Engineering Talent Training and Innovative China Building

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Abstract: This study explores the Chinese way of cultivating innovative engineering science and technology talents under the background of accelerating the construction of an innovative country. On the basis of clarifying the government's policy on scientific and technological innovation, the status quo and existing problems of engineering and technological personnel training, the Chinese path for the training of innovative engineering and technological personnel at this stage is proposed. The article points out that under the premise of market-oriented resource allocation of higher education, institutional innovation is the foundation, reforming the engineering education system is the key, and cultivating the critical thinking and creative thinking of engineering science and technology talents is an important method and means. It is a systematic project that requires the joint efforts of stakeholders such as the government, industry enterprises, universities and research institutes to promote.

Key words: Innovation, Critical thinking, Creative thinking, Engineering talents, Marketization

1. Research Background

Entering the 21st century, under the background of problems such as huge population and technology, insufficient resources and fragile ecological environment, it has become an urgent problem to transform the mode of economic growth as soon as possible. The fundamental way to achieve this transformation is to vigorously improve the capability of independent innovation, so that China's economy can realize the growth from factor-driven growth to innovation-driven growth. Therefore, in 2006, the state proposed the development strategy of building an innovative country, until the 19th National Congress of the Communist Party of China put forward the development strategy of accelerating the construction of an innovative country. On the other hand, enterprises are the main body of technological innovation. In order to realize and enhance the independent innovation ability of enterprises, talent training has become a key problem that needs to be solved urgently. How to realize the cultivation of innovative engineering and technological talents at this stage has become a major issue that needs to be discussed urgently.

There are papers that simply study the cultivation of innovative engineering science and technology

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talents, especially in recent years, there are many papers on the construction of new engineering disciplines. However, these papers are mostly limited to discipline or professional construction, and the demonstration of the key core competencies combined with the cultivation of innovative talents is relatively rare. Research on the combination of critical thinking and innovative talent development is rare. Critical thinking and creative thinking are indispensable conditions for cultivating engineering innovation ability. Examining the training methods and status quo, existing problems and solutions are urgently needed research topics.

How are critical thinking and creative thinking implemented in talent cultivation? It is closely related to its educational philosophy, talent training goals, curriculum system, faculty, teaching methods, teaching organization and management, financial support, and industry-university-research funding cooperation. This requires reforming, improving and perfecting the existing engineering education system, and carrying out institutional innovation under the premise of education market-oriented resource allocation.

This study firstly examines the state's policy on building an innovative country, and secondly examines the current situation and problems of engineering and technology talent training at the current stage.

2. The strategy of building an innovative country

2.1 Building an innovative national strategic development plan

In January 2006, Hu Jintao clearly put forward the grand goal of building an innovative country for the first time at the National Science and Technology Conference. In the same year, the Outline of the National Medium- and Long-Term Science and Technology Development Plan (2006-2020) made a comprehensive plan and deployment for my country's scientific and technological development, clearly proposed to take the road of independent innovation with Chinese characteristics, and regard enhancing the ability of independent innovation as the adjustment of industrial structure and transformation. The central link of the development method. In 2007, the report of the Seventeenth National Congress of the Communist Party of China clearly pointed out that improving the ability of independent innovation and building an innovative country is the core of the national development strategy and the key to improving the overall national strength. In July 2012, the Central Committee of the Communist Party of China and the State Council issued the "Opinions on Deepening the Reform of the Science and Technology System and Accelerating the Construction of the National Innovation System". In the same month, the National Science and Technology Innovation Conference was held. The Party Central Committee and the State Council made further important arrangements for deepening the reform of the scientific and technological system and accelerating the construction of an innovative country.

In 2017, the report of the 19th National Congress of the Communist Party of China made systematic arrangements for accelerating the construction of an innovative country, and proposed to enter the fore-

front of innovative countries by 2035.

