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A Comparative Study on the Cultivation of Applied Undergraduates and Vocational Undergraduates

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Abstract

This paper reviews the relevant policies on applied undergraduates and vocational undergraduates in China, and makes a comparative study and definition of the orientation, talent cultivation objectives, and basic characteristics of applied undergraduates and vocational undergraduates. It studies the successful experiences of developed countries like Germany, Finland and Japan in constructing the talent cultivation system for high-level applied technology talents, so as to provide references for China's talent cultivation of high-level applied technology talents. From the aspects of cultivation level, practical ability requirements, dual-qualified faculty team building, applied specialty construction and so on, it studies the common ground of applied undergraduate and vocational undergraduate talent cultivation. From the aspects of school sponsors, student source quality, talent cultivation objectives, specialty settings, faculty structure, curriculum system, teaching organization and management, evaluation and guarantee mechanism, etc., it makes a comparison of the differences between the talent cultivation of applied undergraduates and vocational undergraduates.

Keywords

Applied undergraduates; Vocational undergraduates; Talent cultivation; Comparison.

1. INTRODUCTION

In the 1980s, China began to explore the cultivation of applied technology talents. In 2013, Sichuan Province approved the pilot reform of cultivating applied undergraduate talents jointly by six institutions, which closely combined with local characteristics to cultivate applied talents. Generally speaking, applied undergraduate education is a kind of professional generalist education. It pays attention to students' systematic and solid basic theoretical knowledge learning and reserve, namely the shaping of the quality of scientists, to lay a solid foundation for students' long-term development in the future. At the same time, it is also a competence-based education, an education to prepare students for entering the real and future job market or starting a business, namely the cultivation and training of engineering capacity.

Compared with applied undergraduates, the concept of vocational undergraduates emerged later. In 2011, Wu Xianfu[1] from Beihang University first proposed the concept of "vocational undergraduates", and studied the connotation of vocational undergraduate education and its school sponsors. In June 2014, the State Council issued the Decision on Accelerating the Development of Modern Vocational Education (Guo Fa [2014] No.19), pointing out that "A number of ordinary undergraduate colleges and universities should be guided to transform into applied technology universities, focusing on undergraduate vocational education". For the first time at the policy level, it proposed "to carry out undergraduate vocational education". From

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2019 to 2023, the Ministry of Education approved 33 vocational universities by means of upgrading undergraduate institutions, merging independent colleges and professional institutions, and transforming independent colleges, to pilot undergraduate vocational education, officially initiating undergraduate vocational education in the form of government documents. Before that, Chinese scholars' expressions of this concept can be summarized as "technology undergraduate", "undergraduate vocational", "vocational undergraduate", "vocational undergraduate" and so on. In 2021, General Secretary Xi Jinping made important instructions on vocational education and stressed the need to "steadily develop vocational undergraduate education".

2. ANALYSIS OF CONNOTATIONS AND CHARACTERISTICS

Applied undergraduates are oriented to the needs of regional economic construction, and cultivate high-level applied talents with a certain theoretical foundation and strong practical ability. They cultivate high-level applied talents with both certain scientific and cultural knowledge and extensive knowledge, and strong engineering awareness, innovation awareness and practical ability. The teaching content has strong applicability, focuses on integrating theory with practice, and emphasizes cultivating students' engineering awareness, innovative spirit and practical ability. It adopts a school-enterprise cooperative training model.

Vocational undergraduates are oriented to the frontline of production, service and management, and cultivate high-level skilled talents urgently needed by the industry. The talent cultivation goal is to develop morality, intelligence, physique, aesthetics and labor in an all-round way, and cultivate high-level skilled talents with abundant professional and technical knowledge, strong practical hands-on ability, and capable of engaging in frontline production, management and service work directly. The professional settings match the directions of employment, combine theoretical teaching and vocational skills training, and adopt a school-enterprise cooperative training model. It focuses on cultivating students' vocational skills, professional quality and employability.

2.1. Training Objects

From the perspective of training objects, there are some differences between the two. Applied undergraduates emphasize theoretical foundation, while vocational undergraduates attach more importance to vocational skills for direct engagement in frontline work. The enrollment objects of applied undergraduates are mainly senior high school graduates who have just taken the college entrance exam, with more comprehensive and systematic knowledge structure. They are better at theoretical study and have stronger comprehensive application abilities. Applied undergraduate degree is more conducive for students to develop towards academic research. The enrollment objects of vocational undergraduates are mainly vocational college graduates and senior high school graduates with secondary vocational school diploma. They have stronger professional skills, but relatively weak knowledge foundation. Vocational undergraduate degree is more conducive for students to develop towards professional technology.

