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Research on Quality Monitoring System of Practical Training in Computer Specialty of Higher Education

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Abstract. Aiming at the problems of imperfect evaluation mechanism and loose assessment in the process of professional training teaching, we present a quality monitoring system by measure each link of practical training and change the education mode in terms of different roles. Through the layout of monitoring points in all aspects of practice, evaluation objectives can be refined. At the same time, various types of data produced in professional training are analyzed and studied to explore and establish a quality monitoring system for practical training teaching. We look forward to open new ideas for solving the problems existing in practical training and optimizing the learning process, thus to improve the quality of personnel training based on school-enterprise integration.

Keywords: professional training, teaching process, quality control, evaluation mechanism.

1. Introduction

Talent is the key to supporting technological innovation in manufacturing industry. Technological innovation depends not only on high-end academic and scientific research talents, but also on the vast number of front-line technical application talents. This kind of talents should have strong theoretical foundation, practical skills and application ability of technology. They can turn theoretical design and development into technology application and directly create productivity. The integration of industry and education and the establishment of joint training mechanism between universities and enterprises are the key to cultivate applied talents to meet the needs of social and economic development, which can solve the contradiction between the structural supply of talents in Colleges and universities.

The integration of the new generation of information technology, such as artificial intelligence, big data and Internet plus, with traditional manufacturing industry has become an urgent demand of the government [1]. Industry talents play an important role in the current economic construction and social development. For the undergraduate computer specialty in colleges and universities, the training goal is to cultivate high-level, multi-level, compound senior software development and management talents with the ability to command the software industry. From this goal, we can see that the training objectives are too broad, the professional orientation is not clear, leading to too loose of the learning content, so that students can not have enough time to highlight their major and strengthen their skills.

2. Joint Training Mode of School-Enterprise Integration

At present, the professional environment, the trend of innovation, the knowledge ability and comprehensive quality required by social development are highly complex. Besides, the curriculum content of talent training in Colleges and universities lags behind the development and application of science and technology [2]. In addition, teachers generally lack experience in engineering practice. Talents training in Colleges and universities are separated from the development of industrial enterprises, which makes the demand of enterprises unable to be transformed into the driving force of talent training reform in time. At present, according to the characteristics of computer specialty, we adopt the long-term school-enterprise cooperation mode to facilitate the joint training teaching based on the mode of school-enterprise integration as follows: "3+1" talent training mode, joint course training in off-campus IT education enterprises, and appointment of teachers to study in enterprises

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to improve teachers' practical teaching level. Although the participation of enterprises in joint training teaching has been greatly improved, there are still many problems:

(1) Enterprises often do not arrange training contents in accordance with school enterprise cooperation agreement to complete the guiding task.

(2) In the process of implementing school-enterprise cooperation, students' daily management and practice process are loose, the effect of practice is poor, and the satisfaction of practice is low.

(3) For students who are assigned to practice in enterprises, it is difficult for enterprises to cooperate objectively and subjectively to complete the task of practice because of the limitations of their own business processes and their own interests.

(4) The selection of cooperative enterprises should be careful and meticulous. We should have a thorough understanding of the scale, qualification level, credibility and internal management mode of the enterprises.

(5) The dual tutorial mechanism should be improved. Enterprise-appointed instructors are skilled in engineering, but there are some shortcomings in teaching experience and methods compared with full-time teachers. There are differences in the acceptance of core skills for students with different foundations, which will affect the quality of training. It is necessary to cooperate with school practice instructors.

Generally speaking, these problems are mainly due to the imperfect evaluation mechanism, loose assessment and process management control [3]. In order to effectively solve the above problems, we present a quality monitoring system in practical teaching process by measure each link of practical training and change the education mode from "relying on experience" to "relying on data" in terms of different roles.

