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The innovation curriculum plan and implementation research of modern vocational education system

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ABSTRACT

This paper takes the "Innovation and Innovative Method" course as example, by defining the objectives and contents of innovation curriculum and analyzing the teaching approaches, our understanding to innovation ability is described; by setting the principle of implementing innovation curriculum and the selection and evaluation mode for practice projects, the paper describes the implementation of innovation ability training. At last, the curriculum implementation result shows the effectiveness of this research.

KEYWORDS

Innovation ability;
Modern vocational education;
TRIZ;
Course education;
Creativity.

INTRODUCTION

To implement the "Outline of the National Medium and Long Term Program for Education Reform and Development (2010-2020)" and the "State Council Decision on Accelerating the Development of the Modern Vocational Education", speeding up the development of modern vocational education, hence establishing the modern vocational education system, the ministry of education and other six state ministries joint published the "Modern Vocational Education System Construction Plan (2014-2020)". The plan clearly states: "… Establish key industrial technology accumulation innovation union. Make multi-party participation and support policy, driving government, college and industry to take joint action to promote technology and skill accumulation and innovation. For those significant industry sectors which are of vital importance to national competitiveness, plan and establish a bunch of technology and technique accumulative innovation platforms which are joint force with enterprises and vocational colleges, encouraging the application of new technology, new material, new craftwork and new equipment, accelerating the pace of converting advanced technology to productivity and industry transformation and upgrading. To promote enterprises and vocational colleges to participate in technology innovation system, improving the synergy innovation capability, encouraging workers skills enhancement along with technology innovation, technology import and technology upgrading, achieving the new technology industrialization as well as accumulation of talents who can use the new technology. Driving vocational colleges and professional technical education groups to take initiative to participate in technology innovation and actively spread the achievements of new technology, providing small and micro enterprises workforces and technology service"[1]. Thus, innovation is the undividable signifi-

cant content of modern vocational education.

There are various approaches and methods of innovation ability training in modern vocational education, adopting and implementing innovation curriculum is one of the important means. This paper discusses some problem occurred in application and implementation of innovation curriculum.

INNOVATION ABILITY

Innovation ability[2] is the ability to use theoretical knowledge to continuously provide new thoughts, new theories, new methods and new inventions in the field of science, art and technology that have economic value, social value and ecological value. We can understand the meaning of innovation ability from three ways:

Firstly, innovation ability is the ability that one individual utilizes all known information, including known knowledge and experience to make some products that are unique, fresh and with social value or personal value. It include sense of innovation, innovative thoughts and innovative skills, among which innovative thought is the key component.

Secondly, innovation ability is known as two inter-related parts, one is to obtain, reorganize and utilize known knowledge; another is to research and invent new thoughts, new technology and new products.

Lastly, the knowledge structure aspect of innovation ability. Innovation ability should show knowledge structure including fundamental knowledge, specialized knowledge, tool knowledge or methodology knowledge and comprehensive knowledge.

The carriers of the innovation ability include state innovation ability, regional innovation ability and individual innovation ability. The innovation is also the fundamental element of vocational education[3]. By offering innovation ability curriculum, students can gain individual innovation ability, accomplish the goal of elementary innovation education.

THE PLAN OF INNOVATION CURRICULUM

In the paragraph below, we will take "Innovation and Innovative Method" course as example, discuss the course definition and objectives, course contents and course teaching approaches.

Course definition and objectives

The "Innovation and Innovative Method" is a course that teaches students how to obtain innovation and creativity and the skills and method of achieving innovation. The principle goal of this course is to inspire students' innovation and creative thoughts, train students' innovation and creative spirits and ability. Its mission is to enable students gradually develop their own innovation ability and creative ability by enriching them with innovation related fundamental knowledge, to encourage students to comprehend some inspiring innovative thoughts, individual innovative spirit and methods of improving individual innovation ability, constantly increase their job competence and viability in the job market, becoming high-skill innovative talents who are needed by the industry.

1)Basic theoretical requirement: The basic learning objective of theory is to have a preliminary understanding of TRIZ innovation theory, including looking up technology innovation break point, technical problem definition, the forty invention principle of understanding and solution of technical problems and the solution theory of physical contradictions[4]. Thus, help students to learn some innovation methods, extend and upgrade students' innovative thinking ability.

2)Basic skills requirement: The basic skill teaching objective of the course is to utilize TRIZ, make a breakthrough of everyday mind-set, reveal the true nature of the problem, confirm the exploring direction, and use TRIZ to solve some small real life problems or study problems. With help of this, encourage students to develop some innovative products with competitiveness progressively. During the course of learning TRIZ, help students to improve their innovation ability, and teach them procedures of applying patents.