2.2 The Ministry of Science and Technology's response policy to the strategy of accelerating the construction of an innovative country

The first is to focus on building the country's first-mover advantage, and strengthen the major strategic layout that takes into account both the current and the long-term. Take the new five types of science and technology plans as the carrier to comprehensively deploy and implement major national research and development tasks, and launch the "Science and Technology Innovation 2030-Major Project"; build an internationally competitive industrial technology innovation system, and promote disruptive technological innovation; improve and support people's livelihood improvement and sustainable development develop a technological system; establish a technological system to safeguard national security and strategic interests, and develop strategic high-tech technologies in the fields of deep sea, deep earth, deep space, and deep blue[2]. The second is to cultivate important strategic innovation forces around enhancing original innovation capabilities. Strengthen basic research for the world's scientific and technological powers, propose and lead the organization of international major scientific plans and major scientific projects; cultivate a group of world-class scientists, and strengthen the team of innovative entrepreneurs. The third is to build a good innovation and entrepreneurship ecosystem around promoting mass innovation and entrepreneurship. The fourth is to focus on expanding the space for innovation and development, and coordinate both domestic and international situations. The fifth is to focus on breaking the institutional barriers that restrict innovation and the transformation of achievements, guide social capital to participate in major national research and development tasks, and comprehensively deepen the reform of the scientific and technological system. Sixth, focus on consolidating the social foundation for innovation and development, and strengthen the construction of science popularization and innovation culture. Promote the transformation of scientific and technological achievements and in-depth integration of production, education and research.

General Secretary Xi Jinping emphasized that innovation-driven is essentially talent-driven. my country's scientific and technological innovation has made remarkable achievements in the world, and one of the most important advantages is the advantage of human resources.

In the future, we will continue to deepen the reform of scientific and technological management, and further help researchers to loosen their bonds. Strengthen the coordination between science and technology innovation policies and related policies in other fields, solve the blockages and difficulties in the implementation of policies, and put existing policies in place; Opinions on talent evaluation, and guide employers such as universities and research institutes to establish scientific and reasonable evaluation

[2] https://baijiahao.baidu.com/s?id=1591062450040711658&wfr=spider&for=pc

standards. Another very important point is to strengthen the construction of scientific research integrity, organically combine the "self-discipline" of scientific researchers with the "heteronomy" of system construction, and create a good academic research ecology.

2.3 The exposition on scientific and technological innovation and education of China's leader

In 2009, Comrade Xi Jinping emphasized the need to vigorously promote the spirit of innovation and improve the ability of innovation in the whole society. Scientific and technological innovation and scientific popularization are the two wings to realize the take-off of science and technology. It is necessary to continue to focus on enhancing independent innovation capabilities and building an innovative country, give full play to the role of the main force in popular science work, and further organize National Popular Science Day activities to form a new pattern of socialized popular science work. In 2012, Comrade Xi Jinping pointed out that it is necessary to conscientiously implement the spirit of the National Science and Technology Innovation Conference and the "Opinions of the Central Committee of the Communist Party of China and the State Council on Deepening the Reform of the Science and Technology System and Accelerating the Construction of the National Innovation System", and insist that the work of popular science should be placed in an equally important position as the focus of scientific and technological innovation. . Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has attached great importance to the role of science popularization in innovation and development, and has made a series of important expositions through continuous in-depth thinking.

General Secretary Xi Jinping pointed out that "scientific and technological innovation and scientific popularization are the two wings to realize innovation and development, and scientific popularization should be placed in an equally important position as scientific and technological innovation[3].General Secretary Xi Jinping's important expositions on scientific and technological innovation continue to enrich and develop important expositions on scientific and technological innovation, which have become the fundamental compliance and action guide for implementing the innovation-driven development strategy and building an innovative country[4].

3. Status Quo and Existing Problems of Cultivating Engineering Innovative Talents

The government regards innovation-driven development as a national strategic development plan, and actively promotes innovative talent training strategies from a policy perspective and has achieved certain

[3] The National Committee of the Chinese People's Political Consultative Conference http://www.cppcc.gov.cn/zxww/2021/12/15/ARTI1639547625864246.shtml

[4] Accelerate the construction of an innovative country and a world science and technology power http://theory.people.com.cn/n1/2019/0128/c40531-30592763.html

results (Yang Yun, 2021). However, there are still many problems in the training of engineering science and technology talents under the background of building an innovative national strategy. Including educational philosophy, personnel training system and structure, personnel training mode and so on. There are many reasons for these problems.

3.1 The establishment and implementation of the "student-centered" educational philosophy

Although the "student-centered" educational concept has been reflected in relevant educational policy documents, it has not been fully implemented in the education and teaching of colleges and universities. The problem is reflected in education governance. Many teachers of engineering majors do not master the laws of education theory and do not do academic research on teaching, which makes it difficult to implement this concept.

