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Effects of Student-centered Philosophy on Teaching Resources and Teaching Methods in Vocational Education in Singapore

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Abstract: *The development of vocational education in Singapore has always been at the world-leading level. The overall characteristics of vocational education in Singapore include respecting students' interests and personality development and serving students' learning needs. The educators also focus on improving students' learning efficiency and skill, as well as cultivating diversified and compound talents. With years of joint efforts from government, educators and colleges, Singapore's vocational education, represented by five Polytechnics, has made great achievements and set a good example in the field of application and practice of the advanced philosophy and teaching methods. Guided by the student-centred teaching philosophy, Singapore vocational education provides a wealth of student-centered teaching resources, as well as innovates and develops many scientific and advanced teaching methods, including flipped classroom, CDIO teaching method, design thinking, information-based teaching method and small group teaching. And both teaching resources and teaching methods have played an effective and significant role in vocational education. This paper primarily focuses on development and application of student-centered philosophy in the field of teaching resources and teaching methods in Singapore. It also provides good teaching experience and rich teaching ideas for the development of vocational education in the other countries.*

Keywords: *Student-centered; Flipping classroom; CDIO; Design thinking; Small group learning; Vocational education*

1. Introduction

With the establishment of Singapore's first Polytechnic in 1954, Singapore's vocational education has entered the track of formal development. After years of development, it has created a series of advanced teaching concepts and methods, based on the vocational education model of Switzerland and Germany, which have been widely and actively applied in classroom teaching. It has also achieved good results, and transported a large number of talents for enterprises. According to the IMD World Competitiveness Ranking in 2021[1], Singapore ranks second in the world, among which the indicators of technology, vocational skills and global knowledge and skills rank fourth and third in the world, which has the close relationship with the excellent development of vocational education in Singapore.

2. Analysis of students in Singapore vocational education

Before entering five Polytechnics, students have to receive six years of primary study, and then enter the secondary school for four to five years, depending on path taken. After that, they usually pass the O-level test and enter the Polytechnics according to their grades, for the students aged for 16-19 years[2]. So they are young and active. Besides, due to the influence of multiculturalism, students are more lively and like to highlight their own personality. These students have strong practical and hand-on ability. Finally, after graduation, students will choose to continue to study in the university, so their learning purpose is clear, their learning attitude is correct, and they can take each course seriously, for the results of these courses are related to whether they can enter the ideal university to continue their study.

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3. Student-centered teaching philosophy

The success of vocational education is closely related to the advanced and scientific teaching philosophies, among which the most widely recognized and promoted teaching philosophy in Singapore vocational education is the student-centered teaching concept. This teaching concept focuses on the development of students' personality, the cultivation of self-learning ability and the embodiment of learning effect. It is found that students take an active role in the learning process rather than being passive recipients of information from teachers[3]. Research also shows that student-centered classrooms increase in students' higher logical thinking, learning, and motivation[4]. Teach Less, learn More (TLLM) philosophy expounded by Singapore's Prime Minister, Lee Hsien Loong[5] can be seen as an impetus for educators to better their pedagogy and innovate their lessons for a richer and more fulfilling classroom experience. It also further established the dominant position of the students in the teaching process. Therefore, according to the advantages of student-centered philosophy, this teaching concept, as one of the biggest features of vocational education in Singapore, has a positive and significant impact on educational resources and teaching methods (see Figure 1).

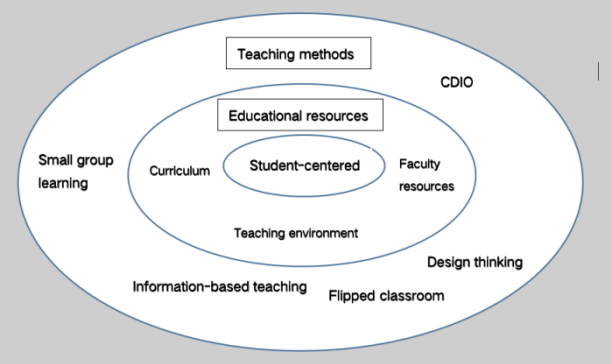

Figure 1: Effects of student-centered philosophy on educational resources and teaching methods

3.1 Educational resources

Teaching resources are materials and other conditions that can be used for the effective development of teaching, including the faculty, money, materials, information, etc. that can support and serve teaching. In this paper, three representative teaching resources will be explained in detail below, which embody the characteristics of being student-centered and provide sufficient teaching guarantee for students' learning.