At the same time, establish their correct mind-set and design concept, grasp the method of sparking creativity, rules and technique of innovation. By training their innovative thinking, help students to comprehend media innovation method.

TABLE 1 : Course contents

No.	Contents	Hour
1	Introduction to technology innovation	2
2	Introduction to originality	2
3	TRIZ technology innovation theory	2
4	Creativity	2
5	Looking up technology innovation breakpoint	2
6	Technical problem define and analysis	2
7	The understanding of technical problem	2
8	Technical problem solution principles – 40 invention principles	4
9	Physical contradiction solution theory – Four separation principle	4
10	Fashion innovation	2
11	Sport innovation	2
12	Game software innovation	2
13	Innovation and originality protection	2
14	Extracurricular practice	30
	Total	60

3)Professionalism requirement: On the basis of above requirements, instruct students to develop innovative and creative spirits, improve innovative and creative ability, job competence, entrepreneurial ability, innovation and invention application ability. At the same time, strengthen their awareness of intellectual property protection.

The plan of course contents

This course has a total class hour of 60hr, among which 15 are teaching sessions and 15 are in-class practical sessions and 30 are individual practical sessions, shown in TABLE 1.

The teaching approaches

Break through students' fixed mindset. After long term thinking practice, everyone forms his/her own ingrained thinking habit, formalized thinking mode. When facing events and real problems, one tend to put them in a specific thinking frame, and think and solve them according to specific thinking route, this is the ingrained fixed mindset. It has two basic characteristics, one is its formalized structure and second is ingrained thinking habit. We need to guide students to break through their own thinking frame, thus create extraordinary thoughts. At the same time, teachers must handle the relation between fixed mindset and experience accumulation.

Look up for students' innovation interest. The interests of students may vary due to change of time, environment and even mood. The more one student gets interested in innovation, the wider and deeper the innovation goes. The training of innovation ability must combine with students' interests. For example, student's goals of innovation can be set to hot topics or appliance they interested in.

Encourage students' sense of innovation. The future life plan of one student influences his/her sense of innovation and desire of innovation. Therefore, we need to strengthen innovation ability, continuously encourage sense of innovation, and constantly excite desire of innovation. Success stories and cases can be shown to students to give them guidance and encouragement with positive energy.

Minimize distance between one student's theoretical knowledge and his/her practical experience. When students have some awareness to innovation, they may hope to produce new thoughts and new theory during the course of studying and practicing. However, their understanding of scientific theory and ability of utilizing them in practical activities is inadequate. Help from teachers to minimize the distance between theory and practice is required. This is also the most important but most difficult part to implement[5].

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Curriculum commence condition

"Innovation and Innovative method" is a practical course, students' understand to meaning of innovation is accumulated through practice work. As a result, this course is suggested to combine with student's major field which can help them to solve professional problems.

The in-class work of the course need large volume of information retrieval, so this course requires computer lab facilitating each student with internet access ability and related software.

Take game software discipline for instance, before students major in this take the "Innovation and Innovative method" course, they need to have some knowledge of the field such as programming, game designing, etc.; At the same time, they also need to study other innovation courses like "Software Design", "Fundamental Art" and "Digital Media".

THE IMPLEMENTATION OF THE INNOVATION CURRICULUM

This part takes the "Innovation and Innovative Method" course as example, discusses the implementing principle, practical project selection and evaluation methods.

Course implementing principle

In the process of implementing "Innovation and Innovative Methods" course, four basic principles need to be followed[6]:

Personality and criticism principle. Each person is a special being different from others. From some aspect, personalize is the synonym of innovation, no personality, no creation. Therefore, training students' innovation ability must keep up with personality principle, teach students in accordance with their aptitude, focus on exciting students' initiative and originality, develop their independent thoughts, independent personality and criticism spirits.

Systematic and open principle. The so-called system is constructed by inter-related and interactive elements, it's an organism with general functions. According to general system theory, developing students' innovation ability includes developing sense of innovation, spirits of innovation, innovative thinking and innovative methods which are undividable elements; Open principle means developing students' innovation is a huge social systematical project, it requires fellowship participation of government, colleges, families and societies. The traditional close-up education has no future.

