

Application and Research of IWF Teaching Mode in Software Engineering under the Support of Big Data

Fu Jie

School of Primary Education, Zaozhuang University, China

43287266@qq.com

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Abstract: The big data technology of information society has a great impact on people's life and social development. The timely reform with combination of teaching mode and the large-scale data technology is the future development trend. This paper first analyzes the current development of international talent training model reform and its enlightenment and the characteristics of IWF teaching model. On the basis of this, the author elaborates the application of IWF teaching model under the support of big data in the teaching of software engineering specialty, which involves the construction of software engineering teaching system and the construction of quality evaluation system respectively, and focuses on the construction of software engineering practice teaching mode and innovation training of software engineering compound applied talents under the background of big data.

1. Introduction

The new information technology not only has changed people's lifestyle, behavioral pattern, way of thinking and community patterns, but also is having a profound change in human education and learning style, especially mobile Internet technology, cloud computing technology, Internet of things technology and big data technology leading the third IT wave. The arrival of the Big Data era provides an open platform and good space for teaching models such as "Web-Quest" and "Flipped Classroom". Software and information service industry, as a strategic emerging industry, is playing a more and more prominent role in the socio-economic development support and lead, the future market's demand for compound software engineering applied talents will be greatly increased. It will be the study focus of this paper to achieve organic integration of "data - network - overturn" based on the common features of "big data" "network inquiry" and "flipped classroom" such as "openness", "diversity" and "immediacy" to make it better serves software engineering teaching. Based on this, IWF (Integration of WebQuest and Flipped Classroom, that is, network exploration and flipped classroom fusion) the application of multi-purpose, cross and complex new teaching mode, will require the core elements of teaching such as teaching ideas, teaching objectives, teaching forms, and assessment methods to be adjusted and reformed to form the teaching system training students' initiative exploration ability, independent thinking ability and self-learning ability.

2. The reform and development of foreign compound applied talents training mode and the enlightenment brought to us

2.1 Reform of foreign compound applied talents training model and its common characteristics

Since the second half of the 20th century, with the rapid development of science and technology, the emergence of a large number of emerging disciplines has had an increasing impact on the development of human society, and many new issues in social development emerge, such as internationalization issues, regional development issues, society management issues, political decision-making issues, strategic choice issues, and so on. The solution to these problems is not what a basic discipline can do, whose resolution should rely on integrated application of a number of

disciplines and a variety of technologies. This poses a serious challenge to the development of higher education in the world, which requires colleges and universities not to just cultivate a single type of talents that only master single-disciplinary knowledge and technology, but to cultivate a compound applied talents with interdisciplinary background and mastering a variety of knowledge and technology. Therefore, higher education can have the future and vitality by being included in the whole cycle of economic and social development, constantly reforming the current mode of personnel training, and training talents who can adapt to the needs of economic and social development. Although different countries have their own characteristics in the personnel training model reform and innovation affected by various factors, we still can find many common features:

(1) In the training objectives, countries develop from emphasis on students' knowledge learning accumulation to focus on students' ability development and improvement of the overall quality of students.

(2) In the teaching content, they develop from the focus on professional education to advocacy of combination of professional education, humanities education and general education.

(3) In teaching mode, they change the traditional closed mode, establish the new teaching model of integration of "production, learning and research" with the school teaching as the leading and joint cooperation of corporate society.

2.2 Enlightenment from the reform of foreign compound talents training mode

From the above analysis, we can find that it is the world's basic trends in higher education to emphasize on capacity training and to enhance the overall quality of college students since 1980s. Developed countries adopt innovative talents training mode, reform the teaching content, set up a comprehensive curriculum, and create cooperative teaching new model of integration of "production, learning and research" and other measures to deal with this development trend, achieving very good results. This provides good enlightenment and reference for the software engineering professional education and teaching reform, especially innovative compound applied talents training model, we can summarize it from the following specific points:

(1) Update the concept of education, and establish a new concept of people first, facing the society and implementation of quality education.

(2) Innovate education and teaching platform, and form the applied talents training model suitable for regional economic and social development.

(3) Truly establish the teaching philosophy of "practical teaching and theoretical teaching is equally important" and construct a scientific practice teaching system.

(4) Attach importance to the security system and the security mechanism of reform and innovation of personnel training model reform and innovation.

3. Software engineering IWF learning mode under big data support

3.1 The relationship between big data and IWF learning patterns

Victor•Meyer•Schoenberg and others put forwards that, "big data (Big Data) is also known as huge amounts of information in the "big data age". Large data has the characteristics of Volume, Velocity, Variety, Value 4V, and openness, non-structure, and visuality. These features provide information resources and display space of the "network exploration", "flipped classroom" and other teaching methods and models to provide information resources and display space.

