

Study on Teaching Methods of Technique Innovation in Secondary Vocational Schools

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Abstract

In order to adapt to the rapid development of science and technology and the social demand for innovative talents, the secondary vocational schools should establish the idea of students teaching reform, putting the students in a leading role in the independent innovation learning process, emphasizing and letting the students have a role to play in it. Secondary vocational schools should combine the independent learning with innovative education in the teaching activities, adopting a new mode of learning reformation and engineering innovation practice, both of which supplement each other to cultivate the students' interest and arouse the enthusiasm of the independent innovation learning. Schools also ought to reform teaching management mode and set up suitable management system of independent innovation learning.

Keywords: teaching methods, technique innovation, secondary vocational schools.

1. Introduction

Improving ability of self-dependent innovation and establishing innovative country is the core of Chinese development strategy and the key to improve national comprehensive power. It is essential to build environment of innovation, try hard to cultivate world-class scientists, scientific leading elite and front-line innovative talents, in order to dig out social innovative wisdom and various innovative talents^[1]. In order to carry out the guiding principle of the Seventeenth National Congress of the Communist Party of China, secondary vocational school should not only cultivate innovative talents, but also focus on knowledge innovation to make contributions to improvement of national self-dependent innovation ability. At present time, the ubiquitous phenomenon that colleges prefer to focus on textbook teaching, and the "storage theory" is popular in teaching process, which means teachers view the student's brain as a warehouse to storage knowledge, rely too much on textbook, all of which lead students to remember knowledge just for examinations. It turns "Study" of researching and thinking into "Read Book". When Australian scholar Paul Ramsden talked about good teaching abilities of vocational education, he pointed out that combining students' learning experience with teacher's researches contributed to a good education and study. Students are not allowed to evade understanding or forced to remember, but understand the world from different angles.^[2] In order to create innovative atmosphere, secondary vocational schools

should focus on autonomy and enthusiasm of “Study”, and facilitate the formation of students' innovative thoughts and ability. Teachers should be the guide of innovative talents, rather than just supporting them. Colleges should establish idea of educational reformation and focus on letting students to know “how to study”. The ability of “how to study” can be achieved from educational reformation and innovation, and it helps students grow into independent, autonomic, efficient learner and valuable technological innovative talents.

2. Combining Autonomous learning and the innovation education in teaching

2.1 Guiding freshmen do autonomous learning to change their view of learning

The Fundamental changes has been taken at the learning objective, the learning content and the learning methods from the common education to vocational education, such as, the learning objective transforming from further education to the employment, the learning content transforming from mathematics, physics and chemistry to professional knowledge and skills, and the learning method transforming from “teacher leading students” rather than “holding the students to run”. The first year in college is the key period to carry out students' entrance education and change their learning view. Optional courses like "learning to learn", "learning methodology" and "creative study" should be set up in this term to make students achieve the "four changes":(1) Changing the concept from the stage learning to the lifelong learning; (2) Changing the view from knowledge centered to ability centered; (3) Changing their learning style from passive learning to autonomous learning; (4) Changing from inherited study to creative study. After the military training, teachers should conduct comprehensive and systematic professional education of students. The concept includes the learning objective of profession and the quality requirement at “knowledge + ability + creativity”, course system setting and practice teaching preparation, school resources and teachers' quality, the employment status and future trends, etc.

2.2 Optimizing the classroom teaching mode, integrating independent innovation activities into the whole teaching process

Subjective initiative can stimulate students' learning enthusiasm. That is not only favorable to contribute to the interactions between teachers and students, students and students, but also to mobilize the teachers' and students' enthusiasm of the whole teaching. In the end, the goal of the combination of independent learning and training innovation ability can be achieved.

(1) In class, teachers should pay attention to the interactions between teachers and students, students and students, and actively create classroom scene to active teaching atmosphere. Meanwhile, based on inquiry learning, teachers should timely encourage students to express their views, assertive personality of students, and improve their oral expression ability and critical thinking ability. They also should actively guide and encourage students to think actively, put questions boldly and question teachers. For some controversial issues, teachers should consciously put forward different views to guide students to ponder before drawing a conclusion, which can cultivate students to get personalized learning methods. Multidimensional interaction, inspired induction and questioning is the only way to cultivate students' innovative quality. Autonomous learning is ground to listen, think, and ask questions in practice, which is an effective way to avoid superficial learning and to achieve "Teaching Reform" target behavior with the increase in students' burden. Zhenjiang Technician College explores the learning method which realizes the idea of heuristic, discussion, inquiry learning and summarizes from the concept to the problem, from the concept to the method, from the method to the ideas. It turns teaching the principle of professional

