

# Exploration on the Teaching Reform of Automobile Parts Design Course in Higher Vocational Colleges Based on the Double Line Mixed Teaching

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**Abstract:** In recent years, with the continuous promotion of information based teaching, the theory and practice of double line mixed teaching have also been further developed. Because of its comprehensive knowledge, difficult parameter design and selection, and high requirements for software operation skills, auto parts design often becomes a learning difficulty for college auto majors. Based on the online and offline mixed teaching, integrate the post course competition certificate, strengthen the students' professional quality and professional ethics awareness, establish correct values and engineering ideas, fully use virtual simulation technology, high-quality online courses, professional teaching videos and loose leaf workbooks, and deeply understand the design requirements of related products from all dimensions. Analyzes the characteristics of double line mixed teaching and explores the implementation of teaching, so as to provide reference for the teaching reform of related courses in colleges and universities.

**Keywords:** Double Line Mixed Teaching, Higher Vocational Colleges, Automobile Parts Design, Teaching Reform.

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## 1. Background

In the context of the epidemic situation, the application of information technology in teaching has developed rapidly, enabling offline teaching of traditional professional courses with technology, and providing technical support for the transformation and innovation of current professional courses with the technological advantages of modern science and technology. To promote the innovative transformation of traditional professional curriculum teaching from content to form, and to build a mixed online and offline teaching model of professional curriculum in higher vocational colleges has become the content that must be carefully studied to improve professional curriculum teaching. The integrated online and offline teaching reform is the core of the deep integration of information technology and education.[1-2] The rapid development of the "Internet+" teaching model and the continuation of the novel coronavirus pneumonia epidemic have made the online and offline mixed teaching model of colleges and universities an inevitable trend.[3-4] After the emergence of the COVID-19, mankind will fully enter the era of "double line teaching", and deeply enter the new era of "mixed coexistence of online teaching and offline teaching", that is, "double line mixed teaching"[5]. At the same time, there are three characteristics of "double line teaching", "double line mixed", and "double line symbiosis".

For the majors of higher vocational colleges, based on the professional construction concept of "what talents the enterprise needs, we will run these majors" and "what skills the employees need, we will offer these courses". Focus on the core skills of the posts facing the major, and set the professional core courses. Most of the core skills courses need to have some practical links to strengthen skills mastery. However, the traditional offline teaching mode is easily affected by the epidemic situation, and intermittent teaching arrangements are difficult to complete systematic teaching. Taking the automobile and motorcycle parts manufacturing major as an example, the course of computer aided design of

automobile parts takes automobile parts as the carrier, integrates automobile fundamentals, 3D modeling, engineering drawing, and processing and manufacturing, and covers the key knowledge and skills such as structural foundation, modeling methods, and drawing skills of automobile parts design and manufacturing posts. The mastery of relevant technical skills requires a lot of practical operation guidance. During the epidemic period, it is difficult to carry out the teaching in an orderly way in the online and offline teaching order, especially the need to plan a double line mixed teaching reform. At the same time, with the promotion of the construction of a skilled society in which the country attaches importance to skills, society advocates skills, everyone learns skills, and everyone has skills [6-7], the new era has given vocational education new tasks. Professional courses should also take into account the social service function, provide online self-study resources for people who are interested in improving their vocational qualification skills, open up the vocational qualification learning path, and contribute to the construction of a skilled society.

## 2. Double Line Teaching of Professional Course

At present, it is often mentioned that in the "three education reform" (teachers, textbooks and teaching methods) [8], "double teacher" focuses on the "double teacher" classroom reform of teachers, and double line teaching focuses on the reform of teaching methods and textbooks. Double line can be a mixture of online teaching and offline teaching, a mixture of physical teaching aids and virtual simulation resources, or a mixture of traditional textbooks and loose leaf textbooks.

