Research on Innovative Talent Training Mode Based on STEAM Theory  

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Abstract. In order to cultivate more competitive and market-oriented innovative talents, colleges and universities need to reform and innovate in educational concept, evaluation and assessment system and education and teaching. According to the theory of STEAM multidisciplinary comprehensive quality education, this paper analyzes the connotation and main characteristics of innovative talents, studies the existing problems of innovative talents training, the evaluation index and training approaches of innovative talents, and puts forward measures and methods for constructing innovative talents training mode. According to the theoretical basis and practical basis necessary for innovative talents in application-oriented universities, the course system is constructed, the training center is constructed, and the innovation guidance service system is improved through school-enterprise cooperation, project construction and perfect innovation training system. It provides strong support for the cultivation of scientific research innovative undergraduate talents, improves the quality and level of talent cultivation, and is conducive to the multi-disciplinary knowledge reserve of innovative talents, the use of knowledge and skills, the solution of social problems, and technological innovation. It is beneficial to study hard, practice hard and strive for breakthrough application innovation.

1. Introduction

In the new era of innovation-driven national economic development, innovative talents have a core position in the innovation-driven development strategy. Education should keep up with the pace of national development, implement the strategy of innovation-driven development, constantly innovate the mode of personnel training, and improve the education system and evaluation system. According to the innovation theory and talent cultivation theory, it is necessary to re-understand the existing problems of innovative talent cultivation and explore new cultivation methods.

The STEAM Education Concept began as an education initiative by the U. S. government to strengthen education for American students in science, technology, engineering, the arts, and mathematics. STEAM stands for Science, Technology, Engineering and Mathematics. Encourage the development and improvement of students' multi-disciplinary, cultivate their comprehensive quality, and thus enhance their global competitiveness. Recently it is joined Arts and became more comprehensive[1].

Research on STEM education theory and practice. Foreign research is more in-depth than domestic research. The development of innovation education in foreign countries is relatively
early, while the innovation education in China is relatively slow\textsuperscript{(2)}. In addition, the application-oriented undergraduate education in China has only been produced for more than ten years, so the training of application-oriented innovative talents is still in the exploratory stage\textsuperscript{(3)}. Domestic research on applied innovative talents mainly focuses on the establishment of talent training mode, and there is a lack of detailed implementation plan in the establishment of talent training mode. Foreign research on STEM education runs through the national, social and school levels, and a relatively systematic implementation plan for STEM education has been formed\textsuperscript{(5)}. Most of the studies on STEM education by domestic scholars are about the development of STEM education abroad, the integration of STEM courses and teacher training. There are few studies on the enlightenment of STEM education on different stages of education in China. In the context of the shortage of applied innovative talents, STEM education, as an educational concept to cultivate innovative and complex talents, has a guiding and promoting role in the training of applied undergraduate innovative talents\textsuperscript{(6)}.

According to STEM education theory and human capital theory, from the innovative talents evaluation, innovation ability training and teaching contents of creative personnel environment construction from four aspects, analyses the reason of innovative talent training experience difficulties, targeted put forward the countermeasures to solve the problem of innovative talent training, promote innovation talent training quality steadily improve.

2. Theories Related to Innovative Talent Training

2.1. Constructivist Learning Theory

Constructivism believes that learning is a process of learners acquire knowledge actively, think learning is not simply an outside-in input and transfer of knowledge, but in the learning of the students in the group with peers, teachers, workers, interaction and sharing of your major constantly enrich and update their own understanding, and take the initiative to construct their own learning content, to acquire knowledge. The cultivation of innovative talents in application-oriented universities should follow the law of students' psychological development and stimulate students' interest in learning. Most of the traditional teaching methods are based on behaviorism theory, which emphasizes that students can passively receive the external stimulus and the knowledge instilled by teachers through the external stimulus mainly provided by teachers. This kind of teaching mode does not adapt to the cultivation of innovative talents, which makes the cultivation of innovative talents become an armchair strategy.

Constructivist teaching theory emphasizes that in the process of knowledge learning, learners, with the help of others, make use of their own knowledge experience and existing knowledge resources to construct meaning and acquire new knowledge. In the process of construction, the cognitive role of students is emphasized, students are the subject of knowledge construction, and teachers are the guide in the construction. Constructivism emphasizes the subject role of students in learning, stimulates students' initiative in learning, and is conducive to the cultivation of application-oriented innovative talents. STEM education is also based on constructivist theories.