knowledge to the search process of putting forward the problem, analysis the reasons, making the plans and realizing the design to cultivate students' ability of analyzing and solving problems and to induce and stimulate their creative consciousness and creative thinking in the classroom teaching methods.^[3] For example, in the class of "Analog Electronic Technology", while we are discussing the basic amplifier structure and principle of the circuit, we can guide students to summarize the necessary conditions to BJT linear operation, so as to analysis or design specific basic amplifiers on the basis of the student has mastered the principle of basic bipolar transistor (BJT).

(2) Make class become the learning grounds of teachers and students to plan learning. Teachers should arrange thinking questions, summary questions and discussion questions in every professional course other than arranged exercises and ask students to ponder after the formation of ideas and to complete through using the panel discussions. In the class, teachers can also allow time for students to think, to understand clearly and to tease ideas. After class, teachers also need to allow time for students to develop learning content, making learning programs, and to exchange learning experiences and so on. At present, many students learn in a passive state, having poor conscious sense of participation in the class, not asking questions or issues raised not deep enough. To reverse this situation, in addition to the teachers to change teaching methods, students have to learn to use the time to learn with the intentions, change from "passive learning" to "active learning", "independent study" behavior. Students should divert their attention from rote to grasping knowledge framework and learning methods of each course, and autonomously choose reference books or magazines related to learning to supplement the lack of knowledge in the classroom and do timely self-learning, consider some questions and discuss with teachers and classmates.

(3) Arousing the students' rich imagination and innovation consciousness in experiment teaching. Based on finishing the experimental teaching plan, the experiment teachers could offer several questions which are over the education outline and easy to motivate students' interest and creative inspiration, and encourage them to choose the title by themselves, then open the laboratory to let the students design and do some experiment. The final score of experimental course is evaluated by their creative design.

(4) Giving leg ups, specialized training and "joint training" to the students who have bigger creative potential. Let them study and design with postgraduate students for promoting each other. The training time is selected in their spare time or holiday.

3. Adopting a new model of combining educational reform with engineering innovation

3.1 Opening innovation practice class to inspire students' creative thinking

In order to enhance the ability of innovation, Zhenjiang Technician College, as Zhenjiang public training base, build five major training centers, such as, mechanical and electrical engineering, mechanical engineering, electrical engineering, information engineering, building engineering. The number of large and medium-sized experimental training equipment sets is more than 2020 and the value of teaching equipment and facilities reach up to 352.8 million yuan.2906 training jobs can meet the needs of 6000 people practice requirements. Training base dedicated to the creation of innovation making practical lesson, teaching the mechanical electronic products innovative thinking and creative design knowledge. By leading the students to visit the innovative design work, holding a variety of innovative lecture, and strengthening the support to the budget of the students' scientific and technological innovation, teachers make full use of laboratories openly to stimulate the enthusiasm of students' autonomous learning.^[4] The innovation and practice course content includes: introduction to the

characteristics of innovative thinking and advanced manufacturing technology; explanation the design process of the modern design method and mechanical and electrical products, including product planning, overall scheme, structural adjustment, technological process and installation and debugging and so on; enumerating new designs of mechanical and electronic information product. Teachers in the practice field inspire students' creative desire. After the end of teaching, some students take the initiative to ask the teacher about the experiment, express their wishes and ideas of the design, and actively engaged in engineering innovation activities.

3.2 Letting the students touch the creative perceptual knowledge

Teachers should give students provide informed about new products, access to new products, and distributed components, let students do it yourself installation and debugging. In this process, students often asked: "the teacher and other students can do, why we can't?" and then they feel the knowledge in colleges is not only in class. It is very important for students to understand and accept new professional knowledge and apply it into practice, and it is an indispensable perception foundation of cultivating students' high level creativity.^[5]

3.3 Having a training of innovative design and production

Teacher organization and guidance group of several innovation design and manufacture training. Training teachers only teach skills, mainly students to design their own small device, small products, self-produced; group and carried out between help and learn from each other and collaborative discussion, each training was the emergence of a a number of innovative design masterpiece. It can cultivate the students' ability of using their knowledge to create ideas and make their creative wisdom to unleash. Zhenjiang Technician College Department of electrical engineering, by holding all kinds of skills competition to fully mobilize the enthusiasm of students' skills and creativity, such as Figure 1 shows the scene photo of the third session Skill Scholar Competition held by Electrical Engineering Department of Zhenjiang Technician Institute in Jiangsu province.