In recent years, some colleges and universities have begun to require teachers to write academic research papers on teaching in terms of educational governance. However, the proportion of teachers who start to work is relatively low, generally teachers who need to be promoted, and teachers who have already obtained professional titles or teachers who do not have the will to be promoted are difficult to be restrained.

This requires grass-roots teaching governance organizations to work hard on governance and train all teachers on the "student-centered" educational concept, so that they can internalize and absorb the connotation of this concept and actually apply it to education and teaching practice.

3.2 The course setting is not reasonable

The first is the number of class hours for undergraduates. The total number of class hours for undergraduates majoring in engineering in education-first countries is about 140 hours. However, in my country, excluding Tsinghua University and other research universities, after the reform in 2005, some majors have reached this number of hours. In addition, the number of credit hours for undergraduate majors in other local engineering colleges is about 169 (Qian Yingyi, 2015). In addition, except for a few research universities, most local engineering colleges do not attach importance to general education, and many teachers and students think that general education is a class for students to play[5].

Only a small number of students take general education elective courses seriously. However, due to the neglect of school administrators and teachers, students do not receive good teaching services. This problem has seriously affected the quality of teaching. The author believes that the general education elective courses can cultivate engineering students' critical thinking, innovative thinking and other thinking abil-

[5] It is derived from a field survey of general education teachers and students in many engineering universities in Shanghai from 2019 to 2022.

ities. However, because of the above reasons, these courses become inefficient courses. Moreover, the existence of these inefficient classes makes students look busy, and many of them conflict with the time when students arrange practical courses for internships, which leads to practical courses for internships cannot be attended. Third, some courses take up a lot of class hours, but some courses that should be offered are not offered. Some courses, such as political and ideological courses as compulsory courses, account for a relatively large proportion of credits, but students report that the learning effect is not good. Some necessary courses, such as logic courses offered in foreign engineering majors, are offered in very few universities in my country except for a few research universities. In this way, curriculum setting has become a big problem in improving the quality of education.

However, the adjustment of the curriculum involves many issues such as education governance, which is difficult. Many courses that are being offered are outdated or can no longer be offered, but teachers are reluctant to remove the courses they have been offering, nor to invest time in preparing new courses. Therefore, it is also difficult to remove unreasonable courses and add new courses, and coordinate the relationship between teachers and curriculum settings[6]

3.3 Insufficient implementation of internship practice

An important feature of engineering science and technology personnel training is to carry out industry-university-research cooperation, and enhance students' practical ability through industry-university-research cooperation. At present, the degree of industry-university-research cooperation among students in engineering colleges varies greatly depending on the type of school and the location of the school. Since 2010, the Ministry of Education has implemented the "Excellent Engineer Education and Training Program" for engineering students to improve the quality of engineering and technical personnel training. An important part of this plan is to enhance practical education. However, at present, the number of colleges and universities implemented by this plan and the number of people covered only account for a small part of all engineering students .

In 2016, China joined the "Washington Accord", realizing the international substantial equivalence of engineering and technical personnel training. However, one of the problems is that the number of students recognized through this "Accord" is only a small part, and the second problem is that even Whether the engineering graduates who have passed the "Agreement" can actually achieve substantial equivalence also needs to be verified. Especially after the outbreak of the new crown epidemic that became popular in early 2020, the implementation of the practical courses for internships is worrying[7].

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[6] From 2010-2022, a field survey of several engineering universities in Shanghai and a local university in Guangdong Province.

[7] Based on interviews and surveys of students from multiple engineering universities in Shanghai from 2020 to 2022.

3.4 Existing problems in teaching methods

Because most engineering college teachers do not do academic research on teaching and have never received training, they do not master the laws of education and scientific teaching methods. As a result, the quality of education is low. Now, students' deeply participatory teaching methods such as “PBL”, “PBJ”, and “Active Learning” are used in higher education in education-first countries. In my country, there are only a few colleges and universities to carry out, and it is a bottom-up development. There is a lack of Active Learning, which is widely implemented in Japanese higher education. As of 2018, the implementation of AL in college classrooms in Japan has reached about 80%. One of the reasons for the lack of widespread implementation in my country is the lack of financial support, and the lack of financial support for industry-university-research cooperation projects, the problem of teachers' professional quality, and more importantly, the lack of attention to teaching management.

