# Thoughts on the Teaching Mode of Deep Integration of Big Data Industry and Education under the Background of New Engineering

**Zhen Tan [1,a,*], Ji Wang [1,b], Yanli Hu[1,c], Xin, Su[2,d] Hu and Xinyao Huang[3,e,*]**

[1] Science and Technology on Information Systems Engineering Laboratory, National University of Defense Technology, Changsha 410073, Hunan, China

[2] Hunan Provincial Key Laboratory of Network Investigational Technology, Hunan Police Academy, Changsha 410073, Hunan, China

[3] Population and Immigration Brigade, Yuelu Changsha Public Security Bureau, Changsha 410073, Hunan, China

[a]tanzhen08a@nudt.edu.cn, [b]wangji08@nudt.edu.cn, [c]smile1979@163.com, [d]suxin@hnu.edu.cn, [c] 362193665@qq.com

*corresponding author

**Keywords:** Integration of industry and education, Teaching practice system, Engineering practice ability

**Abstract:** At this stage, the rapid progress of artificial intelligence, big data and cloud computing technology puts forward higher requirements and challenges for the integration of industry and education in the education industry. This paper first introduces the problems existing in the integration of industry and education, and then designs the in-depth integration teaching system and practice system for the above problems. Besides, it analyzes the feasibility of the integration teaching through cases, and finally puts forward some thoughts and suggestions on the integration teaching.

## 1. Introduction

In recent years, the integration of industry and education has been in a critical period of reform. How to integrate the existing advanced technology into the whole process of the integration of industry and education is an urgent problem to be solved. In 2017, general secretary Xi Jinping proposed to improve the occupation education and training system, deepen the integration of industry and education, and school-enterprise cooperation at the 19th National Congress of the CPC. In December of the same year, Opinions on Deepening the Integration of Industry and Education issued by the general office of the State Council pointed out that "deepening the integration of industry and education and promoting the organic connection of education chain, talent chain, industrial chain and innovation chain is an urgent requirement to promote the structural reform of human resources supply side". It can be seen that deepening the integration of industry and education is of great significance for both vocational education and the progress of the whole economy and society [1].

In addition, the rapid progress of "Internet plus", Internet of Things, block chain and other information technology has laid a profound technological foundation for the leap progress of traditional industries and the "second revolution", and has also brought opportunities and hopes for various industries. The growth of enterprises, the prosperity and progress of national and social economy have been closely connected with information technology. Under the current situation, taking information technology as the support can effectively deepen the reform of vocational education and accelerate the comprehensive integration of structural elements on the supply side and industrial demand side of talent training. How to plan the cooperation and development between schools and enterprises in the Internet wave, so as to realize the coordination, mutual benefit and win-win between schools and enterprises, is an important topic of the current era. It is

the must way for the reform of higher vocational colleges to gather enterprises, schools, teachers and students through information technology, so as to achieve the complementary resources of industry enterprises and schools, promote each other and make common progress, create a new situation of deep integration of industry and education [2,3], and promote the education reform and overall improvement of education and teaching quality of higher vocational colleges.

## 2. Problems in the Integration of Industry and Education

At this stage, the integration of industry and education is still in the preliminary exploration stage. The existing integration model of industry and education has not achieved good results. The main reason is that the concerns of schools and enterprises are different, and the cooperation between schools and enterprises has not brought into effect in the actual process. As a result, enterprises unilaterally pursue economic interests in the process of school-enterprise cooperation, but ignore talent training. The school is still a more vulnerable party in the process of school-enterprise cooperation, failing to realize the real school-enterprise collaborative education. In most cases, school-enterprise cooperation is still dominated by low-level traditional cooperation such as "double election" and "order training", or uses the contact between alumni and enterprises to invite alumni to return to their alma mater to preach and promote on behalf of their enterprises. In the above cooperation process, the focus of schools is mainly on the "export" of students, while the enterprises focus on students' internship performance, resulting in the non-synchronization of information and resource sharing between schools and enterprises. In the current talent training process, the school still occupies an absolute dominant position, and enterprises have little impact on it. Generally, it only plays a role in the scenarios such as enterprises publishing talent demand information due to employment and schools organizing students to participate in school recruitment. In the school-enterprise cooperation, due to the lack of effective communication mechanism between the two sides, the teaching direction and content of the enterprise to the school and teachers, the practical operation ability of the school to the enterprise and the post demand are not clear to each other, so that the students do not understand the corresponding post requirements of the enterprise, and the enterprise does not understand the teaching effect of the school. Although school-enterprise cooperation is called cooperation, in fact, it is dominated by each other, and the resources of both sides are difficult to be effectively shared. In terms of actual needs, schools and enterprises are a mutually needed relationship, but they are subject to the lack of good communication mechanism, so that errors and misunderstandings can't be corrected, and the cooperation effect and the enthusiasm of both sides are bound to be affected. From the perspective of the school, the existing higher education, especially the engineering background education, mainly focuses on general education, and completely transfers the professional skill education and practice links to the society, making it difficult for students to take the first step in the workplace when they move towards the society.