2.2. STEM Multidisciplinary Education Theory

"STEM" is an acronym for Science, Technology, Engineering and Mathematics. In terms of content, STEM education advocates the integration of multi-disciplinary knowledge to achieve the
integration of content, the learning of multi-disciplinary integrated knowledge, and a kind of education mode oriented by the cultivation of critical innovative thinking. Formally, STEM is the synthesis of knowledge, ability, quality and other elements. Without scientific knowledge as the basis, there will be no technological innovation, technological innovation without attitude and emotional guidance, lack of innovation motivation and the value of innovation. STEM literacy not only refers to knowledge and innovation ability, but also refers to the comprehensive learning process of knowledge, ability and quality. Therefore, STEM education is an advanced concept advocating interdisciplinary education and all-round training of innovative talents.

STEM education advocates a problem-sold-oriented education model, which requires the completion of works as a part of knowledge output. By integrating knowledge into the design of a work, it promotes the integration and transfer of knowledge. Therefore, design is the premise for the realization of STEM education model. In the design process of works, not only knowledge should be integrated into it, but also learners' learning motivation should be stimulated. Therefore, the design of problems, works and projects should be interesting. The design of works is a process of cognitive construction, which must be put into practice through practical operation. Practicality is an important approach to STEM education, and STEM education has great advantages as well as practicality. Students can divergent thinking, solve original problems and create new problems in the specific practice process. STEM education aims to cultivate interdisciplinary talents with innovative abilities.

2.2. Connotation and Main Characteristics of Innovative Talents

Connotation of innovative talents: Innovation is the core of innovative talents. The definition of innovation is epochal and cultural. It varies with different times and cultural backgrounds. Therefore, the definition of innovative talents is also different. Innovative talents, with multidisciplinary knowledge reserve, innovative observation and advanced innovative thinking, can independently use knowledge and skills, solve social problems, technological innovation. Study hard, practice hard, strive for breakthrough application innovation.

The main characteristics of creative talents:

Comprehensive knowledge base. Knowledge reserve is the cornerstone of all talent training, innovative talent is no exception. Innovative talents should discover and create new knowledge on the basis of their own knowledge, so as to have a broader vision and richer information. Strong motivation to innovate. Innovation motivation is divided into internal motivation and external motivation. Strong curiosity and strong desire for knowledge are the important components of internal innovation motivation.

Creative thinking and critical thinking. Innovative thinking is a thinking process that breaks the boundaries of conventional thinking and solves problems with novel and unique solutions. Rich imagination. Imagination is the source of knowledge and promotes its development. Innovation is the innovation of old things and the invention and discovery of new things. In the process of innovation, subjects are likely to be trapped in the current situation of problems and imprisoned by their thoughts.

Tenacious will to innovate. In the process of innovation practice, there will be a lot of unpredictable difficulties, if there is no tenacious will face the possibility of giving up halfway,
innovation will is an important force and guarantee in the process of innovation, innovative talents are mostly indomitable, perseverance and tenacity to achieve the goal.

Innovative practical ability. The development of innovation activities should not only stay at the theoretical level of research, innovative talents should start from reality, achieve the "unity of knowledge and practice", and be good at restoring problems to social practice with a scientific attitude.

Ability to work together. Collaboration is about teamwork. It advocates cooperation and joint efforts around common goals. Recent scientific research data show that a major scientific discovery or technological breakthrough requires knowledge and technology in multiple fields, and cooperate with others, motivate each other, and learn from each other.

3. Problems in the Cultivation of Innovative Talents in Colleges and Universities

3.1. Lack of Innovation in Educational Ideas

At present, China's application-oriented universities have a weak sense of innovation, both from the school level and from the student level. Applied undergraduate colleges and universities in recent years, in response to the development of the national innovation drive, a series of policies about innovative talent training, the innovation into the concept, but only in the form of call and publicity, lack of innovation into the key of each link, the education teaching not to implement innovation education. By school internal system mechanism and the influence of students' subjective consciousness, applied undergraduate college students for their talent cultivation orientation stays in the service of technology skilled talents for the society, and think that innovation is high level research university students should have the ability, as a result, their innovative consciousness is weak, lead to the cultivation of applied innovative talents lack a strong spiritual motive and tenacity of innovation will.

