

Research on the Teaching Model of Engineering Practice Innovation Project (EPIP)

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Abstract. Engineering Practice Innovation Project (EPIP) is a teaching mode guided by practical engineering projects, guided by practical application, aimed at cultivating innovative ability and guided by project practice. Its purpose is to enhance students' practical ability and cultivate students' innovative spirit and ability. As a practical platform of EPIP, "Luban Workshop" is of great significance for China's education to go abroad and share with the world. In order to implement the education mode of EPIP for engineering practice better, it is proposed to reform personnel training mode, expand personnel training form, improve hardware facilities and enhance the quality of teaching staff, so as to train high-quality talents and serve the development of "The Belt and Road Initiative".

Introduction

EPIP is the abbreviation of the initials of four words: Engineering, Practice, Innovation and Project. Looking back at the logical path of engineering technology innovation, people mostly learn from previous engineering projects, then carry out engineering practice, observe and find problems in practice, and finally tackle engineering practice problems with innovative skills. Engineering Practice Innovation Project (EPIP) came into being as the times require. In March 2016, EPIP engineering practice innovation project, as an outstanding vocational education concept and the core educational concept of "Luban Workshop", is shared between China and the world with the development of the "Belt and Road" policy. The establishment of EPIP International Education Alliance in May 2017 is a new leap, a new starting point and a new development since the implementation of EPIP Engineering Practice Innovation Project. It will play a leading and promoting role in the flourishing development EPIP Engineering Practice Innovation Project.

The Target of EPIP. With students' independent inquiry and hands-on manufacturing as the core, students' scientific inquiry ability and problem-solving ability is trained. Students' design ability, cooperation ability, practical ability, problem-solving ability and innovation ability are emphasized on the basis of mastery. Students are encouraged to have creative thinking, critical thinking and practical spirit, and stimulate the enthusiasm of innovation. Only by cultivating the willingness and ability of lifelong learning can we adapt to future changes and constantly enrich our ability structure to form the ability to solve all problems systematically.

The Connotation of EPIP. Guided by actual projects. Practice-oriented. Aiming at training of Innovative ability. Directed by project practice.

Characteristics of EPIP. The eight characteristics of EPIP are to create happy all-round development. It is shown in Figure 1.

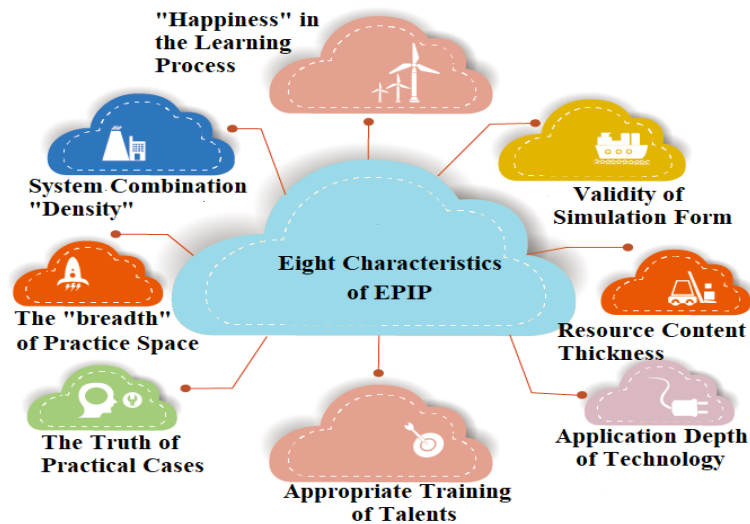


Fig. 1 Happy all-round development

EPIP is the Product Which is Adapting to the New Situation. The main factors of the new situation are as follows: Internet technology makes people communicate fully with each other, Internet of Things technology closes the distance between people and things, artificial intelligence technology gives machine wisdom, and intelligent manufacturing industry 4.0 enables people to manufacture sophisticated equipment faster and better. Talents are indispensable to the research and application of these technologies. Talents need to have a variety of qualifications. This kind of talent training needs to adopt EPIP training mode.

To Cultivate Scientific Inquiry Ability and Problem-solving Ability. Find problems, analyze problems, solve problems and summarize problems. In the way of learning, students should explore independently, that is, students must complete their tasks through a series of exploratory practical activities, and in the process of learning, they need to carry out a lot of cooperation and communications with classmates, parents, community personnel, experts in certain fields, and so on. That is to say, the study of technology and engineering should be "learning by doing" in real or virtual situations. It is an exploratory activity with both hands and brain, including high-level thinking activities of problem solving and practical application of technology and engineering.

