data enterprise application software development technology, Hadoop big data project operation 
planning and management system deployment, enterprise operation and management, etc, Cultivate 
excellent senior software engineers with technical difficulty and big data.

3. Experimental Correlation Analysis

3.1. Experimental Background

The construction of software engineering course system is a systematic engineering. This not only 
requires professional teachers to constantly improve their own quality, sense of responsibility and 
professionalism, but also needs to pay attention to social needs and market changes. Only in this way 
can we cultivate engineering applied talents to meet the needs of social and economic development 
according to the new characteristics of "thick foundation and heavy practice" required by the
undergraduate training plan.

3.2. Experimental Design

After nearly a year of reform and practice, the reform of education and teaching has also achieved initial results. About 35% of software engineering students at level 14 have acquired engineering practice ability through school study, and about 47% of software engineering students of level 15 have signed employment agreement for the first time, as shown in Table 1

| Table 1. Comparison table of employment results of practical reform |
|---------------------------------------------------------------|
| grade | Grade 11 | Grade 12 | Grade 13 | Grade 14 | Grade 15 |
| Signing rate | 10/45 | 13/48 | 15/50 | 18/52 | 23/49 |

4. Discussion

4.1. Application Effect of Big Data Technology in Software Engineering Teaching

In order to test the application effect of big data technology in software engineering teaching, the students of software engineering core courses in 2018 and 2019 in the school of computer and communication engineering of a university were experimented. Software engineering class 1801 is the experimental class, which adopts the software engineering education mode based on big data technology, while the software engineering class 1901 is the control class, still teaching according to the traditional teaching mode. There are no significant differences in the number of classes and academic achievements between the two classes of the same major and the same college, but there are no significant differences in learning environment, learning conditions and living conditions. The staff are the same. The experimental class and the control class are consistent in curriculum, teaching methods and teaching effect, which ensures the effectiveness of the experimental results.

At the end of the semester, the traditional closed book examination method was used to test the core courses of software engineering specialty in the experimental class and the control class, and the significance of the difference between the experimental class and the control class was analyzed by single factor analysis of variance. The analysis results are shown in Figure 1.

![Figure 1. Theoretical knowledge score analysis](image-url)
As shown in Figure 1, the average score of the experimental class is 15.4 points higher than the average score of the control class, and the variance of the experimental group is also smaller than that of the control group, which indicates that the score of the experimental group is more stable, indicating that the test scores of the two classes are very significant, reflecting that the students in the experimental class are better than the control class in mastering theoretical knowledge. It shows that the software engineering education mode based on big data improves the level of basic theoretical knowledge of software majors.

At the end of the semester, each student is required to complete a software project independently by using the knowledge learned. It mainly tests the students' engineering practice ability and scientific research innovation ability, adopts the unified standard of public defense, and the teachers and students give the results of practical work together. Similarly, we used one-way ANOVA to analyze the difference between the experimental class and the control class. The analysis results are shown in Figure 2.

![Figure 2. Performance analysis of software works](image)

As can be seen from Figure 2, through the application of big data technology to software engineering education and teaching, the average score of software works in the experimental class is 9 points higher than that in the control class. Moreover, the variance of the experimental class is smaller than that of the control class, which shows that the performance of the experimental class is more stable, indicating that there is a very significant difference between the two classes. It reflects that the practical ability of the students in the experimental class is obviously better than that of the control class, which shows that the software engineering education mode based on big data promotes students' mastery of software production and improves their working ability.

4.2 Development Potential of Big Data Technology in Software Engineering Teaching

Under the background of big data era, schools need to constantly strengthen the strength of teachers' team. Software engineering teachers should not only have a solid theoretical knowledge foundation, rich development experience and strong practical ability, but also fully master the advanced technology and new standards of software project development and design. There are two ways to improve the level of teachers' team: firstly, teachers can choose to exchange and communicate with well-known enterprises, so that they can participate in the comparison of enterprises engaged in project research and development, so that teachers can fully understand the needs of enterprises' skills and excellent talents, and introduce real enterprise projects and cases. In the formal teaching process, teachers can constantly adjust and optimize the teaching content, Promote the transformation and
progress of big data technology from the perspective of production, teaching and scientific research.

In this stage, in order to promote the integration of software engineering talents and social talent needs, cooperation with enterprises will be conducive to promoting technology with theory. On the one hand, it can help students develop their own practical operation ability; on the other hand, it can help students integrate into the enterprise work team as soon as possible after graduation. Even if the preliminary results have been achieved, there is still a lot of room for exploration in the reform of software engineering curriculum system, which needs to be improved in the future research. We should further improve the course system structure and teaching scheme, enrich the course application cases, reform and improve the existing teaching methods and means, and constantly enhance the sense of innovation; pay attention to the reform of practical links and highlight the effect of teaching practice, so as to cultivate excellent software engineers who meet the professional characteristics and social needs, which is still our task of keeping pace with the times.

The new era of big data technology brings a series of opportunities and challenges to the existing software and engineering technology and software engineering related professional education in Colleges and universities. It is imperative to reform the teaching of software and Engineering in Colleges and universities. How to cultivate professional software and engineering talents who have systematically mastered big data knowledge and technology will be the inevitable trend of software engineering teaching reform in Colleges and universities. From the three aspects of teaching content, teaching staff and teaching methods, this paper puts forward a feasible overall teaching reform scheme for software and engineering related majors. In the era of the Internet and big data, the teaching reform scheme of software and engineering related majors needs to be carried out gradually from all aspects, and finally cultivate professional talents who can adapt to the needs of the big data era and truly contribute to enterprises and scientific research. In short, under the background of big data era, enterprises need more professional and innovative application-oriented software talents. As far as education and teaching are concerned, teaching reform must be carried out, which is an inevitable trend. Therefore, the teaching reform needs to be deepened and strengthened in all aspects. This paper analyzes the teaching reform of software engineering major from the aspects of teaching content and teaching method, so as to provide reference for personnel training and social development in the era of big data.

5. Conclusion

This paper mainly introduces the application of big data technology in the education and teaching of software engineering specialty, because in this era of big data, the education and teaching of software engineering specialty will have different needs with the development of the times. In order to better meet these needs, we need to apply big data technology in software engineering education and teaching, so as to develop software engineering specialty more efficiently. In order to make students' learning ability better conform to the development trend of the times.

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