3.2 Curriculum

Polytechnics in Singapore provide a series of scientific, professional and up-to-date theoretical and practical courses, which fully respect students' interests and personality development, and explore students' potential. For example, the Business School students study on the basis of compulsory and elective courses, including economics, business accounting, business skills, marketing, and business negotiation skills, etc. Meanwhile with the rapid development of digital economy, the curriculum has been appropriately adjusted to meet the students' requirement for the job market, so Polytechnics attach great importance to students' mastery of information technology, and have set up basic courses including artificial intelligence application (AI), robot process automation (RPA), programming and data analysis. The curriculum emphasizes the integration of business and computer-aided application, reflecting the trend of artificial intelligence in the future development of business. Therefore, the school provides a wide range of curriculum to help students acquire skills that can quickly meet market demand, and these skills are always at the forefront of market development.

At the same time, students can also participate in the study of elective courses according to their own interests. For another example, if business students are more interested in mechanical design, they can choose the elective course of mechanical design; Self-study can be carried out by means of video and teacher guidance, and corresponding machines can be reserved for operation; Students can also form an interest group with students if other majors to complete the project jointly. Students of different majors in the school can master how to use machine and equipment through simple training or teacher guidance, and can book the machine to use at any time. On the one hand, the multidisciplinary intersection and integration are conducive to helping students to learn their own major. On the other

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hand, it fully explores students' own potential, respects students' interests and hobbies and personality development.

3.3 Teaching environment

In terms of teaching environment, considering the characteristics of students' learning situation, the design style of each teaching building is distinctive and unique, and there is no unified design standard for the classroom, so that students can experience different teaching environments in different classes. Polytechnics also provide students with a variety of learning places. Students can choose the traditional learning places such as classrooms and libraries, as well as canteens, cafes, outdoor halls or corridors. These places can provide students with theoretical learning. For students who want to learn hands-on exercise, they can make an appointment to the maker's workshop in the school-run factory or library for manual operation practice. A good case in point is that school-run factories in Polytechnics give users the opportunity to learn, use and apply digital fabrication techniques in their projects using a variety of equipment. These factories enable students to make bookings for courses and equipment and also provide a shareable knowledge base where the students can read and post articles to further knowledge and experience in the Maker Arena. For students who have high requirements for the learning environment, they can book a private study room in the library for learning. For students who need group study and discussion, the school provides a small meeting room for group discussion, group meetings or brainstorming. In short, Polytechnics respect the various needs of students in learning places and meets the personalized learning needs and learning standards of different students.

3.4 Faculty resources

In terms of faculty resources, not only academic qualifications but working experience, ability and skill is the principle for the recruitment in Polytechnics. So the teachers are all the professionals with rich work qualifications and experience (generally more than 3-5 years of working experience). They are better at using their working experience to deal with the disconnection between theory and practice during the class, and use their work qualifications to provide students with internship opportunities, allowing students to complete real projects. More importantly, Polytechnics attach great importance to the professional development of teachers, and ensures that teachers maintain a high level of teaching quality and professional skills through a series of activities. Precisely, there is a complete set of teacher training mechanism, such as TPACK model, focusing on teachers' improvement on technological knowledge (TK), pedagogical knowledge(PK) and content knowledge(CK). And a certain proportion of teachers are regularly selected to go to higher education at home and abroad, further study, visiting program and special training to improve their academic and teaching performance and also participate in the projects from the enterprise, or carry out some technical services to improve their comprehensive skills. At the same time, in order to ensure that each student can receive the attention of teachers in the classroom, Polytechnics have been implementing small class teaching, and each teacher only teaches 1-2 related courses per semester to ensure the quality of teaching.