The main problem behind it is that higher education at this stage is not well combined with cutting-edge industries, and it is unable to introduce the latest technologies and methods of cutting-edge industries into the existing education system. On the one hand, teachers are often unable to teach basic theories and professional skills at the same time in limited class hours, and it is difficult for students to fully master so much content only through classroom learning. On the other hand, the frontier technology in the engineering background is closely related to the application areas of "Internet plus" and deep learning. The in-depth understanding of the relevant fields of the industry is the basis for effective future development, but these knowledge can only be obtained through continuous practice and accumulation. So how to effectively organize teaching activities and contents, integrate enterprise application products and teaching theories, make students build a good knowledge system through learning, quickly integrate into the current cutting-edge industrial technology, enhance their learning and practice ability, and have unique innovation ability in social work has become an urgent problem to be solved in higher education.

## 3. Design of Constructing the Teaching System of Deep Integration of Industry and Education

A reasonable, scientific and effective curriculum system should start from the students themselves, take scientific inquiry as the primary purpose, and build it through reasonable and effective teaching means and methods according to the curriculum philosophy and methodology of knowledge constructivism, so as to help students realize their self-worth. Specific to the operational level, it can be understood as paying attention to students' noumenon, imparting reasonable and scientific teaching contents to students through advanced and effective teaching methods and interesting and changeable teaching means, and improving students' research ability and knowledge reserve through the collision and integration of various ideas and views between teachers and students.

Therefore, this paper puts forward the teaching research idea of the field knowledge-oriented in-depth integration ability training method of industry and education, takes the basic course of graduate data science as the teaching pilot, studies the training method of data analysis practical operation ability based on the big data competition platform, designs the teaching mode with the goal of students solving practical problems, and uses the competition platform to provide students with a practical platform, innovate the relationship between teaching and practice, strengthen the internalization process of students' knowledge, provide new learning modes, explore effective methods to cultivate the practical operation ability of college graduate students, and make empirical research. This topic focuses on the teaching design of students' engineering practice ability. The main contents include:

### 3.1 Analysis of Learners' Preparation Level

The analysis of learners is the basis of the whole teaching design. Learners carry out learning activities according to their existing concepts, knowledge, skills and habits, and these factors have a considerable impact on learners' memory, reasoning and problem-solving ability, specific ways to learn new knowledge, and their understanding and internalization ability of learning content.

Through the exchange and communication with students, we found that students have begun to pay attention to the relevant knowledge of engineering practice through the Internet, and some students are interested in exploring the research topics related to engineering practice. Based on the practical needs of graduation and work, they have generated the practical demand of "what they have learned is useful", and began to try to learn relevant knowledge and put it into practice.

### 3.2 Teaching Method Design

Based on the analysis of learners' preparation level, according to the knowledge system and practical characteristics of big data analysis technology, the subject will study and propose a practical new model of industry-education integration, decompose the knowledge points to be mastered in big data analysis, design a curriculum system composed of modules such as big data introduction, data mining and in-depth learning courses, provide learners with a conceptual framework for understanding big data analysis technology, and guide learners to further participate in the practice of big data analysis cases.

### 3.3 Comparative / Exploratory Learning Based on Big Data Analysis Cases

Course practice training is the key for students to master and comprehensively use big data analysis technologies and methods. This topic will compare and screen the big data analysis problems of KDD-CUP, Kaggle and other platforms, analyze the course characteristics and the actual situation of students, design adaptive data analysis cases for students according to the progress of students' knowledge construction, guide students to master big data analysis technology through practice, and then carry out independent learning and active exploration.

### 3.4 Research on Formative Evaluation System

Evaluation is a means to test whether the teaching effect reaches the expectation. Learners build a new understanding of knowledge based on existing experience. Therefore, learners should

actively participate in the whole learning process and construct the meaning of knowledge in communication with the external environment and others according to their previous experience. Therefore, the evaluation of learning effectiveness should be measured by the degree of active participation in the learning process, the ability of independent learning, the contribution of cooperative learning and the level of knowledge system construction.