3. Quality Monitoring System for Practical Teaching Process

As an application-oriented undergraduate college, we attach great importance to the status of IT training in IT personnel training, and insert training teaching in its education system, and gradually increase its proportion. In the talent training program for computer science and technology major of our university in 2017, 188.5 credits are required for all compulsory courses, of which 19 credits are for comprehensive professional practice and about 2-4 weeks per semester are arranged for professional training, accounting for 10.1%. At present, by taking advantage of the school's geographical location, we have established a new mechanism for joint training of talents through in-depth cooperation with IT enterprises and entrepreneurship centers in Donghu Hi-tech Zone (such as Wuhan University Science Park, Wuhan Overseas Students Pioneering Park, Hongshan Pioneering Center, etc.). In particular, many attempts have been made in the teaching of joint training under the mode of collaborative education based on School-enterprise cooperation framework. For example, enterprise engineers participate in professional teaching and student training teaching, the introduction of enterprise management model, the construction of school-enterprise cooperation training curriculum system, and the coordinated implementation of centralized practice posts between schools and enterprises. The school-enterprise cooperative training teaching aims at the actual needs of the society and takes a large number of practical training projects as a means to improve students' ability and solve practical problems. As for the lack of practical training and innovation ability of students trained in the past "arranged and closed" education, the training mode of school-enterprise cooperation talents meets the needs of the society and is in line with the market. However, there are still some problems in the professional training links which play a decisive role in the quality of training high-skilled talents, mainly due to the imperfect evaluation mechanism, loose assessment and process management control. In order to solve the above problems effectively, we intend to measure the monitoring points of each link in the practical training from the perspective of the role of practical training. By classifying the influencing factors and data of practical training events, this paper explores the relationship between events and teaching quality by using data mining method, so as to realize the control of teaching quality.

In view of the professional training activities, the analysis of the quality of practical training teaching includes two parts: connotative data and denotative data. To clarify which data are related to teaching itself and have strong traditional concepts, which belong to a wide range of data, not directly related to teaching. Furthermore, setting the boundary between connotative and denotative data is the premise for the research of teaching data.

The setting of data monitoring points is shown in table 1-4. Monitoring points are defined as control points set up in teaching to monitor certain processes, phenomena or objects. The settings of monitoring points include: effective monitoring of the operation of the whole teaching process, whether the teaching process meets the teaching progress and requirements, students' response and satisfaction with the training courses, teachers' response and satisfaction with students, teaching progress, teaching process, human problems in the process of teaching implementation, and teaching implementation. There are a series of problems in the process, such as environmental problems, students' satisfaction in the process of teaching implementation. Furthermore, it should reflect whether the training implementation process is carried out in an orderly manner, whether the monitoring of practice links is in place, and whether the teachers' guidance in practice links is in place. Through the monitoring of monitoring points, we can find out the existing problems and take timely measures to adjust the corresponding teaching problems.

Table 1.The perspective of instructors in the training process

category	Item No.	Observation point	Data type
Student level	01	Adapt to teaching methods	Logic
	02	Adapt to teaching content	Logic
	03	Adapting to teaching environment	Logic
	04	Adapting to teachers' progress	Logic
	05	Teaching attitude	Grade
	06	Interest degree	Grade
	07	Long term attractiveness of course	Score
Outline progress	08	Does the learning schedule meet the standards?	Logic
	09	Problem oriented curriculum syllabus	Logic
Work assessment	10	Composition of evaluation system	Grade
	11	Performance appraisal relationship	Grade
	12	Does it reflect effectiveness?	Logic
	13	Formative assessment method	Grade
	14	Validation of practice results	Grade
	15	Validity of evaluation	Score
Self evaluation	16	Courseware framework	Logic
	17	Curriculum knowledge decomposition system	Logic
	18	Problem oriented transformation system	Logic
	19	Other resources integration	Logic
	20	Ways to enhance students' attention	Grade
	21	Are cognitive assessment methods effective and novel?	Logic
	22	Reconstructing and reorganizing specialized courseware framework	Grade
Cooperative guidance teachers	23	Complex knowledge decomposition ability	Score
	24	Understanding of knowledge	Score
	25	Collaboration with speakers	Score
	26	Ability of Fragment knowledge combination	Score
	27	Conversion ability of problem types	Score
	28	Transformation from logical thinking to image thinking	Score
	29	Expressive force	Score
	30	Organizational counseling reconstitution ability	Score