3.5 Administrative power is greater than academic power

Regarding the staffing of administrative staff, the university, which was once a state-affiliated institution, did not have a strict assessment system for those who entered the university before the marketization and basically did not worry about unemployment. From the founding of New China until the mid-to-late 1990s, the jobs of college graduates were assigned by the state according to the enrollment plan. Since 1999, the market-oriented employment system has been implemented. The state no longer provides distribution, but graduates themselves make career choices through the labor market. However, administrators and teachers working in colleges are a group who do not need to worry about the danger of unemployment once they enter colleges and universities. Peking University first carried out the reform of the personnel system, reforming the administrative staff from the establishment (iron rice bowl) position to the labor contract position (non-lifetime employment system). After that, this kind of reform was gradually launched in colleges and universities across the country, but the progress was very slow. Now, more than two decades have passed, and the lifetime employment system of administrators still exists in some universities. Moreover, even in universities that have formally abolished the lifetime employment system, their administrative power is still greater than academic power.

The bigger problem is that many people involved in education governance inside and outside colleges and universities work without understanding the laws of education, resulting in laypeople leading experts. In addition, the training of internal and external governance personnel in colleges and universities is mostly limited to political and ideological education, and there is very little business training in combination with educational development laws and educational governance, and there is even no relevant institutional mechanism. The problem of efficiency and fairness in the internal and external governance of higher education is very serious. These have seriously affected the quality of higher education.

3.6 Onboarding and training of teachers

At present, most of the teachers in engineering colleges come from newly graduated doctors, and they have no practical experience such as working in enterprises, so the current situation of low teaching quality is caused. In addition, there is an overall lack of post-employment training for teachers. Furthermore, although application-oriented colleges and universities stipulate that there must be a certain number of full-time teachers with practical experience in enterprises, many colleges and universities have not met this requirement, or they have falsified the number in order to meet this requirement of the Ministry of Education for colleges and universities[8].

Full-time teachers in engineering colleges basically do not do academic research on teaching, and most of them have not received training to master the laws of education and teaching. In terms of education and teaching, they inherit the education and teaching methods they received when they were students, and they are largely passive. Due to different types of colleges and universities, teachers' individual titles are different, and the assigned teaching workload is very different. The lower the professional title and the shallower the entry experience, the heavier the teaching task is required to undertake. On the contrary, the amount of class hours taught by professors to undergraduates belongs to the lowest group among the various professional titles, and it is also a matter of recent years to emphasize that professors teach undergraduates. Professors who hold both administrative and academic positions do not do the research themselves at all, but are only in a mentoring position for graduate students to do research.

3.7 Issues in the management and use of scientific research funds

The restriction of the scientific research funding management system stipulates that the funds must be used up in a short period of time, resulting in a serious problem of low efficiency in the use of funds. The problem of the scientific research funding system and mechanism has seriously affected the scientific research ecology, causing teachers to spend a lot of time on reimbursement. Many people rack their brains to spend the funds. Not only can they not concentrate on teaching and scientific research; cause varying degrees of mental stress.

There is a lack of fair and equitable approval procedures from the sources of financial funds to the projects supported by enterprises such as industry-university cooperation. There are not a few cases of pulling relationships, taking personal connections, or even cheating. On the contrary, some groups with educational sentiments and abilities are seriously disadvantaged in the acquisition of scientific research funds, and have a serious negative impact on the scientific research career. A large part of the people in this scientific research group are returnees. In particular, the returnees who are studying for masters and doctoral degrees abroad have few personal connections in the country, which puts them at a disadvantage

[8] From a field survey of an engineering university in Shanghai from 2016 to 2022

in obtaining scientific research funding[9].

In addition, the allocation system of scientific research funds under the background of marketization is based on the scientific research performance results of the previous year. In this way, on the one hand, it is unfair for basic research with a long scientific research output cycle; on the other hand, it is impossible to measure its output for future and prospective research. This leads to the short-term utilitarian characteristics of scientific research distribution, which has a serious negative impact on the independent innovation output of scientific research, and will form a vicious circle in the long run. This will also seriously affect the cultivation of innovative talents.