Collaboration and teamwork principle. The so-called collaboration is more than one people or a

TABLE 2 : Extracurricular practical projects

No.	Practical exercise	Hour	Basic criterion
1	Exercise one : The solution to one real life little problem	15hr	The problem solved must be different from those encountered in-class
2	Exercise two : The solution to one professional problem	15hr	The problem solved must be from in-class

TABLE 3 : Evaluation methods

Exam	Pct.	Assessment	Pct.	Additional exercises	Points
Theoretical Knowledge	20%	Attendance	10%	The Solution to real life problem	30 points
In-class practice	20%	Seminars	10%	The solution to professional problem	30 points
Extracurricular practice	20%	Level of innovation	20%	Patent or copyright	80 points
Exam total score	60%	Assessment total score	40%	Additional exercise total	No more than 100 points

number of work units collaborate to achieve one mission. The innovation ability is not only the intellectual ability of one student, non-intellectual elements also influences one's potential of innovation. Collaboration and teamwork ability is such element.

Practice and evaluation principle. Practice is the unique objective activity of human beings, it's the way of human beings' existence. To follow practice principle is to persist in correct education vision, insist on evaluating innovation ability according to practice result.

The plan of practical projects

According to above principles. In addition to in-class practical training hours, we arranged 2 important extracurricular practical projects. Students select and try out these two practical projects according to their own ability, shown in TABLE 2.

Course evaluation methods

1)Evaluation method and criteria

Evaluation method: assessment

Criteria: attendance, seminars, in-class practical work, extracurricular practical work

2)The components of overall appraisal and criteria

Theory teaching:

According to the nature of this course, students are required to comprehend fundamental knowledge, teachers focus on training students' innovation ability. In addition to traditional theory test, this course emphasizes on procedural exam, evaluating students from multiple aspects, including attendance, seminars, in-class practical work and extracurricular practical work. Extracurricular practical work give the chance for students to earn bonus points. It is shown as TABLE 3.

Independent Practice: Accomplishment of the practical project contributes 70% to the final result, whereas practical report (electronic version) gives another 20%.

INNOVATION CURRICULUM IMPLEMENTAION EFFECT

This part describes the implementation effect of "Innovation and Innovative Methods" course.

The test before the course was implemented

Before this course was taught to the students,

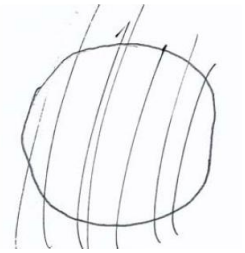

Figure 1 : Student's answer to the question

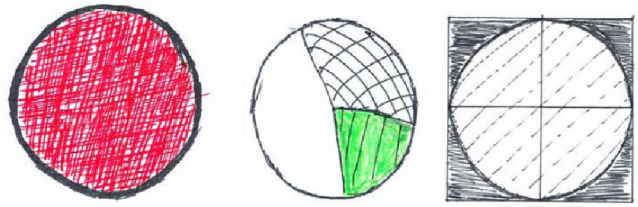

Figure 2 : Three typical student drawings as their answers to the question

TABLE 4 : The outcome of students' innovative work

No.	Work submitted	Quantity	Work evaluation	Product name
1	Yes	5	Winner Prize from Provincial level competition	Green Factory Better looking with me Portable intelligent Massage Bracelet Lifesaving wrist strap Sleeping Snail Lamp
2	Yes	13	Good	-
3	Yes	15	Moderate	-
4	No	5	None	N/A

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we gave each student an independent innovation test, the test question was to color a circle[7].

Figure 1 and Figure 2 shows some typical answers of students.

Among 76 students from two classes, only one student answered the question like Pic 1, shows no restraint from borders and frames. All the rest students' works are like those three typical drawings shown in Pic 2. This shows before developing students sense of innovation, they tend to have borders and frames on their mind, no sense of break through fixed mindset, lack of innovative thoughts breaking the borders and frames, mostly they make changes within the frame.

The effect after taking the course

After one semester, all the students selected this course were asked to provide an innovation work, the outcome is shown in TABLE 4.

From above table we could see that in general students achieved certain level of innovative thoughts improvement. 13.2% of students achieved excellence in innovation ability and won Provincial level competition prizes

CONCLUSION

In modern vocational education system, planning and implementing innovation curriculum is an important method of training innovation ability of student. It's a feasible and effective way of training innovative ability.

Further research are needed to find out how the planning and implementing experience of "Innovation and Innovative Method" curriculum can be promoted to other related courses and inspire the reformation of those courses. At the same time, more systematical research are need to be carried out on innovation, creativity, employment increase, art creation and venture capital to identify the inter-relation and possible collaboration of these activities.

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