Strategy of Training Blockchain Talents in Application-oriented Universities: A Case Study

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Abstract: Blockchain is a recently emerging technology that can play a vital role in various applications. However, many industries are facing serious shortage of blockchain talents due to the complexity of blockchain technology. Moreover, undergraduates of application-oriented universities are particularly facing a daunting barrier to grasp blockchain technology. This paper investigates on the technical requirements of a local company in the city of Weifang and propose a strategy to train blockchain talents in application-oriented universities. It adopts a task-oriented mechanism to strengthen students' mastery of the basic knowledge related to blockchain. Subsequently, it assigns more complex tasks to students and factorizes the task into a series of hands-on operations or programming sub-tasks, which all center at the blockchain developing framework. In this manner, technical concepts of blockchain are mapped to specific functions of a programming language, thus lowering the threshold for students to grasp blockchain. Finally, the students are trained through practical projects. The strategy has been applied in School of Computer Engineering of Weifang University, and some positive effects have been achieved.

1. Introduction

Nowadays economic and social developments are exerting significant impact on the training of talents in colleges and universities. Higher education institutions of various categories need to identify characteristics of their target industries and meet demands raised by these industries. In other words, higher education institutions should bridge the gap between talent training and practical industry demands through endowing students with appropriate knowledge and skills. In this manner, training in universities could be seamlessly joined with the future jobs of students. Weifang University is an application-oriented university, which is being constantly funded by government of Shandong Province as an outstanding application-oriented higher education institution.

Weifang Zhongcaixin Technology Co., Ltd. is a high-tech enterprise recognized by the state. The School of Computer Engineering affiliated to Weifang University has established a stable cooperative relationship with Weifang Zhongcaixin Technology Co., Ltd. in recent years. Main areas of cooperation are information technology research/development and training. Representative projects include the development of "Financial Baidu" (an elastic searching engine deployed in the intranet of Weifang Finance Bureau) and the "Mobile Embedded Development Technology" training of employees of Zhongcaixin.

Agricultural-product-related industries are very prosperous in the city of Weifang. This city has nine national-level demonstration zones of agricultural products quality and safety. In response to the actual needs of agricultural products and related industries, Weifang Zhongcaixin Co., Ltd. has developed the "Agricultural Product Standardization System", which involves on-site data collection of agricultural products, product information entry, transportation, warehousing, sales tracking, and consumer traceability/feedback of product information. Additionally, this system enables quality supervision departments to monitor the quality of agricultural products. Core requirements raised by this system are summarized as follows. First, data should be stored and exchanged in a decentralized

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manner. Second, producers, transporters, sellers, consumers, regulators and other relevant parties can obtain information on rural products. Moreover, the system maintains the consistency of views of all parties. Third, private information should be properly protected and information tampering is strictly prohibited. Finally, all above functionalities are efficiently integrated to regulate the production and circulation of agricultural products, improve regulatory efficiency, and achieve agricultural product information forensics and traceability.

Blockchain technology provides the core support to efficiently meet these requirements [1]. The essence of blockchain technology is a point-to-point distributed database system. This database system can guarantee the consistency of data among nodes with a certain consensus algorithm and ensure the security and privacy of data through encryption algorithm [2]. In addition, this system creates an open, transparent, verifiable, non-tamperable and traceable technological architecture through timestamp and an end-to-end chained data structure. Following the footsteps of emerging technologies such as big data and cloud computing technologies, the blockchain technology is another research hotspot in the field of information technology. Blockchain has been applied in many fields, including online payment, Internet of Things, equity trading, auditing, supply chain and notarization [3]. Zhongcai Company is planning to use the "Agricultural Product Standardization System" as an opportunity to accumulate technology and build a development team, setting a stage for wider applications of blockchain technology in various fields. At present, Zhongcaixin company is in urgent need of a large number of qualified blockchain talents. Weifang city or even the whole country is also facing a serious shortage of blockchain technical talents. We expect that our work can open a way to contribute to local economic and social development via cultivating blockchain talents.

The rest of this paper is organized as follows. The second section demonstrates our training strategy in detail. The third section concludes our work and points the future work.

2. Strategy of Training Blockchain Talents

In this paper, we adopt the concept of "industry-university collaborative education" [4] to explore the training mode of blockchain technical talents. We focus on exploring the routine of efficiently training students. The concept of "collaborative education" means that each subsystem in the training system behaves in a systematically cooperative manner and thus results in a synergistic effect of "1+1>2". Applying collaborative education to undergraduate training aims at stimulating students' learning motivation, and reorganizing the educational elements. Our training strategy places students under task-driven status. We illustrate our training strategy in Fig.1.

Fig. 1 Three stages of our training strategy

2.1 Establishing Solid Fundamental Knowledge for Practical Training.

Although "blockchain" is a new concept, the fundamental supporting technologies of blockchain have undergone a long period of development and are also involved in current courses offered by computers or related disciplines. As shown in Fig.2, blockchain covers some core technologies including peer-to-peer networks, data encryption and decryption algorithms, hash algorithms. These knowledge points are covered in Computer Network, Cryptography (or Network and Information

Security), and Data Structure courses, respectively. The data consensus algorithm can be implemented based on the sorting algorithm [5], which is imparted in detail in the "Data Structure" or "Algorithm Design and Analysis" course. We guide the students to establish solid fundamental knowledge in these relevant courses.