In the aspect of teaching mode mix, based on the concept of post course competition and certificate integration, project courses are conducted for the teaching contents of professional courses, and online courses are built. Online courses are built on the Superstar platform, covering theoretical explanation, software practice, guidance for key

assignments, curriculum ideological and political sharing, professional standard library links, etc., and providing sufficient online teaching resources for students' online learning. Taking the course of automobile parts CAD as an example, the teaching team of schools and enterprises implements multiple rounds of teaching practice polishing based on the existing automobile parts products in combination with the actual technical skill needs of the post. The teaching contents are summarized as 15 projects such as overview of computer-aided design of automobile parts and components, computer-aided design of connecting rod components, and 38 subtasks such as piston modeling and clutch modeling. With the reorganization of the teaching content, the project of the teaching content is realized, which lays the foundation for the double line mixed teaching. In offline teaching, when encountering personalized teaching problems, the corresponding teaching practice guidance videos are pushed to accurately break through the teaching difficulties. When reviewing the relevant teaching content after class, students can reproduce the key practical steps according to the online teaching resources to strengthen the mastery of teaching practice.

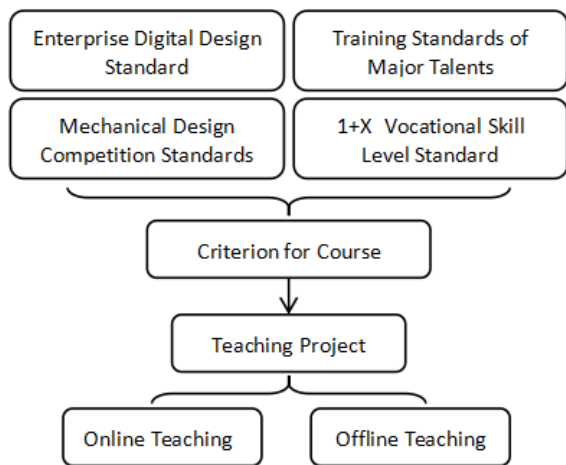


Figure 1. Reorganization of Double Line Teaching Content of Professional Course

### 3. Double Line Mixed of Professional Course

Most of the existing double line teaching, namely "online teaching" and "offline teaching", are separated from in class teaching and extracurricular teaching, that is, teachers' in class teaching and online extracurricular self-study go their own ways without integration. The core of double line mixed teaching is online and offline resource exchange, and interaction inside and outside the class. Specifically, it is necessary to achieve self-study and self-test before class, break through core difficulties in class and refinement and improvement after class in classroom teaching.

Taking the teaching of transmission gear drawing in the course of automobile parts CAD as an example, the students completed the basic knowledge of transmission on Superstar before the class, mastered the basic knowledge and skills of the project, and completed the online self-test. According to the new requirements of the digital design of the standard enterprise and the requirements of the 1+X professional skill grade standard, combined with everyone's self-test scoring and attendance analysis, determine the students who need to

be focused on in this class, and arrange mutual assistance within the group leader. It is clear that everyone is confused about the knowledge and practical difficulties in this section. Many students will not correctly select the roughness of different positions of gears and modify the details of engineering drawings, and design targeted classroom tasks.