Groups of researchers with academic titles or hats, such as academicians, among them, obtain large amounts of scientific research funds through their prestige and interpersonal network in academia, and outsource scientific research tasks that they and their team members cannot complete to other teams or individuals. These teams or individuals are often academic teams or individuals with lower status than the above-mentioned personnel. In this way, in fact, many scientific research projects are completed by researchers in non-professional fields, resulting in poor output and quality of scientific research results[10].

Inefficiency in the use of funds caused by the fact that the same research topic is supported by a large number of project funds. This situation generally exists in groups of researchers with high academic or administrative power. These researchers have a certain influence or interpersonal relationship in the academic or administrative field. They apply for scientific research funds through various channels for research on the same topic. As a result, the cost of funds is huge but the completed scientific research results are produced. low quality and low quantity.

The shortage of engineering practice equipment and facilities or the improper distribution and use of scientific research output results. In local engineering application-oriented colleges and universities, there must be corresponding instruments and equipment for engineering practice research. Powerful administrative leaders or academic leaders often control the right to use equipment or instruments. There are no reasonable rules and regulations for the right to use equipment. Dissidents are often excluded from using equipment for scientific research, resulting in low scientific research output[11].

Too much emphasis on the market-oriented distribution system of scientific research funds makes the amount of scientific research funds and the number of projects obtained by scientific researchers engaged in basic research very low, and innovation requires the transformation of patents created by basic research. The low quality of the transformation of scientific and technological achievements is directly related to the phenomenon of fraudulent transformation of scientific research achievements under the

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[9] From 2016-2022, interviews and surveys of many universities in Shanghai, 2 universities in Guangdong Province, and many universities in Beijing.

[10] From a field survey of a research university and two local applied universities in Shanghai from 2013 to 2022.

[11] From the interview survey of many engineering application-oriented universities in Shanghai from 2016 to 2022.

current scientific research evaluation system. Patents are related to material rewards and personal honors in various aspects such as scientific research funding support, professional title promotion, and awards. Therefore, some college teachers find affiliated companies for virtual transformation in order to obtain patents. In fact, this is undoubtedly a disguised academic corruption. In recent years, application-oriented colleges and universities, including higher vocational colleges, require a certain proportion of teachers who teach in schools to have corporate work experience. In view of this, many college teachers use industry-university-research cooperation projects to establish companies, and carry out dark-box operations for the transformation of scientific and technological achievements within their own companies[12].In this way, the exaggerated problem of the transformation of scientific and technological achievements has become a problem that seriously affects scientific and technological innovation, and has become one of the problems that need to be solved urgently.

3.8 Light teaching, heavy research

Whether it is financial scientific research funds or project funds from enterprises, most of them are used for scientific research, and very little is used for teaching. Especially for teaching reform projects, most of the funds are taken by administrators who are not directly responsible for undergraduate teaching, and teachers who directly teach undergraduates on the front line are indeed rarely received (Lin Yaqiong, 2021). There is the problem of the evaluation system and mechanism of funds. Including the issue of external review and internal funding review. This problem is more serious especially in local application-oriented colleges and universities. Administrative personnel in local application-oriented colleges and universities have more discourse power than academic professionals, and it can be said that administrative power is greater than academic power.

Another is the problem of teaching management and teaching: not enough attention is paid to undergraduate teaching. One of the reasons is the problem of the guiding system and mechanism of the evaluation of educational and teaching achievements. In the existing education and teaching evaluation system, the vast majority of schools simply take the output of scientific research results as the orientation for evaluating teachers' educational and teaching achievements. The promotion of teachers' professional titles, awards and evaluations, post-employment assessments, and annual performance assessments are mostly related to the output of scientific research results. And most colleges and universities regard the amount of scientific research funding, the quantity and quality of published papers (based on the journal impact factor ranking) as the criteria for professional title promotion and award evaluation. And teachers who do a good job of teaching rarely get positive evaluations. In terms of teaching, generally only the corre-

[12] Sourced from an interview and survey of internal scientific research managers of an applied university in Shanghai in December 2019.

sponding teaching tasks and workload can be completed. As a result, most teachers lack due enthusiasm for teaching. Most teachers do not do academic research on teaching, and do not seek quality in teaching, but only want to complete the teaching tasks assigned by the school.