3.2. Obsolete Teaching Methods and Methods

At present, the teaching methods of application-oriented universities in China are relatively old and lack of innovation. In China's application-oriented undergraduate universities, the form of group learning, with project completion as the carrier, teacher guidance and students' independent learning, has not been paid attention to and popularized, and the quality of innovative talent cultivation cannot be improved.

The teaching method of application-oriented universities in China is still based on traditional classroom teaching, and heuristic teaching is insufficient, let alone exploratory teaching based on problem solving and project completion. As a result, the students only stay at the knowledge level, ability and quality cultivation is ignored, in the long term, the exploration of applied undergraduate college students ability, innovation ability, and a strong thirst for knowledge in virtually been obliterated, result in applied undergraduate talents after entering society is difficult to adapt to the development of the state and society, and it is difficult to realize the sustainable development of its own.

We are in the era of information explosion, and the way of knowledge learning is no longer limited to classroom acquisition. However, at present, application-oriented undergraduate universities in China still focus on in-school classroom teaching, with fixed teaching materials as the main teaching content, and lack of self-learning space and social practice curriculum. The main
performance is: the school for the innovation base construction fund investment is insufficient; When students participate in innovative activities, the school is not equipped with or rarely equipped with professional guidance teachers and the activity funds are insufficient; There is no close connection between schools and social enterprises.

3.3. Discipline Barriers are too Rigid

At present, the setup of applied undergraduate colleges and universities mainly depend on the local economic development, the curriculum is based on the required professional knowledge, ability and quality structure to set, rather than the perspective of sustainable development and the curriculum itself with the talent of the comprehensive and divergent as a starting point, lead to the curriculum limitations is too strong, the lack of a comprehensive, students learning content is not comprehensive. In addition, there is a heavy trace of subject-oriented curriculum setting, lack of interdisciplinary curriculum setting and lack of interdisciplinary curriculum setting. As a result, the knowledge learned by students will form fragmented knowledge with discipline as the boundary. At present, with the rapid development of economy and society, the talent specifications required by the major are constantly changing, and the courses set according to the major ultimately cannot meet the needs of talent cultivation. The curriculum setting is too heavy, students cannot acquire knowledge of other subjects, and their thinking is restricted. At the same time, theory and practice courses are not closely related in the curriculum setting. Most schools divide practice courses and theory courses into two periods. For example, in the last few weeks of a semester, intensive practice courses are studied, while the first half of the semester is the study of theory courses. In the stage of theoretical learning, students are exposed to a large amount of theoretical knowledge, but they cannot verify it through concrete practice, which leads to the failure to learn and apply or even understand what they have learned, and thus they become weary of learning. However, in the practical stage, since the theoretical learning is far away from each other, it cannot be easily applied in the practical operation, so the theoretical courses and practical courses should be closely linked in order to realize the practical application of what is learned.

3.4. Imperfect Evaluation Mechanism

At present, the content of evaluation for students in Application-oriented universities in China is mainly to assess the students' mastery and application of the knowledge they have learned, and to evaluate the students with deterministic answers as the standard. Innovative talents are the type of talents with collaborative development of knowledge, ability, quality and personality. Such knowledge assessment method has great limitations and has a restrictive effect on students' innovation ability and innovative thinking, which is not conducive to the cultivation of innovative talents. Therefore, the evaluation of knowledge, ability, quality and personality should be emphasized in the evaluation of innovative talents.

The traditional form of written examination is the main way of student evaluation in the application-oriented universities and even some institutions of higher learning in China. Most applied undergraduate universities in Our country take teachers as the subject of assessment, which makes students become passive evaluators and weakens the initiative and enthusiasm of students to participate in evaluation. In addition, application-oriented innovative talents are talents who directly serve the society. In their talent evaluation, the society, enterprises and schools should all participate in the process. A single school teacher as the main body will result in the phenomenon that the quality of talent cultivation is divorced from the society.
4. Measures to Build Innovative Talent Training Mode

4.1. Reconstruction of the Comprehensive Curriculum System

Build an innovative talent training model for application-oriented undergraduate universities by integrating STEM education concepts, draw on the practical experience of applying STEM education concepts at home and abroad, analyze the high consistency between STEM education concepts and application-oriented undergraduate innovative talent training, and realize the localization of STEM education according to the rules of higher education in China. Draw lessons from STEM education concept to construct the innovative talent training model of application-oriented universities from the guiding ideology and principles, basic content and implementation path.

