



Exploratory and Innovative Curriculum Design in Body Painting and Restoration Course Practice

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Abstract. Body painting and restoration course is a core practical training course for automotive engineering technology majors, which is of great significance to cultivate the practical hands-on ability and innovative thinking of automotive students. The purpose of this paper is to summarise the teaching reform experience of the body painting repair course in the past few years, and to discuss the importance of teaching based on the "three-ring comprehensive practical training" in the design of the course as well as the importance of the enhancement of students' skills.

Keywords: body paint restoration; practical training course; three-ring integrated practical training; course design;

1 Introduction

In order to implement the "National Pilot Implementation Programme for the Integration of Industry and Education", the automotive engineering technology major of our school and GAC Honda have cooperated to build a spray repair project class since 2018. The teaching team and the enterprise jointly formulated the "Quality Improvement Engineer Training Plan"[1], relying on the school's 3,000-square-metre large-scale training base and the school-enterprise joint research and development of simulation training equipment and systems, the introduction of third-party accident vehicle repair projects, facing the problems on the spot, and focusing on the "Teaching, Learning and Evaluation". "The whole process of assessment is carried out by "Skill Tree Growth Platform", which is a key project recommended by the Ministry of Education, and solves the problem of "difficult to realise excellence in on-site operation", It solves the three major pain points of "difficult to achieve excellence in on-site operation", "difficult to evaluate the operation process" and "difficult to develop engineering thinking", and cultivates high-tech and skilled talents in spray-painting and repairing, who are proficient in operation, understand the process, know how to manage, are good at collaboration and are capable of innovation.

2 Overall Design of Teaching

2.1 Building "4 + 1" Programme Modules Through the Integration of Job Competitions and Certificates

Teaching team docking enterprise actual job ability demand, comprehensive "1 + X automobile body paint maintenance and painting spraying technical standards (senior)", the World Skills Competition automobile spraying competition technical standards, based on the cognitive law of vocational education students, from easy to difficult, layer by layer, the course reconstructed into a "single, double, triple, multiple" 4 learning modules The course is reconstructed into four learning modules of "single, double, triple and multiple" and one assessment and certification module of "painting job certification". Repeated training in direct face of on-site problems effectively improves technical skills and lays the foundation for the quality improvement engineer's assessment and realises the effective transformation of single competence to vocational competence. Teaching team docking enterprise actual job ability demand, comprehensive "1 + X automobile body paint maintenance and painting spraying technical standards (senior)", the World Skills Competition automobile spraying competition technical standards, based on the cognitive law of vocational education students, from easy to difficult, step by step, the curriculum reconstruction for "single, double, triple, multiple" four learning modules The course is reconstructed into four learning modules of "single, double, triple and multiple" and one assessment and certification module of "painting job certification". Repeated training in direct face of on-site problems effectively improves technical skills and lays the foundation for the quality improvement engineer's assessment and realises the effective transformation of single competence to vocational competence, as shown in figure 1.

2.2 Establishing New Teaching Objectives Based on the Teaching Content

According to the reconstructed teaching content, our teaching team redefined the quality objectives of this course of love and dedication to work and strive for excellence, the knowledge objectives of mastering atomic grey treatment, intermediate primer treatment and topcoat treatment, and the ability objectives of being able to fill in, polish, defend colors, spray paint, paint mixing and polishing.

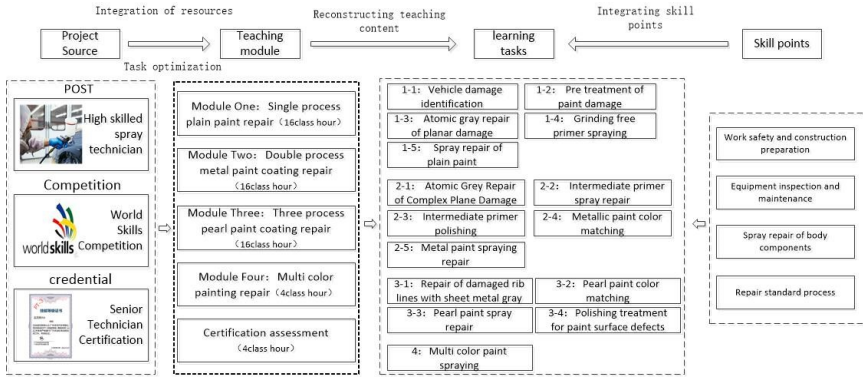


Fig. 1. Curriculum system reconstruction

2.3 Strong Theory, Practical Practice, Lean and Innovative Teaching Strategies

The teaching process is based on the two basic points of operation specification and quality attainment, and will be driven by lighting up the skill tree, relying on the provincial industry-teaching fusion training centre, skill tree growth platform, online teaching platform, strengthening the detailed assessment, carrying out online and offline mixed teaching, and deepening the theoretical understanding in multiple aspects; students complete the content preview through the online teaching platform before the class, complete the virtual operation training and assessment to obtain the pass certification, and use the real-time recording system to observe the teacher's standard demonstration and summarize the technical points through group exploration in the class to circulate the practical operation and achieve the enterprise quality standard[2]. During the class, students use the real-time recording and broadcasting system to observe the teacher's standard demonstration and summarise the technical points through group inquiry, and circulate the practical operation to meet the enterprise quality standard, upload the operation video and effect pictures after the class to light up the skill tree and participate in the maintenance of real vehicles, and the three-ring comprehensive training to improve the assessment awareness and engineering thinking, and cultivate the craftsmanship of the students' leanness and innovation, as shown in figure 2.