3.9 Internal friction caused by the problem of internal governance in colleges and universities is serious

The lack of corresponding educational background and professional management training for the internal administrative personnel in colleges and universities has resulted in the lack of governance system and low governance capacity. For example, unclear rights and responsibilities among class teachers, counselors, academic tutors, and internship practice teachers are common in applied colleges and universities. Coupled with the fact that administrative power is greater than academic power, full-time teachers are often forced to do administrative work and other aspects of work. However, these tasks cannot be calculated as the workload of teacher assessment. The time occupied by full-time teachers doing administrative chores has caused pressure on teachers' teaching and research[13].

In addition, due to the curriculum setting and project application, the intervention of administrative power and the unhealthy behavior of some people, teachers' mental stress and job burnout are caused. This situation has seriously affected the teaching and scientific research of full-time teachers, and has a serious negative impact on the cultivation of engineering and technological talents. In a word, various problems are related to education governance. Establishing a fair and efficient education governance system and mechanism can largely avoid the occurrence of the above problems and directly affect the effectiveness of engineering and technology talent training.

4. Conclusions, recommendations and topics for future research

4.1 Reforming the Educational Decision-Making Mechanism

The existing educational decision-making mechanism is relatively simple. There is an urgent need to reform the educational decision-making mechanism with the participation of multiple subjects. Especially in engineering technology education, its practical education requires in-depth industry-university-research cooperation, and industry enterprises are an important carrier of industry-university-research cooperation. Under the premise of market-oriented resource allocation of higher education, at present, the mechanism for industry enterprises to participate in education decision-making has not been established and perfected, resulting in low enthusiasm for industry enterprises to participate in education decision-making. The government needs to mobilize industry enterprises to actively participate. One is to

[13] From 2010-2022, interviews with teachers from two universities in Guangdong Province and many universities in Shanghai.

implement preferential policies of tax reduction and exemption for enterprises like developed countries, and another very important aspect is to stimulate entrepreneurship. Under the theoretical guidance of the triple helix innovation model, a modern industrial college system of new engineering education will be built. While giving full play to market-oriented resource allocation, strengthen the functions of government governance and regulation. In addition, as to how to cultivate entrepreneurial spirit, should it be realized through entrepreneurship and innovation education in colleges and universities, or through some other means? The issue of training paths needs to be discussed in depth.

4.2 Reforming the curriculum and classroom teaching methods

Condensing the curriculum, improving the learning effect of each course, and enhancing the practice curriculum. Increase the reform of classroom teaching mode, and actively explore and promote the reform of classroom teaching in which students are deeply involved. Students' deep participatory teaching reforms such as PBL, PBJ, and AL can stimulate students' curiosity, imagination, judgment, and students' ability to discover, ask, and solve problems. In order to cultivate students' critical thinking, divergent thinking, creative thinking, and other engineering thinking abilities. To achieve the ultimate goal of cultivating students' ability to solve complex engineering problems.

Guide teachers to do academic research on teaching and study the cultivation of technical and non-technical factors of engineering students, so as to maximize the learning effect. Running through the "student-centered" education and teaching philosophy. The imparting of knowledge and the cultivation of ability are paralleled, and individualized education is carried out in different courses to stimulate students' inner drive, cultivate students' independent thinking ability and judgment, and develop the habit of lifelong learning.

4.3 Develop students' higher-order thinking skills

The current education model, from the basic education stage to the higher education stage, is not conducive to the cultivation of innovative talents. One of the important characteristics of innovative talents is the ability of higher-order thinking such as critical thinking and creative thinking. So how do you develop higher-order thinking skills? Is it enough to train only at the higher education stage? the answer is negative. The author believes that the cultivation of this kind of thinking should be paid attention to from the 0 basic education stage of school education. To this end, systematic reforms should be carried out in terms of curriculum setting, teacher allocation and teaching mode. For example, it cultivates students' various abilities and literacy through comprehensive practical activities, and cultivates students' critical thinking ability through Chinese reading teaching in middle schools.

Critical thinking education has been implemented for more than half a century in education-first countries, but its implementation in various educational stages in my country has just started, and only a

few teachers are doing it themselves. The education of critical thinking must be implemented from the educational policy in order to cultivate students' creativity, which is indispensable for the cultivation of innovative engineering and technological talents. How to implement? It needs to organize specialized personnel to study. It is necessary to carry out extensive investigation and research, and it needs to be jointly explored by scholars in educational psychologists, engineering, and educational sociology. Large-scale universal implementation will not be completed in a short period of time.