Web Quest was a course developed by the American Bernie Dodge in 1995. "Web" means "network" and "Quest" has meanings of "seeking" and "survey". Web Quest follows the framework of the constructivist learning theory, providing a "scaffolding" model in a relatively unified task to guide students to think about and explore questions like investigators and encouraging students to perform knowledge expansion and experience accumulation in other fields. It is an intermediate transition from traditional classroom learning to modern open learning, which is the best way and method for the teachers to introduce network technology into the classroom, and for students to make

full use of "big data". It can help students to carry out creative and personalized learning with independent topics, self-exploration and free choice in the original class teaching form.

Flipped Classroom is the teaching model first applied by Jonathan Berg-mann and et al in 2007, and rose with a large scale in 2011. Tara Arntsen (2013)'s "The Flipped Classroom" is the latest foreign relevant representative literature. He believes that the "flipped classroom" subverts the traditional teaching, that is, "part of classroom knowledge" is moved to the "extracurricular knowledge" completed independently by the students through watching the network theme video and other ways; part of "extracurricular puzzles" are taken to the "classroom", jointly completed by teachers and students through research and exhibition. The teaching form of "teaching - learning" model is changed into a "learning - teaching" model. The characteristics of the flipped classroom such as clear teaching information, short and pithy video, convenient and flexible search and good control ability provide good conditions and platform for students for improvement of their learning efficiency, review and test, quick and convenient study and inquiry.

It can be seen that the big data provides the resources for inquiry teaching, and the inquiry teaching provides a way to the flipped classroom, the flipped classroom provides a platform for the use of big data, and the network pro-vides technical support for big data.

3.2 Software engineering big data + IWF teaching system construction

In the big data + IWF teaching system construction process, pay special attention to the followings:

(1) Teaching tasks and objectives adjustment and positioning

The original teaching tasks and goals of the software engineering special-ty are influenced by the examination-oriented education, and most of them focus on the solid foundation of the students' knowledge, the accumulation of knowledge structure and the quantity, the application ability and the cultivation of the quality are not well reflected. Under the big data + IWF mode, in order to meet the requirements of compound applied talents training, and ensure the upgrading of students' ability, teaching should be adjusted to the one with "ability and quality training" as orientation from the original one with "knowledge accumulation" or "clearance test" as the main goal.

(2) The adaptability of teaching methods

In the original teaching mode of software engineering courses, teachers uphold the sage concept of "a teacher passes on knowledge, educates on various subjects, and solve problems", students play the role of the audience or the listeners. In the large data + IWF mode, based on the characteristics of inquiry learning and teaching requirements of the flipped classroom, teachers are responsible for stimulating students' interest in learning, guiding students to dig knowledge in depth, making clever use of massive information and paying attention to the cultivation of students' ability. Therefore, it is necessary to fully mobilize the enthusiasm and initiative of learners, so that all the students can fully participate in learning, classroom teaching under large data + IWF model is featured by the teaching method in which "students are the main bodies" and "learner are centered".

(3) The selection and application of teaching materials

The teaching materials of software engineering major are mostly print paper books, where there are defects of lagging content, single forms and small amount of information. The era of big data brings opportunities and platforms to overcome these shortcomings. Based on the 4V characteristics of large data, teachers use the hypermedia technology to effectively structure, dynamize and visualize the large data so that they can become available "teaching materials" with strong immediacy, diverse forms and large amount of information to construct network teaching resources for students to use which are suitable for their own teaching objectives to make the original "dead book" changed into "living book."

(4) Teaching philosophy under large data + IWF mode

Based on the characteristics of Web Quest and the Flipped Classroom, in the IWF model, teachers and students must have the courage to break a balance between the original themselves and the educational environment, to break single teaching paradigm and habits with the "synchronous teaching", "classroom teaching", "teaching" and "knowledge accumulation" as the main things in the

examination-oriented education model, have complete and new series of adjustment and reform that can conform to the era of big data, and change the "synchronous teaching" into "personalized teaching."

3.3 Software engineering large data + IWF quality evaluation system construction

(1) Assessment and evaluation methods

There are two forms of quality evaluation, one is graded (results) evaluation, and the other is the process evaluation. The original assessment way of software engineering specialty, due to the constraints of teaching objectives, teaching technology and teaching environment, usually uses paper type and ultimate assessment and evaluation methods for assessment and evaluation of "learning", which is single and subjective. Multi-dimensional and multi-level process assessment and evaluation is difficult to be carried out. The "teaching" assessment and evaluation is mostly based on lectures and evaluation of classroom teaching and the evaluator mainly relies on experience and observation to evaluate and assess, so there is no data and quantitative analysis, and the scientificity, objectivity and impartiality of evaluation and assessment cannot be effectively reflected. Today, "big data" makes process evaluation possible. In big data + IWF mode, according to the actual teaching situation and the characteristics and requirements of each course, through data collection, classification, finishing, statistics and analysis of retained student attendance, job accuracy, teacher and student interaction rate in the classroom "teaching" at any time, a more complete process measurement is formed to better reflect teaching and learning state in the various stages. It plays an important role in evaluating the equality, interchange, interaction and assessment, intelligence, multi-direction and multi-factor of the evaluation and combines the ultimate evaluation and process evaluation to give full play to the advantages of "data" and network.