In-class Teaching and Extracurricular Activities Complement Each Other. Give full play to their advantages. Strengthen the cultivation of technical and engineering literacy in informal environment.

Development of Engineering Practice Innovation Project (EPIP)

In 2010, Professor Lv of Tianjin, China, launched the EPIP project. From 2012 to 2013, two seminars on engineering practice innovation projects were held in Shanghai. From 2012 to 2014, EPIP International Challenge Competition has been held for three consecutive years. Six consecutive EPIP International Forums were held from 2012 to 2017. From 2014 to 2017, four consecutive Tianjin Higher Vocational College Students Skills Competition "Practical Innovation of Mechanical and Electrical Technology Engineering" competitions were held. In March 2016, the "Luban Workshop" project, a practical platform for the educational concept of EPIP project practice and innovation, enabled China's vocational education to go out and share with the world. Since the implementation of the EPIP project, the EPIP International Education Alliance established in May 2017 has become a new leap, a new starting point and a new development. It will play a leading role in the vigorous development of engineering practice innovation projects.

The practice platform of EPIP teaching mode "Lu Ban Workshop", as an outstanding teaching idea, it has gone abroad and shared its ideas with the world. Since 2016, Tianjin has built 7 "Luban

workshops" in the countries along the "belt and road". It has carried out EPIP teacher training for Chinese and foreign teachers. After the training, the students produced "EPIP robot" to show the teaching results in the form of competition, and exercised the students' hands-on practice ability, which was well received by both domestic and foreign teachers and students.

Suggestions on Implementing Engineering Practice Innovation Project (EPIP) Teaching Model

Reforming the Training Model of Talents. Talent training mode is the concretization of educational thought. In ordinary colleges and universities, the talent training mode is manifested as the "university idea", which makes the talents trained in Colleges and universities pay more attention to theoretical knowledge learning, but lack of practicality, creativity and innovation, and cannot catch up with social development. In higher vocational colleges, the mode of talent cultivation has gradually changed to "production, study and research", "order-based", "employment-oriented" and "double certificate system". Although students are the main body and pay attention to cultivating students' practical ability, there are still some shortcomings, such as inadequate service for regional economic development, inaccurate orientation of talent cultivation and so on. Nowadays, the emerging specialties of artificial intelligence, data science and big data technology need high-quality talents who combine theory with practice. Therefore, only by reforming the personnel training mode and paying attention to the EPIP teaching mode can we cultivate high-quality and all-round talents.

Expanding the Form of Talents Training. EPIP teaching mode can be applied not only to general education, but also to adult education, training of new employees, education of the third age (retirement period) and so on. Not only can they receive long-term education, but also short-term training. It can meet the needs of different time periods and different industries, and can also cultivate interest and hobbies. EPIP teaching mode has been widely used in various fields.

Improving Hardware Facilities: Building an Open EPIP Training Room. On the basis of mastering theoretical knowledge, engineering practice innovation projects focus on students' practical ability, cultivating the ability to discover, analyze and solve problems. Therefore, hardware facilities are particularly important. It is necessary to build an EPIP training room, which is open to teachers and students, to provide more convenient practice platform for teachers and students.

Necessity. First, expand the knowledge coverage of traditional engineering training content. Traditional engineering training has a great influence on students' comprehensive quality, especially on engineering quality. There are not many related knowledge points for electronic information technology, computer technology and other professional courses, but the knowledge structure of engineering quality is more diversified. In order to cultivate students' engineering quality in an all-round way, it is necessary to introduce a teaching platform which integrates all aspects of mechanics, electricity and control, and can even be broadened. Knowledge coverage will expand the scope of the project.

Secondly, we should pay more attention to students' multiple intelligences. Gardner's theory of multiple intelligences fully affirms the diversity of human intelligence. The basic characteristic of intelligence is the combination of a group of abilities. Various abilities do not exist in the form of integration, but in a relatively independent form. Each ability can be strengthened through different ways. Engineering practice teaching conforms to the overall goal of comprehensive quality cultivation. It can be strengthened in logical intelligence, language intelligence and other aspects. Students of different majors and personalities complete a practical project in a team form, so that more aspects of intelligence can be exercised.

Finally, the integration of traditional engineering training courses and professional basic courses should be deepened. The aim of innovative curriculum is to cultivate students' comprehensive

quality, strengthen their ability to solve practical problems by using their knowledge comprehensively. The content of innovative curriculum covers the basic knowledge of many professional courses, and enlarge students' knowledge.