3.5 Advanced and innovative teaching methods

The advanced teaching methods of Singapore vocational education are not limited to a specific method or concept, but design creative and effective learning experience for students. Therefore, a series of innovative teaching methods have been promoted and applied in Polytechnics and have achieved good results. These teaching methods are closely centered on the student-centered teaching concept, and continue to innovate and develop on this basis. For example, the information-based teaching method, small group learning, flipped classroom, design thinking and CDIO are all based on the student-centered pedagogy. This teaching concept plays a significant role and runs through the whole development process of vocational education in Singapore. It is the core of the development of the educational methods.

3.5.1 Information-based teaching method

The information-based teaching method in Singapore makes full use of multi-sensory learning methods, animation video, blended teaching and RPA + AI mode to improve students' classroom participation and learning effect, and continuously improve the application of information technology in the classroom.

By stimulating students' multi-sensory and creating good teaching situations, the multi-sensory

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teaching method can effectively mobilize students' multi-senses, contribute to the multi-sensory experience, absorb the process of knowledge learning, and deepen learners' memory and understanding of knowledge. According to the theory of modern learning science, the essence of learning is to establish connections between information. Multi-sensory stimulation can effectively activate neural cell information, so as to promote knowledge connection[6]. Research shows that the human brain has evolved to develop, learn and operate optimally in multi-sensory environments and training protocols that employ uni-sensory stimulus regimes do not engage multi-sensory learning mechanisms so multi-sensory training protocols can better approximate natural settings and are more effective for learning[7]. Therefore, in the classroom, students can master the teaching content by listening to and watching teachers' electronic teaching plans and video clips. They can also stimulate students' senses and improve students' participation and learning effect through teachers' teaching and guidance, independent self-study, hands-on operation, work display, group discussion, summary report, presentation and other forms.

The teaching method of animation video is that students learn and interact by watching animation or video. Animation and video can effectively stimulate students' senses, sparks students' interest and participation in learning. Therefore, in Polytechnics, all teachers adopt the form of electronic teaching materials or electronic handouts. The electronic materials are often mainly pictures, videos and animation, without a large number of words and theoretical content. The colorful picture animation is used to stimulate students' senses, and the simple and humorous animation plot is used to show the knowledge points of the course to attract students' interest. They are rich in content and diverse in forms, and can be adjusted in time according to market changes or information development. They can also adjust the content distribution according to teaching design. Students can read electronic teaching materials through computers or mobile phones anytime and anywhere. So electronic teaching materials are very in line with the characteristics of students and the requirements of the information society. Students are easy to accept and learn as well as improve their learning efficiency.

Blended learning systems combine face-to-face instruction with computer-mediated instruction[8] and it is the thoughtful integration of classroom face-to face learning experiences with online learning experiences[9]. Thus, blended learning is an organic combination of offline learning and online learning. It makes full use of the advantages of online teaching and offline teaching, adopts different teaching methods according to different teaching contents. In the online part, teachers mainly explain the theoretical content before class in combination with the flipped classroom. The students do the individual study before class by teachers uploading review materials or recording classes to cultivate students' self-study ability; During offline teaching, teachers mainly focus on tutorial, practice and guidance. They will also let students enter the cloud classroom to facilitate students review and review of the class content after class. Blended teaching makes teachers' teaching methods more diverse.