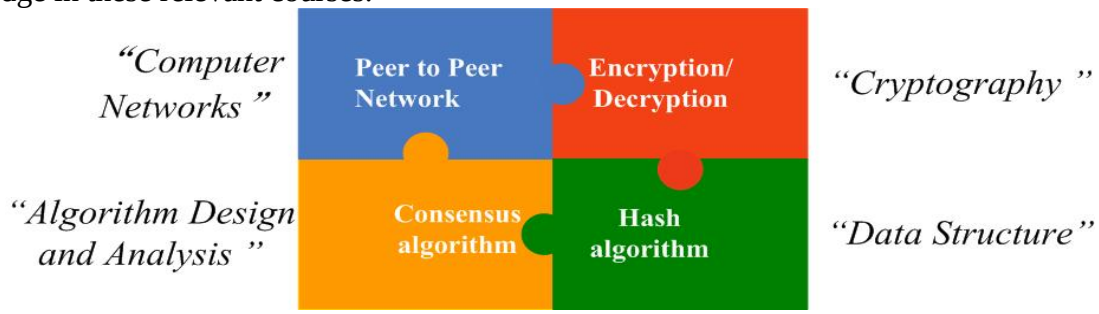

Fig. 2 Core technologies of blockchain and related undergraduate courses

According to our past teaching experience, students generally have grand plans but little skill in technical training. After receiving the task, students commonly face a daunting barrier to start their work or eventually fail to complete the task. The reason is probably that students do not grasp relevant basic knowledge. In response to this problem, we propose to adopt a task-oriented mechanism to strengthen students' mastery of the basic knowledge related to blockchain. For example, we demand students use the Python language, the Python Flask framework, and the HTTP protocol to implement a simple blockchain instance to consolidate the basic knowledge.

2.2 Building a Soft Environment Close to the Industry Background for Training.

Undergraduate students often lack practical project experience. As a result, they typically feel overwhelmed and unable to get started in the face of a wide range of practical industry requirements. Consequently, this situation discourages students' motivation of learning and training. On the basis of the previous stage, a reasonable difficulty degree is set at this stage to ensure the enthusiasm and training effect of the students.

We select a practical blockchain development framework Hyperleger Fabric [6] according to the actual requirements of the enterprise. In this manner, we strengthen the task orientation, and guide students to master the use of the development framework, as well as secondary development. The software environment, business background, and business requirements all stem from the enterprise. We guide the students to install and use the development framework, explain the business background in detail, and decomposes the business requirements. In this way, the industry background, industry requirements and technical concepts of blockchain are transformed into a more comprehensible form, and mapped to a specific function of the development framework, or a specific piece of code. In this way, the tasks of students are finally factorized into a series of hands-on and gradual deepening operations or programming sub-tasks, which all center at the blockchain framework and its secondary development.

At this stage, because of the more practical development framework, the threshold for students to complete training tasks is higher than the previous stage. However, the task of understanding business requirements and understanding the development framework are completed under the guidance of training tutor in a step-by-step manner. As a result, the threshold for this phase is lower than the next stage. After the completion of the training tasks at this stage, the business background and requirements will be re-discussed, and ability of students to understand the actual business can be effectively improved.

In addition, latest mainstream development frameworks usually only provides English development documentation and no Chinese documentation. Therefore, in this stage we consciously guide students to read and use English documents. In this way, we improve the technical English level of students, and thus lay the foundation for the next stage. In the next stage, students will gradually start blockchain development independently.

2.3 Training Through Actual Project.

At this stage, the training tutors undertake the following duties: coordinate relationships among team members, answer questions, and guide the development. These duties place high demands on tutors. Tutors need to have sufficient practical development experience. Only in this way can they efficiently assign tasks to students, answer the students' questions, and guide students to explore. In addition, the tutor must keep in mind that his/her role is auxiliary. The protagonists of this stage are enterprise engineers and students participating in the training. Tutors fulfill their duties when students successfully adapt to practical development.

3. Conclusion

We have successfully applied our strategy to training courses in School of Computer Engineering of Weifang University. We have cultivated some students who won provincial level prizes in well-know undergraduate technical competitions of China like "the Contest of Lanqiao Cup".

We conclude our work as follows.

1) Blockchain technology has extremely high application value in many industries. At present, there is a serious shortage of blockchain talents in China. Our work aims at requirements of enterprises and studies the training strategy of cultivating blockchain technical talents in applied universities.

2) Blockchain is a complex system that has a high threshold for undergraduates to complete training tasks. Our strategy takes into account the the actual knowledge levels of students in applied universities and sets a reasonable difficulty degree of learning.

3) Blockchain involves a lot of theoretical knowledge, which can easily discourage learning enthusiasm of students. We use the blockchain development framework as a carrier of knowledge and skills, so that the training focuses on understanding and mastering the functions and codes of the development framework. In this manner, we ensure the training effect.

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