4.4 Reform the top-design of governance and evaluation on scientific research and teaching

Reform the status quo of emphasizing research and ignoring teaching, and strengthen the selection of teachers and pre- and post-employment training. Set up a certain proportion of special funds to support teaching; and strengthen support for teaching and academic research. Reform the scientific research evaluation system, reform the academic paper review system, and implement an anonymous peer review system for all submitted papers. The audit of the subject project is completely anonymous. Facial recognition systems that utilize artificial intelligence to ensure that audits are carried out by the experts themselves rather than the graduate students they supervise.

For all teaching and research personnel, a certain proportion of basic scientific research funding is set up, so that researchers can have basic funding support for insisting on scientific research even if they cannot obtain competitive scientific research funding support due to limitations. Efforts should be made to maximize the efficiency of scientific research funds, discuss and implement scientific and reasonable evaluation systems and supervision mechanisms.

4.5 Reducing the cultural obscurity in educational governance

Educational administrative governance departments, whether external or internal, are culturally obscured due to the comprehensive quality of their administrators, making the overall efficiency and fairness of educational governance low. This is the so-called modernization of the educational governance system and governance capacity, and it is also a key issue that needs to be solved urgently in the current education reform in China. Only by solving this problem can we achieve institutional innovation in educational governance. Institutional innovation is the basic guarantee for talent training and scientific research innovation.

4.6 Strengthen the implementation of the "double reduction" policy

The requirement of the double reduction policy is to effectively reduce the burden of excessive homework and off-campus training for students in the compulsory education stage. To this end, on July 24, 2021, the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "Opinions on Further Reducing the Burden of Students' Home-

work and Off-campus Training in Compulsory Education". One of the goals is to effectively reduce the burden of students' heavy homework and off-campus training, family education expenditure and the corresponding energy burden of parents within one year, and significantly reduce various burdens within three years, further improve the quality of education, and the people's satisfaction with education is obvious promote. The basic education after the "double reduction" has changed the characteristics of the previous test-oriented education and placed more emphasis on the cultivation of key abilities and core literacy; it is conducive to cultivating students' curiosity and imagination, enabling children's personalities to be brought into play, and helping to cultivate children's their creative thinking. Creative thinking is essential for innovative engineering and technology talents. Strengthen the research and analysis on the implementation of the double reduction policy, continuously improve and perfect its implementation methods and paths, and cultivate children's curiosity and creativity.

4.7 Strengthen the implementation of STEAM education from the basic education stage

After the implementation of the "double reduction" policy, the time when students' academic burden is reduced, the education in science, technology, engineering, art and other aspects will be strengthened through school education. And continue to explore and improve its implementation effect. Cultivate students' wide range of interests and hobbies, which can cultivate students' core literacy and key abilities, and cultivate students' curiosity, imagination, critical thinking ability, and creative thinking ability.

4.8 Strengthen the reform of the college entrance examination system

The new college entrance examination system implements 3+3, that is, three compulsory subjects (Chinese, mathematics, English) and three optional subjects (that is, three subjects selected from physics, chemistry, biology, history, geography, and politics are included in the college entrance examination score.). Compared with the previous dichotomy in which the college entrance examination was simply divided into liberal arts and science, this reform laid the foundation for the implementation of interdisciplinary education in higher education. One of the characteristics of innovative engineering science and technology talents is the engineering ability to solve complex problems. Interdisciplinary education is formally designed to develop this ability. Research and improve the shortcomings and deficiencies in the college entrance examination system, increase the probability of candidates' interest in admission, and lay the foundation for the suitability of university disciplines.

4.9 Accelerate research and build a free marketplace of ideas

Ronald H.Coase, a Nobel Prize winner in economics, once pointed out that from economy to education, from law to politics, every corner of Chinese society lacks a vibrant market for ideas, and the lack of a free market for ideas directly leads to the lack of technological innovation (2013). He emphasized that

the development of the market for ideas will allow knowledge and innovation to guide China's economic development. At present, innovation-driven development requires a free and open market for ideas, and how to play a role in education, economic, and social development requires research.

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