Feasibility. The construction of open EPIP training room is not to build a completely different training room, it is to improve on the basis of the original training room. The curriculum is based on the professional setting outline of the Ministry of Education. Different schools can build their own training rooms according to their own school's professional setting, and condense the integrated knowledge of multiple professional courses into the project, from functional requirements to details. The design is completed by the students themselves. Each project has different aspects of knowledge training, students of different majors and grades can choose to complete different projects according to their needs. Engineering practice innovation project is to improve and enhance the traditional curriculum. The teaching form, teaching content, evaluation system and other aspects adopt the same way as the training objectives of engineering practice innovation project, rather than the teachers who have to be trained by professional innovation curriculum to teach. To sum up, it is feasible to build EPIP training room.

Value. First of all, in terms of curriculum design. The teaching content of engineering practice innovation course adopts the project-oriented mode. Each project contains different knowledge points and training. In the process of realizing a project, learning, understanding and using the knowledge points involved can solve practical problems. The evaluation of the course also adopts a process-oriented rather than a result-oriented approach.

Secondly, the way of teaching. Every three students form an engineering team and cooperate to complete each project. Teachers only explain relevant knowledge points. Teachers participate as "mentors" in the course to help students analyze problems rather than solve them. They demonstrate, analyze and discuss with you to fully mobilize students' enthusiasm and participation.

Finally, the evaluation system. Each student has its own "project experiment report" to record the implementation process of each project, including the detailed process of finding, analyzing and solving problems, and observe the growth of each student through the "project experiment report".

Strengthen the Construction of Teachers. Engineering practice innovation project covers a wide range of knowledge, so the requirements for teachers are relatively high. Teachers must keep up with the times in teaching content. It is suggested that teaching content should be set up from basic disciplines, engineering disciplines (machinery, electricity, etc.), general education (humanities, economy, management, etc.). In addition, teachers show the teaching results of engineering projects in time, share new knowledge and technology in time, broaden students' knowledge, stimulate students' desire for exploration and knowledge, and improve students' innovative ability. In view of this, it is suggested to organize regular training for teachers of relevant professional courses, share teaching experience among teachers of different majors and teachers of brotherly colleges, find out problems existing in the implementation of engineering practice innovation projects in time, and put forward feasible solutions.

Promoting Learning by Competition and Teaching by Competition. The cultivation of high-quality talents requires people to change their traditional educational concepts, and the development of project teaching mode of engineering practice innovation has greatly changed the original teaching mode. In order to meet the needs of the development of the new era, students' learning is not only confined to the classroom, but also to the professional courses. The motivation of the second classroom subject competition outside the classroom will stimulate students' interest in learning, improve students' learning ability, and thus improve students' initiative in learning in the classroom. Students will have more specific skills needs in the competition, and will be more active in the classroom, so that classroom teaching will be more vivid. In the process of guiding students to compete, teachers' knowledge literacy will be improved. Through the three-dimensional, fruitful and diversified teaching inside and outside the classroom, students' interest in classroom learning can also be enhanced, so as to promote classroom teaching and improve the effect of

classroom teaching. In addition, reward mechanism should be implemented for participating instructors and students, such as teachers' performance appraisal plus points, students' grade evaluation, scholarship, etc.

Conclusion

Engineering Practice Innovation Projects (EPIP) are constantly transforming our learning from the aspects of professional knowledge, curriculum outline, knowledge and ability. This teaching mode enables us to discover problems from the real world and real life, take engineering as the command, practicalize teaching, activate traditional classroom, pay attention to process, stimulate students' interest in learning, and play an important role in the process of education and teaching.

References

- [1] Jingquan Lv, Xiaohua Tang, and Yanxia Shi, Research and Practice of Engineering Practice Innovation Project (EPIP) Teaching Model, Vocational and Technical Education in China, 2017(05)
- [2] Minjuan Zhao, Minchan Zhao, and Shaolin Su, Application and Development of Information-based Teaching in Higher Vocational Education, Shanxi Education (Higher Education), 2015(8).
- [3] Jingquan Lv, and Xufeng Fei, Engineering Practice Innovation Project Course, China Railway Press, 2012.
- [4] Xu Wen, Preliminary Study on VBSE "Luban Workshop" Model Based on Engineering Practice Innovation Project, Journal of Tianjin Vocational College, 2016(10).