Figure 1. The Scene Photo of The Third Skill Scholar Competition in Jiangsu Province

3.4 Making the innovative design normative, normal, systematic

Secondary vocational school should provide students a stage to fully show their personalities, also should make the training of electronic design, mathematical modeling and logo design before the

competitions normal and encourage more students to attend these competitions; all of the academies should also organize these competitions actively, students can enhance their innovative ability by it; when the teachers tutor the students, they should strength the leading of student's innovative consciousness or help them declare school project topics, or they can encourage the students to attend school's technology innovation group voluntarily, instruct them to carry out the scientific researches(including designing, installation, commissioning, paper and research reports writing and so on)and cultivate their skillful innovation ability gradually.

4. Cultivating students' interests and hobbies, mobilizing the enthusiasm of independent innovation learning

The intention of academic reform is to check out college students' learning knowledge, cognition ability and teaching effects while the key of reform is to inspire students to have the independent innovation consciousness and play a key role in their learning activities. Students' subjective initiative tends to come from their interests and hobbies. Choosing experts' research results show that whether a person has strong interests in a profession or an occupation which he is going to engaged in has great effects on his learning activities and employment. Interests are the "engine" of one's mental vigor, and great interests tend to be great motivation to overcome difficulties and study assiduously. Many inventors' achievements are originated from their interests and curiosity. Interests and curiosity are the best teacher permanently, which is the Nobel Prize owners' only requirement of their scientific research work.^[6] However, interests and hobbies should be cultivated patiently. Based on this, on the basis of academy reform and engineering training, we should organize students who have ambitions and interests to attend all kinds of well-known enterprises' special skill innovation training activities. The students' innovation training cooperation agreement is shown in the picture two, which is signed by Zhenjiang Technician Institute and Beijing Automobile co.LTD in Zhenjiang.



Figure2. Signing the Students' Innovative Training Cooperation agreement between Zhenjiang Technician Institute and Beijing Automobile Co.,LTD(Zhenjiang)

Students' team collaboration spirit can be cultivated through training, meanwhile attending the competition also temper students' enthusiasm of study. For example, on the ninth of December in 2015, department of electrical engineering of Zhenjiang Technician Institute contacted with Zhenjiang branch of China telecom and arranged students to attend network wiring skill innovation training in skill

appraisal center of China telecom and the training time limit is one month, which is shown in picture three. Under the leading of the company masters and school's practical teachers, based on the optical fiber as the training project, students attended the skill training of Single-mode and multimode fiber optic cable installation, optical fiber splicing and cold shut, copper wire cable connection, building wiring (including backbone network and horizontal cabling), home wiring, connection of the type F connector, speed and quality of copper wire cable and optical fiber cabling system testing, fault detection and analysis maintenance, information channel links and permanent connection construction and measurement, copper wire cable installation and so on.



Figure3. Students to Telecommunications Skill Appraisal Center for Network Wiring Skills Innovation Training

5. Innovating school's teaching management mode and setting up suitable management system of independent innovation learning

In order to broaden the knowledge needed for innovation and to build more and better 'learning platform' for students, Zhenjiang Technician Institute reforms majors and courses on a large scale according to the idea of integrated cultivation education. Improve the personnel training mode that combining 3M (norms, multi-channel, modular) with "wide, special, cross", and reform the existing teaching management mode gradually. Laboratory management has to be improved at the same time, in order to meet the needs of the students for independent innovation.

5.1 Widely training and increasing the selectivity of the independent learning for vocational school students

According to the contemporary innovation achievements within the trend of cross compound discipline, since 2006, Zhenjiang Technician Institute try to recruit students by discipline enrollment, the choice of profession autonomy more give students which is helpful for college students to have broad disciplines basic knowledge, and students can select and adjust their professional direction in the process of continuous learning. In order to adapt to this change, according to student-oriented guiding ideology, the school implements the categories of training scheme, according to the college categories enrollment plan in accordance with the revised level 2006 various professional students' training scheme. The training plan for students after 1 to 2 years of general education, according to their own development plans, interests and special skills, after confirm the major and minor courses entered into the stage of

professional learning. Students can choose the professional direction in the college categories has confirmed, they can also inter college choose new major minor courses and professional direction. These actions highlight the cultivation of the students' personality and ability, and they are welcomed by students and their parents.