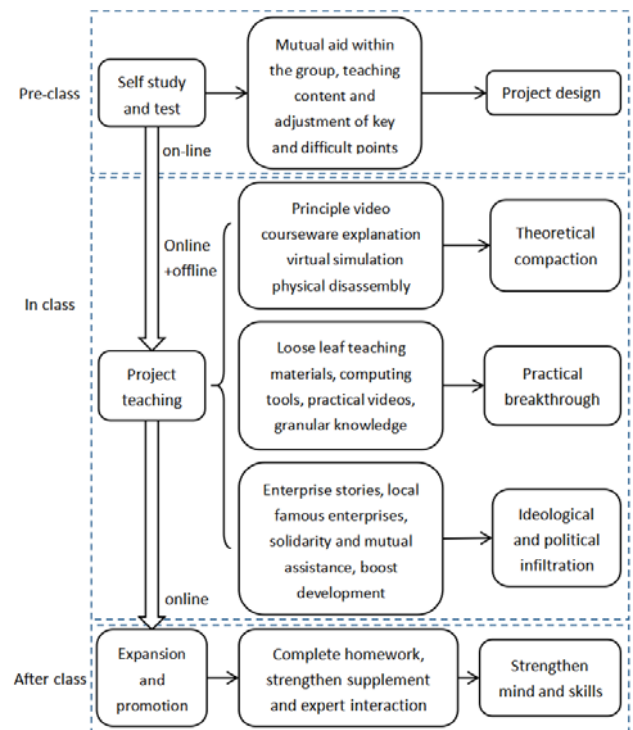


Figure 2. Basic Logic of Double Line Mixed of Professional Course

When carrying on the classroom induction, by the introduction of the actual work of the automobile parts design post in the enterprise and the integration of posts and courses, the core classroom tasks of completing the modification and marking of the transmission gear graphics were introduced to enhance the students' interest in learning. Watch the recorded principle video, analyze and explain the courseware, observe the virtual simulation model, disassemble and assemble the physical teaching aids, show the cooperation between the transmission gear and the surrounding parts in multiple dimensions, analyze and deduce its use requirements, break through the students' knowledge confusion, and solve the problems that the theory does not understand. When the practical operation is advanced, the loose leaf manual for the operation process guidance jointly compiled by schools and enterprises will be issued to clarify the classroom practice tasks. Use the electronic document modified based on the mechanical design manual to calculate the standard parameters of helical gears. Guide students to find and select reasonable technical requirements for each position based on the relevant matching of transmission gears. During the exercise, record the problems encountered by everyone, timely supplement granular knowledge, and accurately break through personalized practical problems. Effectively resolve teaching difficulties, make practical operation reasonable, reliable and reliable, and solve the problem of not proficient in practical operation. At the same time, when consolidating the theory, we should integrate the stories of famous enterprises' listing, encourage students to strive actively,

strive for excellence, and establish lofty aspirations. In the task practice, introduce the well-known local drive enterprises, guide everyone to unite and help each other, overcome the fear of difficulties, and help regional industrial development. After class, push the homework of "Learning Pass" to strengthen students' skill mastery. After the teacher's evaluation, organize mutual assistance within the group to check and fill gaps. Organize enterprise experts to conduct online interaction, show the development trend of the industry, and encourage students to cultivate their hearts and skills.

After the implementation of double line mixed teaching of professional courses, the average student spends more than 650 minutes online learning in a semester, has a good grasp of the basic structure and working principle of typical auto parts, and has significantly improved the efficiency and accuracy of using professional software such as SolidWorks, AutoCAD to complete design tasks, as well as the mastery of skills.

#### 4. Double Line Symbiosis of Professional Course

When the double line teaching breaks through the relationship between the time axis and turns into synchrony, the online teaching and offline teaching of professional courses will present a state of coexistence and integration, that is, in the whole teaching cycle, online and offline teaching will become a state of symbiotic development. Specifically, it can be understood as pre-class online learning, which can guide teachers to revise the teaching content, teaching methods, and teaching difficulties, and guide students to organize pre-class mutual aid activities. In the course of teaching tasks, real-time evaluation and interaction can be carried out through online information means to grasp learning dynamics, judge students' knowledge and skills and accurately provide granular knowledge supplement. After class online interaction, break the gap between time and space, introduce enterprise experts to guide and expand classic cases, extend the teaching classroom outside the school, establish a time-space teaching space, take students as the main body, and realize the harmonious coexistence of online and offline teaching.

#### 5. Conclusion

(1) Double line mixed teaching is a new thing with the rapid development of information teaching at present, and also an important teaching mode to realize the construction of a skilled society under the background of epidemic situation.

(2) The remarkable characteristics of double line mixed teaching model are double line teaching, double line mixed and double line symbiosis. Through the reform of teachers, textbooks and teaching methods, the effective

implementation of double line mixed teaching is guaranteed.

(3) In the exploration of the implementation of double line mixed teaching, based on the fully developed post course match certificate integration curriculum, we firmly grasp the pre-class learning analysis, in class task implementation and evaluation supplement, and after class extension and expansion, and the final form is to achieve the harmonious coexistence of online and offline teaching.

#### Acknowledgment

This work is supported by the Zhejiang Provincial Curriculum Ideological and Political Demonstration Course: Computer Aided Design of Auto Parts (ZJH [2021] No.47) and the Curriculum Ideological and Political Studio Project of Wenzhou Polytechnic(WZYSZGZS202106).

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