(2) Assessment and evaluation process

The "openness", "immediacy" and "diversity" of the data overcome the simplicity of the original assessment methods, making it possible to diversify the evaluation system with the participation of schools (teachers), individuals and society as the main body. Especially it overcomes the difficulty for the society to evaluate the quality due to the universality and dispersity, so that colleges and universities have more extensive ways for the tracking assessment of the graduates and have more comprehensive and true feedback information after the students are employed. First of all, students can use multi-stage, multi-level and multi-channel data to have independent evaluation of the learning quality. At the same time, teachers can use the scores of students, background, educational experience, personality characteristics, behavior hobbies and other data analysis to give the process evaluation. Second, the school guides and controls teaching activities based on data. Finally, the society can make the ultimate evaluation of quality. Then there will be a complete set of three-dimensional evaluation process by the three main bodies.

3.4 Software engineering practice teaching reform and innovation based on large data + IWF model

Software engineering practice course aims to cultivate a large number of various types of high-quality technology talents with strong innovative ability who can adapt to the needs of economic and social development. The engineering practice focusing on the cultivation of students' practical ability and innovation ability pays attention to comprehensiveness, inclusiveness and selectivity, to promote coordinated comprehensive development of students' knowledge, ability and quality. Through the reform and innovation of software engineering teaching driven by big data, our school can further optimize the students' training mechanism, pay attention to the cultivation of students' basic knowledge, cooperative development and cooperation innovation, to make the students' theoretical knowledge, frontier field and practical ability comprehensively developed. We evaluate students from different levels by introduction of peer evaluation and user evaluation and other assessment methods. Thus the students can not only have a solid theoretical knowledge, but also be familiar with the development trend of the industry, and can use the current mainstream

technology to solve problems in software development, to adapt to the current needs of the development of the software industry.

The software engineering practice teaching reform based on the big data + IWF model is mainly reflected in the construction of interactive three-dimensional software engineering teaching model, that is, iterative optimization teaching mode. The teaching model mainly solves problems from the following four aspects: updating the educational philosophy, optimizing the curriculum system, strengthening school-enterprise cooperation and improving the quality of teachers. In the specific operation process, we should note the followings:

(1) Keep up with industry trends, and continuously optimize professional teaching content and curriculum education system. The colleges should continue to introduce the latest technology into classroom teaching, and adjust the teaching plan according to the current hot technology every year, and even set up a new professional direction, so that students can master the popular technology in the first time to maintain a competitive advantage in internship and employment.

(2) Strengthen school-enterprise cooperation, and establish employment-oriented school-enterprise cooperation linkage mechanism. Colleges should introduce more business forces into the teaching system combining with multiple needs, so that they can participate in classroom teaching, after-school experiment, project training, scientific research and innovation, internship, starting a business and other teaching and practice links. In order to enhance the enthusiasm of enterprises to participate in teaching, the team of college teachers closely should study and trace the development direction of large-scale software enterprises, to find the integrating point of teaching content and the development direction of the enterprise, and meanwhile perform targeted training combining with the needs of enterprises in the employment to achieve win-win situation, to establish long-term cooperation mechanism.

(3) Improve the quality of teachers, and form a professional team of teachers with "double-teacher" education ability. College young teachers have a doctorate, and years of academic research experience makes them have a solid theoretical foundation who lack the engineering practice ability. By strengthening our cooperation with the society and enterprises, we introduce more practical development projects into the laboratory, and we also arrange some teachers to the well-known enterprises to communicate, improve the technical application of teachers in the actual project training to gradually form "double-teacher" teaching team with rich theoretical knowledge and excellent application technology, so that the students can have a solid theoretical foundation and strong practical ability.

Acknowledgments

In conclusion, software engineering practice teaching reform and innovation based on large data + IWF model is mainly reflected in continuously optimizing the main links to form a new model of software engineering teaching based on iteration method; timely integrating the frontier knowledge and forming three-dimensional curriculum system based on domestic latest research results and technical developments; improving the ability of college teachers engineering practice and paying equal attention to both theory and practice to make up for short board of classroom teaching based on the two-way interaction mechanism of school and enterprise.

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