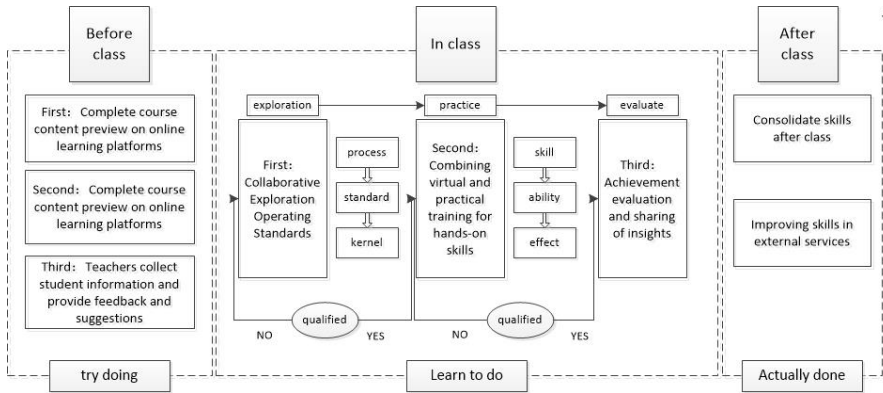


Fig. 2. Teaching strategies

2.4 Integrating "Made in China→Quality Made in China→Creation in China" into the Civics and Politics of the Curriculum

In the teaching of the course, two main lines of ideology and politics are constructed, namely "lean and innovation", and students are required to focus on each process and link throughout the whole course, to meet the existing standards of the enterprise as the bottom line requirement, and to pursue to do better, so as to cultivate the "lean spirit" of the students. In the operation process, with the goal of "better, faster, more economical", students are encouraged and guided to put forward ideas[3], try to do, verify the effect, and form the process, so as to cultivate students to use engineering thinking to find out the problems, solve the problems, and verify the effect, so as to realise the Quality Improvement Engineer Nurturing Plan.

2.5 Quantitative Assessment Criteria and Implementation of the Trinity Evaluation

Based on the enterprise certification assessment system and pointing to the senior technician, we formulate the task assessment work order around the teaching objectives, and with the help of intelligent and process-oriented methods[4], we carry out an all-round and multi-dimensional evaluation of the whole process of teaching by means of students' self-assessment, group mutual assessment, teachers' evaluation[5], supervisors' evaluation, assessment and certification, and so on.

3 Teaching and Learning Process

3.1 Pre-Lesson Analysis Tasks

Students receive task work orders through the e-learning platform, study hands-on videos and micro-lessons independently, complete quizzes, simulate exercises and gain clearance. View the operation videos on the Skill Tree platform and summarise the

process and key points. Put forward your own problems for the existing process, and discuss in groups to put forward ideas to solve the problems. In the process of confrontation and discussion to achieve the problem to trace the root cause, so that students on the depth of the theoretical knowledge of the new situation.

3.2 Practising Skills in Class

Teachers combined with real cases to analyse job skills requirements, through step-by-step demonstration of practical exercises, enriching the students' sense of occupation; for the exploration of the link designed for group cooperation, the students to group units to design the repair programme, improve the repair process, the approved repair standards, enhanced the sense of interest; the role of the practical exercises in the exchange, the cycle of correcting errors, to help the students to gradually master the skills of the job, to enhance the sense of learning gains; students to share the experience of the exhibition of elegance, Teachers review heavy incentives to stimulate a sense of achievement in learning. "Strict assessment", from the operation method to the stage results, the formation of data-based means of assessment to meet the standards required by the enterprise as the bottom line, the pursuit of better quality, higher efficiency, saving the environment. "Based on the mastery of methods and skills, we put forward optimisation ideas for the existing process, and conduct on-site discussions between students and teachers to explore the rationality, feasibility and implementation conditions of the ideas. Discussions are held on site between students and teachers to explore the rationality, feasibility, and implementation conditions of the ideas, and to develop the habit of thinking and solving problems by applying engineering thinking, so as to turn the cultivation of innovative spirit by teachers into the students' conscious actions and gradually develop the habit of applying engineering thinking to realise "Quality Improvement".

3.3 Post-Course Intensive Skills Progression

Using the Sheet Metal Spraying Training Centre and on-campus social service factories that are open around the clock, combined with the learning effect in the class, teachers set up extension tasks at different levels to strengthen the skills in the class and enhance the advanced skills, and students upload videos of the operation process of the workpieces and real vehicles and pictures of the effect of the works to obtain the lighting of the skills tree at different levels, so as to create a visual business card of the students' skills achievements[6]. "Verification and Optimisation of Innovation", for each group's solution to the problem, select mature cases at the theoretical level, and carry out tests to verify and optimise the process after class. Let the spirit of innovation into action, so that the "quality improvement" can be realised.

4 Conclusions

Through the reconstruction of teaching content, each learning task link is closely articulated, full of tasks, evaluation of multi-dimensional precision, so that the stability of students' learning status is high. Through the reform of teaching means, so that the students' knowledge goals, ability goals, quality goals have achieved the expected results, teaching difficulties to break through and solve the experimental works of the final effect of uploading the platform to verify that all the standards are met, lighting up the fruits of the skills tree of this module. Realised the theoretical depth of inquiry from passive to active, the practical effect are up to the enterprise standard, partially exceeding the standard, the application of engineering thinking problem-solving ability has been enhanced.

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