At the same time, Polytechnics pay close attention to the development trend and dynamics of information and communication technology (ICT). In addition to paying attention to the interaction between teachers and students, students and students, it also increases the interaction between teachers and students utilizing informatization. Robotic Process Automation (RPA) is robot process automation, which takes robots as virtual labor force, interacts with existing user systems and interfaces according to preset procedures and completes expected tasks. Artificial Intelligence (AI) is a machine that responds in a similar way to human intelligence. RPA simulates human behavior and endows AI with strong executive power; AI simulates the human brain and endows RPA with strong cognitive ability. Therefore, in addition to offering relevant courses, the learning methods of RPA + AI mode and VR + AR mode are widely used in Singapore Polytechnic. Precisely, RPA + AI forms the ability of intelligent automation. RPA + AI mode is widely used in business courses. In the classroom, teachers guide students to use RPA, implement automatic office process, simplify some repetitive work. Furthermore, they improve work efficiency, let students experience the advantages and automatic operation performance of RPA through the comparison between traditional methods and RPA methods. This intrigues students' interest; Experience AI operation and simulate some simple human behaviors through the extended functions of websites such as Google, so as to realize the interaction with students. In some science and engineering disciplines, teachers also use Augmented Reality (AR), Virtual Reality (VR) and other simulation technologies in teaching to simulate the real working environment, so that students can experience the "immersive" working state in learning and operation, and make teaching more combined with work practice, Let students adapt to the future job needs faster and better. Therefore, this human-computer interaction mode is widely used in various disciplines. It improves students' interest in learning information means and increases the interest of the classroom; Meanwhile students gradually realize that the application scope and field of informatization will be more and more extensive in the future. Informatization is a skill that every student must master.

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3.5.2 Small group learning

Group learning is widely used in vocational education in Singapore, closely combined with flipped classroom and CDIO, which is an active learning method that is learner centered but instructor led[10]. It fosters individual and group accountability as groups of four to six students work together to solve problems. There are usually 20 to 30 students in a class and the teacher will divide them into small groups, which is the basic premise to carry out some projects or assignments.

The key problem of small group learning is how to divide students into groups. Some researchers divide students according to the characteristics of the individual member that would promote the team success and then distribute people with the qualities evenly between the teams[11] while some teachers will distribute students randomly. In the teaching process, it is found that the former view does not respect students choice and the latter one would lead to the group members with the similar quality such as primary knowledge and skills, learning attitudes and individuality.

However, through years of classroom practice, the teachers in Polytechnics summarized a set of grouping mode which is suitable for students' development. First the teacher will choose the group leader randomly who is elected and acted as the organizer and coordinator in the team and then the group leader can choose two team members. Second, the teacher will choose the other two team member based on their knowledge, skills, learning attitudes and individuality. In this way, the teachers respect the students' choice and try their best to make sure each team has a maximal diversity in the knowledge and experience and the team member can help and learn from each other. It also avoid that only the good students would like to do most of the job in the team because the team leader will distribute the jobs to every team member and everyone has the opportunity to finish the different part of the project. Finally all the group members will do the final presentation together that enable everyone in the team to participate in the project. In this distribution method, both teachers and students have half of the distribution rights, which is relatively fair and recognized by students. In addition, different groups are established for different courses, and members of different groups communicate and cooperate to complete tasks together, which promotes the communication among students and cultivates students' teamwork spirit. Therefore, every students' participating in the task is the key to the success of classroom teaching and it is also the basis and premise for the flipped classroom and CDIO, which fully reflects the student-centered teaching concept.

3.5.3 Flipped classroom

Flipped classroom is a main way to promote students to actively participate in the classroom, dedicate themselves to the learning process and become participants in learning. It is a teaching method to turn over the acquisition and application of traditional classroom content, so that students can obtain necessary knowledge before class and guide students to actively participate in knowledge application in the classroom.It is defined that flipped classroom as an educational technique consists of two parts: interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom[12].