Table 2. The perspective of students in the training process

category	Item No.	Observation point	Data type
The tutors	31	Qualifications	Grade
	32	The orderliness of the knowledge points	Grade
	33	Teaching skills	Grade
	34	Associative expressive power	Grade
	35	Subject background	Logic
	36	Professional degree	Logic
	37	Educational background	Grade
Homework / assessment	38	Assessment and evaluation	Grade
	39	facility value	Grade
	40	Type diversity	Logic
	41	Professional fit	Logic
Practice conditions	42	Enterprise environment	Grade
	43	Enterprise atmosphere	Grade
	44	Equipment conditions	Grade
	45	Management level	Grade
	46	Support degree	Grade
	47	Disciplinary requirements	Logic
Learning support	48	Effectiveness	Logic
	49	Pertinence	Logic
	50	meet professor	Logic
	51	Frequency and intensity of counselling	Score
	52	Degree of discussion	Grade

Table 3. The perspective of teaching administrator in the training process

category	Item No.	Observation point	Data type
Teaching behavior	57	Unity of practice and outline	Grade
	58	Unity of emphasis and difficulty in Teaching	Grade
	59	Unity of teaching and tutoring	Grade
	60	Teaching answer conditions and real time response	Grade
	61	Practical activity guidance	Score
	62	The unity of lesson plan and syllabus	Grade
	63	Degree of homework approval	Grade
	64	Qualifications and professional background of Teachers	Grade
	65	Teaching deviation	Grade
	66	Teaching process evaluation	Score
	67	Unity of contents and courseware knowledge points	Grade
	68	Overall training intensity	Grade
Student learning behavior	69	Student mastery level	Score
	70	Business upgrading capability	Score
	71	Problem solving ability	Score
	72	Can you get timely guidance?	Logic
	73	Achievement distribution	Grade
	74	Quality Control	Logic
Training development	75	Contradiction between engineering and Engineering	Logic
	76	Contradiction between quality and quantity	Logic
	77	Contradiction between occupation and learning direction	Logic
	78	Student base differences	Grade

Table 4. The perspective of teaching resources

category	Item No.	Observation point	Data type
Training course	82	Modularization	Logic
	83	Quality of lectures	Grade
	84	Empathic degree	Score
	85	Interactivity	Score
Curriculum resources	86	Courseware evaluation	Grade
	87	Teacher's evaluation	Score
	88	problem mining	Grade
	89	Technical specifications	Logic
	90	Resource database construction	Grade
Learner	92	Matching between resources and learners	Grade
	93	Attention to resources	Score
	94	Fragmentation of knowledge	Logic
	95	Job evaluation	Score
Evaluation of learning effectiveness	96	Self-test of students	Score
	97	Formative assessment	Score
	98	Discussion on Interaction Evaluation	Score
	99	Test evaluation	Score

Training teaching can show the characteristics that traditional classroom teaching does not have. Effective monitoring of teaching quality has become a very important link to ensure the quality of teaching. By setting up the data monitoring points, we can detect, analyze and process in time. Usually, the occurrence of teaching events has certain precursor, relevance and predictability. In order to deal with the current events, we must understand and mine the relevant phenomena and information, infer the causes of the events, the factors involved and other information from these data, so as to provide effective basis for decision-making. In addition, by making use of data mining and waveform analysis of historical data, the law of events can be discovered. Furthermore, it can help to realize the prediction of teaching quality, which is of great significance to improve the effect of practical teaching.

4. Conclusion

Professional training activities based on the mode of school-enterprise integration can effectively combine theory with practice, improve students' ability and realize seamless connection between talent training and social needs. However, this mode often shows imperfect process evaluation mechanism, loose assessment and process management control. To solve these problems, this paper intends to start from different roles in the practical training, measure the monitoring points of each link in the practical training, and change the educational mode from "relying on experience" to "relying on data". By laying out the monitoring points in each link of the internship, refining the evaluation objectives, analyzing and researching the huge amount and various types of data generated in the professional training, we explore the establishment of a quality monitoring system of the training teaching process, which integrates data collection, analysis, evaluation and feedback. Through the setting of data monitoring points, it can effectively improve the management and control of the joint training teaching process under the mode of school-enterprise integration, and enhance the degree of industry enterprises' participation.

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