Research on the reform of "three immersion and three integration" in the assessment and evaluation of embedded system design and development courses under the background of new engineering

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Abstract. With the development of major colleges and universities on the research of teaching reform projects related to assessment and evaluation, the participation and influence of higher education are increasing, and the talent training program is the starting point and the most fundamental basis for professional development, of which the course assessment is the key link to determine the implementation effect of the talent training program, and determines the quality of students' ability to go to the society and go to the workplace. Under the background of vigorously promoting the construction of new engineering, the course "Embedded System Design and Development" explores a new mode of talent training in engineering education and carries out research on course assessment reform, which is intended to improve the learning efficiency and assessment quality of the course, and then find a more suitable solution for the improvement of the quality of education in colleges and universities, which is of great significance for improving the quality of talent training.

Keywords: Talent development programs, Curriculum assessment reform, Quality of education

1   Introduction

With the rapid development of higher education, course assessment is a concentrated embodiment of testing the teaching quality of colleges and universities, is an important part of the teaching reform of cultivating application-oriented and innovative talents, with a variety of functions such as course performance evaluation, diagnosis, guidance, motivation, identification, etc., its educational function presents diversified characteristics, especially higher education, its function is not only to impart knowledge, but also to emphasize the comprehensive development of students' personality and the cultivation of innovative consciousness and innovative ability.

2 Analysis of the current situation of course assessment methods

Taking North American universities such as the United States and Canada as examples, their assessment is diversified, and the academic assessment of students pays special attention to process evaluation, and the course assessment forms a decentralized complete system[1-5]. The assessment is mainly open book and open evaluation, through students' reference to materials or division of labor and cooperation, teachers always maintain interaction with students, and constantly improve the assessment form in combination with the course content to strengthen the process guidance. The performance of assessment results is mainly level quantification, such as European and American countries generally use A+, A, B+, B... and other forms of performance, Russia and other countries with excellent, good, pass, fail four-level scoring method, can avoid blindly pursuing the first place of bad orientation[6]. At the same time, but in the teaching management, it is clearly required to formulate assessment standards and be as detailed as possible, so as to ensure the fairness of each student's achievements[7-8].

With the rapid development of higher education in China, most colleges and universities have many misunderstandings and deficiencies in examination concepts, examination content, examination methods, and application of examination results. The single traditional assessment method in China still dominates, and the proportion of process assessment is low. At present, the assessment method of domestic professional courses is mainly based on the closed-book written examination after the course, supplemented by ordinary grades, the assessment content lacks practicality and application, and most of the assessment content is based on teaching materials and teaching notes. The form of test questions is also mainly selection, fill-in-the-blank, judgment, noun explanation, short answer, calculation, etc., while research, extended or innovative questions account for a smaller proportion. At present, college teachers are actively carrying out teaching reform, among which the form of course assessment is also constantly innovating, and began to pay attention to the process assessment, such as: setting up classroom attendance, seminar answering questions, homework display, etc., but in the actual evaluation operation, there are problems such as irregular assessment, arbitrariness, and great difference[9].

3 Curriculum assessment reform practice content

"Embedded System Design and Development" is a professional core course of Internet of Things engineering in our school, which is a course jointly built with ZTE Co., Ltd. with wide coverage and strong practicality. With the advent of the era of the Internet of Things, it is urgent to improve the level of students' embedded technology application ability with the main purpose of "practical innovation".

In view of the characteristics of "new engineering" and the needs of society and enterprises for embedded system engineers, this paper sorts out the existing professional course system of Internet of Things engineering, and takes advantage of the course school-enterprise co-construction of the smart city college jointly built with ZTE

Co., Ltd., actively adapts to new technologies, new industries and new economic development, refines and improves the course assessment standards of "Embedded System Design and Development", and realizes the ability-oriented professional course assessment method.

3.1 School-enterprise discussion and innovation of curriculum assessment standards under the background of "new engineering"

In order to improve students' practical ability in embedded system design and development, the traditional assessment method pays too much attention to the current situation of theoretical knowledge and does not meet the requirements of "new engineering" for engineering practical ability, so the course assessment method is reformed, the process assessment is increased, the non-standard assessment ratio is increased, and the school-enterprise teachers cooperate to innovate and develop the whole process of course assessment standards, so as to truly realize the mutual benefit of teaching.