Learners' knowledge construction is a step-by-step process. Therefore, different from the summative evaluation means such as examination, this topic will study how to establish a gradual formative evaluation system, and comprehensively consider the factors such as students' classroom participation, after-school practical homework, curriculum practical project level and so on to evaluate students' final performance.

## 4. Practice System Design of Industry-Education Deep Integration Teaching Mode

In addition to the integration of industry and education in teaching courses, it also needs teaching resources and teaching platform to facilitate the integration of industry and education.

Firstly, by integrating multidimensional data such as enterprises and industries, schools and teachers, students and learning, we can realize multi-party interconnection [3], realize the real integration of enterprise post ability requirements with school talent training programs and teaching contents, and build a curriculum structure that meets the requirements of enterprises, school education and students' success. Internet plus can be adopted to achieve deep integration of industry and education, and deepen the convergence of enterprises, schools and students, so as to break down the barriers between different majors, between professional courses and basic courses, and between theory and practice, establish a school-enterprise communication mechanism to closely connect the two processes of production and learning. In this way, it can not only improve the actual technical level of students, but also cultivate skilled talents who really meet the needs of enterprises, and integrate the craftsman spirit valued by enterprises into the whole process of talent cultivation.

Secondly, a new platform for school-enterprise cooperation based on "Internet plus" can promote the real-time updating and sharing of multi-party information, bring greater possibilities for schools and enterprises to carry out multi-mode online and offline resource docking activities, and facilitate the docking of enterprises, docking of talents resources and docking of technological capabilities. Thus, the school can accurately and timely grasp the development law, trend, development prospect and direction of the industry, and then make reasonable and scientific adjustments to the professional division, curriculum system design and talent training orientation [5], so as to build the school into a training base for the fresh blood of enterprises, and then fully integrate into the innovation process of enterprises.

Thirdly, a new platform for school enterprise cooperation based on "Internet plus" can build an integrated assessment system for deep participation of schools and enterprises, integrate technical ability standards, teaching level standards, post ability requirements and teaching content norms. Schools and enterprises jointly formulate talent training plans, share educational resources and enterprise equipment, jointly manage the teaching process, supervise the teaching quality, build an integrated assessment and evaluation system recognized by both schools and enterprises, so as to promote the comprehensive integration between schools and enterprises, achieve the sharing of resources and information between schools and enterprises, and then solve the problem of information synchronization between the two sides. In a word, using information technology to solve the current problems in school-enterprise cooperation is conducive to improving the comprehensiveness of school enterprise integration, optimizing school talent training, and improving social influence and school contribution to regional economy.

## 5. Implementation Case of Industry-Education Integrated Teaching Design

This paper is in the curriculum empirical research facing the engineering background. According to the characteristics of the integration of industry and education, students need a lot of teachers'

guidance when constructing a new knowledge system. The research group will provide students with various learning resources, provide students with an industry-education integration environment that can meet their needs and promote their learning, provide top products and experience in the industry, and help students successfully build a new knowledge system and practical experience.

The specific steps of the research are divided into the following stages:

## 5.1 Case Analysis and Design Stage

Conduct extensive research on industry-leading enterprises such as Alibaba cloud, Baidu and Tencent, find key business needs and products of the industry, and conduct topic selection, demonstration, analysis and writing of enterprise products and needs. On this basis, we can communicate with education and education technology enterprises, including Huike, Lenovo, Inspur, Dolphin Big Data, etc., and initially form a series of basic viewpoints and achievements of the industry-education integration model.

## 5.2 Teaching Research Practice Stage

Implement undergraduate oriented curriculum design, establish a teaching method based on the in-depth integration of industry and education, and conduct pilot experiments in classroom teaching, experimental courses and other links. Based on the needs of enterprises, we can build a software teaching practice environment integrating the tool platform of modern data science and big data technology. From the perspective of the integration of industry and education, we should introduce the collaborative education project of industry and education, increase the participation of enterprises in the process of practical teaching, and pay attention to the training with enterprise characteristics in the process of teacher development.

## 5.3 Practice Effect Analysis Stage

Collect student' opinions and suggestions in the course through questionnaires, timely carry out statistical analysis and empirical research, and adjust the teaching contents and methods according to the existing problems.

## 5.4 Summary and Improvement Stage

Analyze the teaching results, sort out the teaching materials, summarize and improve the teaching mode, and form the final research results.