5.2 Creating the new course system of innovative talents, implementing the wide caliber professional education

The course system and teaching content optimization is the core of innovation personnel training. Zhenjiang Technician Institute implement the curriculum system consists of general courses, college categories of courses, professional courses, personalized courses and personalized courses. In the early stage of the vocational education, focus on laying generous basis and strengthening general education, but later outstanding professional education and interdisciplinary knowledge, implement the new mode of wide caliber professional education. The important features of the curriculum system construction is to reduce the required courses, increase the proportion of elective courses, and increase the types of elective courses. According to the needs of creative talents, the school set up a freshman seminar, cultural quality courses, ability training courses, creative study courses, network courses, bilingual courses, brand specialty courses etc., greatly mobilized the enthusiasm of the students' independent innovation learning, thereby giving impetus to the reform of the course construction and teaching content.

Make full use of the second classroom, school carry out various levels and types of innovation research and development activities. Students' creative enthusiasm is stimulated in the combination of the first class and second class. This heavy foundation, wide caliber, modular innovation education curriculum system provides a good platform for the development of students' innovation ability. At the same time actively reform of curriculum system, school have been constructed the Course selection system as the core, flexible credit system, major minor system grade point system, tutorial system and other for auxiliary teaching management mode. From the school management system for the implementation of the curriculum system provides the necessary guarantee.

5.3 Promoting the teaching reform by academic performance evaluation and incentive mechanism.

From the perspective of education management, examinations, scholarships, awards and other incentive systems determine politically that learning is about scores. Students tend to care about the exams item type and complexity of the optional courses. Therefore, teaching reform is not only the change of learning beliefs and methods, but also the transformation of many aspects involving the learning evaluation, teaching management system and the incentive mechanism, etc.^[7]

5.3.1 Reforming the way of learning evaluation and examinations.

The examination forms of professional courses can be an open-book exam, a closed-book exam, as well as an interview, and item type is flexible and various, it can be estimating and multiple-choice questions, analysis, judgment, application, small innovative design mission, experiments and so on. With objective items accounting for 75% and its moderate complexity, we emphatically inspect students' comprehensive ability of applying knowledge rather than requiring them rote learning. Abandoning the past, single evaluation mode, which is based on score rank, Zhenjiang Technician Institute now regards students' innovative ability as an important evaluation index, promoting a new mode of course assessment, which combines general tests with reading reports, novelty search, essay writing and pleading. Teachers

in school lay emphasis on cultivating students' comprehensive ability of applying the knowledge they learn to analyze and solve problems, and the skill of autonomous learning and cooperative learning, paying attention to leading students to focus on the latest development trends of their subjects, such as organizing well-known experts and scholars at home and abroad to make special reports, developing academic salons on campus network, and implementing activities like information retrieval and novelty.

5.3.2 Strengthening the incentive mechanism construction of the development of students' innovation ability.

(1) According to the content of the innovation ability cultivation, we should set up the scientific and standardized evaluation index, and closely combine with rewards and punishments measures, let the educates have a clear goal, at the same time make education administrators have rules to follow when taking incentives steps. Evaluation index should be fully embody the positive features of personality development, promote the consciousness of main body and personality development, combined with the scholarship evaluation to establish awards at the same time, take the "personal declaration + organization review" system. Practice has proved that implementing of the system plays a positive role in to the enhancement of students' main body consciousness and personality development, benefited for their independent innovation learning.

(2) In order to give full play to the positive role of learning evaluation in innovation ability cultivation, we'd better set up specialized agencies and staff to take charge of the learning evaluation.

(3) What we have to do next is to pay attention to the institutionalization and long-term construction, combine the evaluation results with effective incentive methods timely, keep and motivate students' enthusiasm to pursue the development of innovation ability. In order to prevent students from studying for credits and fully mobilize students' initiative and enthusiasm of voluntary participation and innovative research, the Institute of Electrical Information in Zhenjiang Technician has taken the main measures. The specific measures are below. For the subject design projects in teaching, we implement "four-self and two not", which means, regardless of the result and credits, students would be free to attend, voluntary to report, combine by themselves, and self-financing. Under the guidance of teachers, the task can be completed in a semester or cross term, cultivating roundly students' abilities of organization, division of labor, practice, novelty and innovation. At the same time, the outstanding innovation students can be recommended to the excellent enterprise for further exercise, and awarded the title of "school (or college) merit students".

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