3.2 Teacher-student collaboration to build the whole process of project-guided, task-driven non-standard evaluation and learning

Select the actual project of the enterprise as the teaching content, take the improvement of ability as the goal, set up advanced projects, and subdivide the tasks of the project. Follow the law of student ladder growth, promote ability improvement through project ladder training, and then construct a knowledge system, and carry out multi-process assessment and evaluation based on ability and mixed online and offline. The assessment can promote teacher-student interaction, student-student interaction, and stimulate students' learning potential. The level docking task, the implementation of the level points, the points are converted into the corresponding assessment results in the project process.

3.3 Combine virtual and real to build online and offline standard and non-standard assessment question bank resources

The course adopts online and offline hybrid teaching, flexibly adopts the two modes of virtual simulation and hardware development platform in the practical link, builds a standard question bank such as objective questions and subjective questions according to the course learning requirements of task knowledge add task practice, develops non-standard assessment schemes, evaluates the assessment question bank from multiple dimensions such as teachers, students, enterprises, engineers, etc., and continuously optimizes the question bank resources through multi-party feedback.

Finally, to improve the monitoring and guarantee system of course teaching quality, the formulation of course assessment standards needs to be evaluated through multiple demonstrations and continuous optimization to ensure implementation.

4   Effect of practical reform

Under the background of new engineering, with the goal of cultivating high-quality application-oriented talents with strong practical ability[10], strong innovation and entrepreneurship ability, strong interdisciplinary integration ability, and international standards, it has achieved certain results after two years of practice.

Based on the goal of application-oriented talent training, investigate the demand for embedded technology talents under the background of new engineering, divide the project task module, formulate the "immersion assessment" scheme of teacher-student immersion participation, online and offline immersion assessment, and virtual reality immersion evaluation from the two dimensions of online-offline and standard-non-standard, explore the implementation path and method of effective "integrated evaluation" of assessment mode, teacher cooperation and evaluation method, and comprehensively improve the embedded course assessment and evaluation system to ensure the effect of students' classroom learning.

4.1   Investigate the current situation of talents and demand positions, capabilities and skills in the embedded system industry

Based on the ability needs of embedded related positions and talent training, the research direction and research content are determined first, the research method is designed, and the research plan is formulated[11-12]. After that, extensive collection of relevant information is carried out in the work, information is obtained through online collection and internal information, embedded engineer interviews, etc., and then the collected data is sorted out and summarized, and finally made into a job demand research report.

4.2   Create a "three immersion and three integration" whole-process course assessment plan

Create immersive assessment from the three aspects of "teacher-student" immersion participation, "online-offline" immersion experience, and "virtual-reality" immersion mode, and explore the effective path and method of "integrated evaluation" of "standard non-standard, school-enterprise, teacher-student" to create a "three-immersion and three-integration" course assessment model.

(1) Teacher-student immersion participation

First, draw a complete roadmap for project-based learning landing classrooms, organize project-based teaching from the aspects of establishing classroom culture, design and planning, corresponding to course standards, managing teaching activities, evaluating students' learning, building learning scaffolds, participating and guiding, and reviewing and reflecting, so as to create an immersive learning experience for students, so that every student has the opportunity to experience high-quality project-based learning.

(2) Online-offline immersion experience

Embedded practice mostly relies on hardware experimental platforms, but completely relies on offline practice, and the teaching effect is difficult to guarantee. Therefore, through virtual simulation software, online practical teaching resources are synchronized to create an online and offline full-time immersive experience. Online and offline group division of labor, intra-group communication and interaction, overcoming barriers, and collaborative completion; Level challenge, set up levels online, complete challenges online, challenge data feedback learning effect; Advanced improvement, online extended learning, offline process assessment, complete project advancement, achieve the improvement of application development capabilities, and build a learning community for teachers and students.

(3) Virtual-reality immersion mode setting

Through the combination of virtual simulation and actual hardware platform, it helps students practice and all-round understanding at different levels, so that students can learn at any time and conveniently, and help students gradually acquire the ability to solve complex engineering problems. Set up graded challenge evaluation standards, and conduct reasonable grading assessment and evaluation of students' ability to solve complex problems.

4.3   Optimize the effective path and method of "fusion evaluation"

In terms of assessment mode, the course focuses on cultivating students' ability, follows the law of ladder growth, reforms the non-standard answer examination scheme, and adopts a multi-process assessment and evaluation method that mixes online and offline[13].