Polytechnics have accumulated a lot of teaching experience by more than ten years of application of flipped classroom teaching concept. The steps of flipping the course: the first step is to plan. The teacher plans to flip the course part and content of the classroom. The PPT or courseware carefully edited and made by teachers before class is uploaded to the Internet for students' self-study before class. The content of the courseware usually includes three parts: the first part is the introduction to the content of the course module, including the learning purpose and learning tasks, mainly by some pictures, videos and general words, and puts forward questions or tasks for students to learn the content of this module with questions or tasks; The second part is module related exercises to test students' self-study, or assign some tasks to students. Some can answer online, and some tasks are explained in offline teaching, which requires students to be fully prepared; The third part is feedback, students' understanding and satisfaction with this part of learning. Singapore teachers attach great importance to students' feedback and decide the content to be explained in the next class according to students' feedback. Teachers will focus on the points that students generally don't understand in the next class. Students' learning time in pre-class is generally about 1 hour. Students can log in to the school website for learning at any time and leave a message to the teacher. Some teachers will also choose the form of live teaching to explain relevant contents and theories on the school website. Therefore, students can learn through live teaching or watching playback.

Through classroom observation and the deep conversation with the teachers, it is found that most students will actively carry out self-study in pre-class because, for this part is used as part of the usual assessment, and teachers will carry out specific offline teaching and discussion according to students'

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learning before class. In addition, offline teaching in Singapore is taught in small classes, so teachers pay more attention to students. Students who do not study before class are difficult to keep up with the pace of the classroom in the offline teaching link, and cannot meet the requirements of teachers and other team members in the group discussion and task display link, which is easy to be excluded in the class activity. Therefore, most students will complete the part of pre-class learning according to the requirements of teachers

The first phase, plan is extremely important in the whole flipped classroom. Through self-study, students understand the module content and know what parts they don't understand. Students can take questions to participate in offline teaching. Students' studying enthusiasm and initiative will be cultivated by self-study in this part.

The second phase is to implement: lecture + tutorial. Class time in Singapore is generally 2-3 hours. In the first hour of class, the teacher will explain the problems in students' pre-class learning, sort out the points of the module in students' self-study before class, discuss with students, and learn the module content for the second time, so as to further deepen students' understanding of the learning content. For the remaining 1-2 hours in class, the teacher will do the tutorial by arranging group discussion or task review. This part mainly focuses on the problems left by the teacher and the tasks assigned before class. The teacher makes one-to-one group tutorial to solve the problems of each student. Through the repeated tutorial, students have the better understanding of knowledge application and expansion. The interaction between teachers and students increases the attraction of the classroom, improves students' participation in the classroom, and makes the classroom truly student-centered. At the same time, in order to increase students' interest in learning and students' enthusiasm to solve practical problems, the tasks or problems discussed in this part are basically the real tasks from enterprises and the real problems in work, so that students can fully immerse themselves in the real working environment and tasks in this part of the learning process, and improve students' working experience in the future.

In this part, teachers will correct the errors in the process of students' self-study, as well as the errors between the points and the actual work situation caused by a lack of working experience. The first error is that the teacher will make the students really understand the relevant knowledge points and guide the students to have the full knowledge of the content through repeated discussions with the students and teacher. The second error is that teachers make full advantages of their own working experience to solve the errors between knowledge and practical work. Therefore, it is particularly important for school students and lays a foundation for students' future work. It is also a key link of the combination of theory and practice.

The third phase is evaluation. After class, teachers can evaluate the effect of the flipped classroom by students' project or assignment. So it is also the third time to review the key point and apply it into practice. According to the students' after-class feedback, teachers can appropriately adjust the content of the next flipped classroom which is better for students' learning rhythm.

The use of flipped classrooms greatly improves the classroom efficiency and students' learning efficiency because students find problems through self-study, teachers solve problems in class, and teachers guide or assist students to complete learning tasks. This cultivates students' ability of self-learning, and makes students really become the masters of the classroom and fully integrate into the classroom environment. For teachers, their responsibility is to guide and promote the students' learning, not to impart the knowledge or lead the study in the classroom.