## 6. Reflections on the Integration of Industry and Education

In order to improve students' engineering practice ability in the school, we must carry out comprehensive and scientific design, strive to build an environment conducive to the integration of industry and education, build "double tutorial system", design examination questions according to the requirements of enterprises and complete them in groups, so as to improve students' comprehensive abilities such as practical operation ability, team cooperation ability and vocational skills.

## 6.1 Build an Industry, College and Research Cooperation Platform and Promote the Integration of Graduation Design

In order to ensure the smooth progress of the graduation project of the integration of industry and education, we must build a good talent education mechanism, jointly establish teaching and research offices and large-scale practice bases by schools and enterprises, establish a corresponding long-term cooperation mechanism of industry, college and research, design and form a completion platform for school enterprise cooperation, and hire excellent enterprise engineers to participate in the completion guidance process every semester and academic year.

## 6.2 Implement the "Double Tutorial System" and Strengthen the Construction of Enterprise Tutor Team

Firstly, establish a stable and long-term "double tutorial system" and set up a tutor team to fully cooperate with technology companies, development companies and service companies. Secondly, the industry side and the teaching side provide convenient land for graduation project, such as teaching and research office and technology development department, so as to achieve division of labor, cooperation and multi site guidance inside and outside the school. Thirdly, the industry side and the teaching side make joint efforts, cooperate in an all-round way, and jointly study the establishment, review, defense and other aspects of the graduation project theme.

## 6.3 Strengthen the Interaction between Schools and Enterprises and Promote the Graduation Project Cooperation between Schools and Enterprises

Firstly, enterprise engineers join the preliminary work of graduation design to create an atmosphere of engineering practice. Secondly, we can deepen the comprehensive integration of industry and education, improve the proportion of engineering design topics, and advocate the graduation design in enterprises. Thirdly, we can pay attention to process supervision, ensure graduation project quality, improve performance evaluation methods, and introduce more enterprise ideas and opinions.

## 6.4 Tackle Key Problems in Groups and Improve Teamwork Ability

According to the ability certified by big data specialty, guide the graduation project according to the course requirements. The graduation project theme is composed of 3 to 5 small questions under a big topic, which can really improve the students' team communication and cooperation ability.

## 6.5 Determine the Graduation Project Direction According to the Needs of Industry-Education Integration

According to the different advantages of schools and enterprises in resources, they can learn from each other, give full play to the advantages of stronger theoretical foundation and scientific research ability of schools, and make good use of the solid practical ability and engineering project foundation of enterprises. In particular, it can combine the students' internship and employment, contact and coordinate relevant enterprises, and design some career planning topics with practical application prospects. In a word, the graduation project topics can be divided into basic and applied types, such as comprehensive problems, algorithm simulation, basic development, innovative projects and career planning.

## 6.6 Fully Penetrate the Concept of Integration of Industry and Education, Ensure the Effectiveness of Training

In order to help students successfully complete the graduation project, the supervisors of both schools and enterprises should fulfill their obligations of guidance and pay attention to the all-round development of students' abilities. In addition, the instructor should strictly guide the students in the process of graduation project, such as literature retrieval, data collection, article writing, etc. Combining regular inspection and random inspection, they should also review and supervise the students' progress according to the time node of graduation project, strictly review the article, review the authenticity and feasibility at the same time, and put forward improvement suggestions for the first draft. Finally, they should accurately evaluate the quality of the paper, deeply analyze the graduation project of each student, and then give an objective general evaluation.

## References

[1] Big Data Research and Development Initiative [DB/OL]. [2012-03-29]. http://www.whitehouse.gov/sites/default/files/microsites/ostp/big_data_press_release_final_2.pdf.

[2] Enhancing Teaching and Learning through Educational Data Mining and Learning Analytics [DB/OL]. [2012-10-12]. http://www.ed.gov/edblogs/technology/files/2012/03/edm- la-brief. pdf.

[3] Netflix Prize. http://www.netflixprize.com/

[4] KDD Cup. http://www.sigkdd.org/kddcup/ index.php?section=1997&method=info.

[5] China Big Data Technology Innovation Competition. http://bigdatacontest.ccf.org.cn/.

[6] http://www.kddcup2012.org/

[7] Luo Mingdong, He Xueren, Li Zhiping, et al. Fundamentals of educational technology -- Exploration of the integration of modern educational theory and information technology [M]. Beijing: Science Press. 2007.