In the reform of education and teaching, curriculum teaching is the core content and central link of talent training, and the reform of curriculum system is the most important step of education and teaching reform and the breakthrough point of education reform. Curriculum reform and teaching reform are the core of the reform of innovative talent training mode in application-oriented universities. Interdisciplinary core idea, in this study using STEM education based on professional required course content and strengthen the existing theory and practice of the course, to achieve the continuity of the course content and comprehensive, will be more courses according to certain logical relationship, integrated with explicit knowledge, ability and quality target of wide-area integrated curriculum, eventually form to train applied innovative talents for a comprehensive curriculum system.

4.2. Innovative Teaching Methods and Methods

Optimize the mode of production, education and research. The mode of industry-University-Research cooperation in running schools is the future development trend of application-oriented undergraduate universities and an important way to cultivate application-oriented innovative talents. It is of great significance to students' cutting-edge knowledge learning, practical application ability improvement, innovation ability and comprehensive quality training. However, the current industry-university-research cooperation is at a superficial level, which cannot achieve in-depth cooperation. Work together to develop course content goals. Curriculum content goal is the standard of curriculum setting, which determines the knowledge, ability and quality goal that students should achieve after completing the course. In school-enterprise cooperation, curriculum content objectives can be set from the perspective of students' own development rules and the current development status of the industry, and the technical requirements, job competence and quality requirements of the industry enterprises can be integrated into the curriculum content objectives, so as to form a close connection between curriculum implementation and social enterprises.

4.3. Construction of Diversification Evaluation Mechanism

The evaluation of applied innovative talents should be based on the whole knowledge, ability and quality. In the past, the assessment content of applied innovative talents in education mostly stayed in the level of knowledge structure, and the assessment of ability and quality was insufficient. Applied innovative talents are the core features of application and innovation, ability and quality structure is an important part of applied innovative talents, evaluation content should contain ability and quality structure, should fully realize the diversity of students' intelligence, respect the
differences of students, therefore, on the examination content, prominence should be given to the evaluation of innovation quality and innovation ability, pay attention to the comprehensive content, to promote all-round development applied creative talents.

The cultivation of application-oriented innovative talents is closely related to the social demand for talents. The social demand for application-oriented innovative talents changes with the change of The Times and the continuous improvement of technology. The evaluation of application-oriented innovative talents should not be based on the social demand, and the quantitative evaluation of students should be carried out only by the single subject of university teachers, which should keep dynamic consistent with the development and demand of the society. In the selection of specific indicators and the setting of relevant weights, the principle of dynamism should be embodied, and the specific indicators and weights of the evaluation system should be dynamically adjusted in real time, so as to meet the needs of The Times. Social enterprises and employers should participate in the formulation of talent evaluation standards and the process of talent evaluation, and participate in talent evaluation in coordination with university education and management personnel according to the development of society.

5. Conclusion

(1) Practitioners who have received STEM education generally have strong technical level and innovation ability. In the United States to promote the level of science and technology and innovation capacity.

(2) In recent years, STEM education has produced a series of good effects in China, promoting the change of teachers' concepts and teaching behaviors.

(3) Project-based STEM courses fundamentally change the traditional classroom landscape in which teachers are the subject and students learn passively, and form a learning atmosphere of independent exploration, innovation and creation.

(4) The characteristics of STEM education concept and applied innovative talents are highly compatible. It is of great significance to draw on the STEM education concept when constructing the innovative talent training model for application-oriented universities.

(5) The remarkable characteristic of the development of modern science and technology is the continuous high degree of integration of disciplines. The acquisition of major scientific and technological achievements depends more and more on the intersections and integration of different disciplines, which requires comprehensive knowledge reserve and learning transfer.

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