3.5.4 Design thinking (DT)

Design thinking is a human-centric process application, which is compatible with the skills of the 21st century, including innovation, creativity, problem-solving, critical thinking, communication and cooperation. Design thinking is transformed into action using a theoretical thinking structure[13]. The method of design thinking is a tool that can improve the ability of individuals to solve problems, evaluate the environment and create products. It can enable students to solve problems through a variety of application methods in a flexible and changing environment. It has been accepted as a comprehensive pedagogical framework that encourages students to gain 21st century skills and talents [14][15][16]. The aim of design thinking as a learning approach is to enable innovation through the combination of creative and analytical approaches[17]. At present, design thinking course is a basic compulsory course for students of Singapore Polytechnic. The college hopes that through design thinking, students can change their subjective thinking mode, effectively solve problems from a more extensive, in-depth, objective, innovative and practical perspective, improve students' ability to deal with and solve problems, innovate the method of combining creativity and thinking, and is a learning method that goes beyond the self-centered world outlook[18].

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Based on the original design thinking, some Polytechnics have continued to develop, innovate, and create a new design thinking framework with their own teaching feature (see Figure 2). It emphasizes the deep understanding of users' feelings through observation, research and other forms, and then data collection and analysis. The first step is to perceive the existence of the problem. The second step is to further understand the user's feelings through the existence of problems, such as what kind of products and services the user really needs. This step is completed through a lot of observation and research. Once the real needs of users are mastered, the team will enter the third step, brainstorm or put forward feasible suggestions to help users solve problems and design models. Then, through the user's feedback on the model, the suggestions are improved again to produce more new and innovative ideas. As a result, the team redesigned a more functional model for testing. Through continuous circulation and improvement, the best innovative model design and suggestions are finally obtained. As the original concept of design thinking, the new framework is not linear, but an iterative process. If the team finds that the understanding of the user's needs is not enough to put forward a feasible scheme, the second step will be repeated to deeply experience the user's feelings through observation or research till the user's real needs are mastered[19].

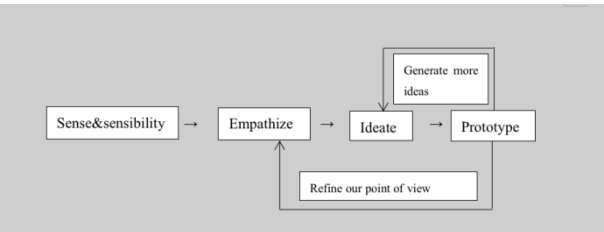

Figure 2: The new design thinking process

Design thinking has been widely used in and out of the class. For example, the newly renovated Library in one Polytechnic has applied the concept of design thinking in many internal designs, transforming the image of the library from a place that consumes resources to a place where works are produced. In the early stage of decoration, the library conducted a lot of research on students' learning needs, and summarized them. The team then selected the best design scheme through brainstorming discussion, and finally transformed the model design that is the most effective for students' learning and the highest students' satisfaction through repeated verification. The student discussion room in the library consists of tables, chairs and walls that can be painted at will, which is convenient for students to explore their ideas as much as possible and write their ideas at will. And the maker's workshop in the library provides a large number of mechanical equipment for students to operate, and regularly holds various technical seminars (such as 3D printing, 3D design, programming and video production). Other types of courses include extracurricular experience, training camps, technical lectures, emerging technology demonstrations and project consulting services for students. The resources provided include DIY toolkit, tools, books, videos and online platform to promote the sharing of resources and information. Fully explore students' interests and hobbies, meet students' practical needs, and become the second classroom for students to create works. These are the results of the application of design thinking. Now the library is the favorite place for students to study after class.

At the same time, design thinking is widely promoted as a compulsory course for freshmen in some Polytechnics, so that students can cultivate the scientific thinking concept and thinking method of design thinking at the beginning of admission. Consequently, they can use this thinking mode to find and solve problems, to improve the efficiency of solving problems, and to learn to analyze problems in depth, so as to put forward innovative solutions through repeated verification.