In terms of school-enterprise co-construction, school-enterprise teachers give full play to their respective advantages, and enterprise teachers design non-standard assessment plans in terms of curriculum practice, set task checkpoints in the process of project implementation and task completion, and conduct whole-process assessment and evaluation of the actual aspects of the project. Full-time teachers sort out the knowledge points related to project tasks, build a standard question bank, and complete the evaluation by asking questions, discussing and closing the final book.

In terms of teacher-student co-evaluation, the class mostly adopts flipped classroom and group tasks to examine students' practical ability and knowledge internalization, and in this process, the ability improvement is promoted through project ladder training, and then the knowledge system is constructed, and the multi-process assessment and evaluation based on ability and mixed online and offline is carried out. The assessment can promote teacher-student interaction, student-student interaction, and stimulate students' learning potential. The level docking task, the implementation of the level points, the points are converted into the corresponding assessment results in the project process.

5   Conclusion

Under the background of new engineering, through continuous school-enterprise in-depth cooperation, school-enterprise teachers jointly build and share the course "Embedded System Design and Development", build a theoretical course system and practical course system construction for Internet of Things engineering, create a digital course resource library such as MOOC and micro-courses, improve online and offline assessment subdivisions, pay attention to the whole process of assessment, create teacher-student immersion participation, online and offline immersion assessment, virtual reality immersion evaluation, integrate process and final assessment, and improve the assessment and evaluation system in an all-round way. Provide good guidance for students' professional learning.

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References

1. Li Fangyuan, Fang Qizhi. (2023) Response, Negotiation, and Co-construction: Curriculum Evaluation Optimization and Practice Centered on Student Experience. Education Exploration,6:46-50.http://s.dic.cool/S/9C2vqdhm.
2. LIANG Jilei, FAN Linlin. (2023) Improvement measures of student curriculum evaluation system in the context of new engineering. Chemical Management,14:12-14.http://s.dic.cool/S/M8s4yq79.
3. Yang Chuang, Shao Weishuang, Li Xiaohong. (2023) Construction of Mathematical Analysis Course Evaluation System in the Context of Curriculum Ideology and Politics. Journal of Science and Technology,43(04):77-80.http://s.dic.cool/S/FO8YUfwB.
4. Wang Jingshu, Feng Mingchi, Ma Jinghu. (2023) Evaluation and continuous improvement of mechanical electrical control and automation courses for engineering certification requirements. Scientific Consulting,2:5-7.http://s.dic.cool/S/xzIg8doW.
5. Yue Bin, Yu Zhiyun, Zhang Zhenbao. (2023) Computer composition principles and design course assessment reform. Computer Education,7:98-101.http://s.dic.cool/S/stnkZzuU.
6. Gui Lan, Yang Hairong, Yang Liu. (2023) Discussion on the assessment reform of road survey and design courses. Journal of Higher Education,9(11):137-140.http://s.dic.cool/S/xIzl3T41.

7. Ai Liwang, Wang Jiaoyang. (2022) Reform of professional course assessment method of colleges and universities based on engineering application talent training. Tech Wind,8:37-39.http://s.dic.cool/S/O6VzQIxc.

8. Wang Zhaodong. (2022) Reform of assessment methods for automation professional hands-on practical courses. Paper Equipment and Materials,51(04): 231-233.http://s.dic.cool/S/NiMTpFEH.

9. Wang Yanan, Zhang Wei. (2022) Thinking and exploration on the reform of college curriculum assessment. Journal of Jilin Institute of Education, 38(03):25-28.http://s.dic.cool/S/dIEyTD0z.

10. Gao Xue, Qin Jiayang. (2022) Discussion on the reform of mixed curriculum assessment methods based on the personality characteristics of college students. China Medical Education Technology,36(02):154-156+161.http://s.dic.cool/S/2IoEy8mh.

11. Clark Keriffe R.(2022) Education for Sustainable Development, Curriculum Reform and Implications for Teacher Education in a Small Island Developing State.Discourse and Communication for Sustainable Education,13(1): 145-153.DOI：10.2478/DCSE-2022-0011.

12. Tucker Catherine M.;Jaffe Rebecca;Goldberg Allison.(2023) Supporting a culture of patient safety: Resident-led patient safety event reviews in a pathology residency training program. Academic Pathology,10(1) :100069-100069.DOI：10.1016/J.ACPATH.2023.100069.

13. Russell Frances M.;Herbert Audrey. (2021) Development and implementation of a point of care ultrasound curriculum at a multi-site institution.The Ultrasound Journal, 13(1): 9-9.DOI：10.1186/S13089-021-00214-W.