3.5.5 CDIO

CDIO is short for conceiving, designing, implementing and operating. Singapore vocational education began to apply the CDIO teaching concept as early as 2004. The CDIO teaching concept embodies the teaching concept of project teaching and learning by doing. It is a practical teaching model combining work task and learning[20]. CDIO-based learning also embodies the student-centered teaching concept, which integrates the method of active learning, and promotes students to cultivate project-based practical skills through students' active thinking and problem solving.

CDIO represents the four key stages in the most of engineering activities and students can master what is, how to do, what to become, how to grow and how to innovate[21]. Through the combination of CDIO and design thinking framework, students can conceive innovative engineering solutions based on real user needs. Its purpose is not only to impart necessary technical knowledge, but also to instill

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necessary skills and attitudes into students, including innovative spirit and problem-solving thinking set, so as to become lifelong learners.

Based on this CDIO teaching concept, some Polytechnics have continuously adjusted the CDIO process, CDIO standards, CDIO curriculum and the scope of disciplines applied by CDIO on the basis of projects and tasks. Taking the accounting major as an example, in the teaching process of CDIO, according to the requirements of project teaching, students complete the financial project of enterprise cooperation in the form of team. First, carry out the project conception, clarify the financial objectives and needs of the enterprise, what problems need to be solved, and finally clarify the financial needs of the enterprise through analysis and discussion; The second step is to design. Students study the problem under the guidance of teachers, use the knowledge they have learned to design the scheme, find out the feasible solution, select the optimal feasible solution, and carry out the scheme design and layout; The third step is to design and manufacture, clarify the financial design scheme, and find out the problems through the implementation of different schemes for inspection and correction; The fourth step is to practice the final scheme to meet the financial needs of the enterprise.

In the conception stage, teachers will motivate and guide students to find and solve problems in combination with professional training objectives, establish the confidence of "I can do well", reduce dependence on teachers, find information in many ways, and improve students' ability of independent thinking. In the design stage, the key technologies and solutions of the project need to be completed under the guidance of professional technicians or teachers. Some projects need team members with different professional backgrounds to discuss the design together, so as to produce innovative design concepts or solutions. At the same time, in order to ensure the implementation of the project, the scientific research center, the experimental site or relevant machinery and equipment are fully open to students to facilitate students' design and operation, so as to find out the best feasible scheme and conduct preliminary design of the project. In the implementation stage, if the scheme with good implementation effect is recognized by the enterprise, it can obtain a small amount of financial support from the enterprise, so that students can establish confidence in their learning ability and learning results, so as to better promote students' learning and stimulate students' interest in learning. In the operation stage, problems are found and corrected through previous implementation to make the scheme or design run smoothly. Team members summarize the whole project process, record the conception, design, implementation and other processes in detail, whether the expected objectives have been achieved, the problems have been solved, and write the project report.

CDIO fully cultivates students' ability to think and deal with problems independently, and effectively solves the problem of disconnection between theoretical teaching and practical teaching based on projects. Complete the task in the form of a team, and cultivate students' sense of teamwork and collaborative spirit. In particular, the cooperation among project members with different professional backgrounds promotes the integration of various disciplines, and lays a good foundation for students to enter the workplace in the future.

4. Conclusion

The development of vocational education is inseparable from advanced teaching philosophy and ideas for they improve the teaching quality and effectiveness and also enhance students' hands-on ability, self-learning ability, and cooperative ability, which are helpful for students to integrate into the working environment and adapt to their jobs. At the same time, these scientific and efficient teaching philosophy and methods save a lot of educational resources for the government but achieve the most ideal effect. Therefore, these advanced teaching concepts should always insist on meeting the requirement of students' learning characteristics, market needs and information needs, constantly improve the amount of information, students' thinking and training in the classroom, so that the students can act in their thinking and behavior in the classroom. Accordingly, teachers also stimulate students' learning interest and initiative, guide students to study independently, and enable students to learn how to learn, how to innovate, how to work, how to cooperate and how to survive. Therefore, just like the mission of Polytechnics, use the acquired service skills to improve lives and have a positive impact on society.

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