2.2. Training Objectives

The goal of applied undergraduate is to cultivate high-level applied talents with a certain theoretical foundation and strong practical ability to meet the needs of regional economic and social development. The goal of vocational undergraduate is to cultivate high-level vocational skilled talents that can directly engage in frontline production, service and management, and meet the needs of industrial and vocational development. Applied undergraduates emphasize cultivating students' innovation awareness and practical ability by combining theory with

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practice. Vocational undergraduates emphasize cultivating students' professional technical competence and professional quality.

2.3. Training Models

Applied undergraduates focus on school-enterprise cooperation and emphasize knowledge acquisition in work process. Vocational undergraduates emphasize joint talent cultivation between schools and industry enterprises. The two have some common ground in school-enterprise cooperation, but applied undergraduates place more emphasis on work process learning.

2.4. Training Outcomes

Graduates of applied undergraduates can choose direct employment or further their studies through postgraduate education to prepare for innovation and entrepreneurship. They are suitable for medium and high-level technology and management positions. Graduates of vocational undergraduates mainly choose direct employment. They have stronger employment competitiveness and are more suitable for grassroots technical positions. Applied undergraduates have more flexible choices for employment or further studies.

Through the above theoretical comparison of the two undergraduate education levels in terms of training objects, goals, models and outcomes, it can be seen that applied undergraduates relatively emphasize more on cultivating students' application abilities and practical innovation spirit, while vocational undergraduates attach more importance to vocational skills training required for direct employment. But both highlight the training model of school-enterprise cooperation and have common ground in cultivating application abilities. These theoretical differences are helpful for clarifying the positioning of the two undergraduate education types.

3. POLICY GUIDANCE

In recent years, the Ministry of Education and other ministries and commissions have successively introduced multiple policies to support and standardize the development of applied undergraduate education.

In 2012, the Ministry of Education's "Several Opinions on Comprehensively Improving the Quality of Higher Education" proposed "supporting a number of ordinary undergraduate colleges and universities to set up applied undergraduate majors oriented to the needs of regional economic and social development".

In November 2015, the Ministry of Education, the National Development and Reform Commission and the Ministry of Finance jointly promulgated the "Guiding Opinions on Guiding the Transformation of Some Local Ordinary Undergraduate Universities into Applied Types", which officially opened the curtain for the transformation and development of applied undergraduate education by local undergraduate colleges and universities.[2]

In 2020, the CPC Central Committee and the State Council issued the "Overall Plan for Deepening the Reform of Education Evaluation in the New Era", clearly proposing "promoting the classified evaluation of universities and guiding different types of universities to scientifically position themselves and develop their own characteristics and standards", and deployed 8 specific tasks, one of which is: Exploring the establishment of evaluation criteria for applied undergraduate programs, focusing on cultivating corresponding professional competence and practical application abilities.

In 2021, the Ministry of Education website responded to the "Recommendations on Accelerating the Construction of High-level Applied Universities", mentioning that it is necessary to strongly support the development of applied universities through special funds

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such as "support funds for local university reform and development", and give appropriate inclination to regions with remarkable effects in carrying out reform pilot projects on transformation into applied universities.[3]

The "Implementation Plan for Undergraduate Education Teaching Assessment of Ordinary Colleges and Universities (2021-2025)" issued by the Ministry of Education in 2021 provides two types and four "assessment packages" for universities to choose independently. One type is oriented towards applied universities, with a focus on examining the personnel training objectives, resource conditions, training process, student development, teaching effectiveness and other aspects of undergraduate education, so as to promote such universities to focus on cultivating applied talents and serve regional economic and social development and demonstrate local characteristics.

As of 2021, there were a total of 1,238 ordinary undergraduate colleges and universities nationwide. Excluding the 147 universities currently undertaking "double first-class" construction (positioned as research universities, focusing on cultivating academic talents), the remaining 1,091 universities are mainly positioned as application-oriented, accounting for a high proportion of 88%[4].

In 2014, the State Council issued the "Decision on Accelerating the Development of Modern Vocational Education" (hereinafter referred to as the "Decision"), which clarified the guiding ideology, basic principles, goals and tasks, and policy measures for accelerating the development of modern vocational education in the next period.

The "Decision" proposes that "by 2020, a modern vocational education system with Chinese characteristics and world standards will be formed to meet development needs, achieve deep integration of industry and education, connect secondary and higher vocational education, enable communication between vocational education and general education, reflect the concept of lifelong education."

It is proposed to study and establish a degree system suited to the characteristics of vocational education. In principle, secondary vocational schools will not be upgraded to or merged into higher vocational colleges, and higher vocational colleges will not be upgraded to or merged into undergraduate colleges and universities, so as to form a clearly positioned and scientifically rational vocational education hierarchy.

Guidance will be provided for the transformation and development of ordinary undergraduate colleges and universities. Pilot promotion, demonstration guidance and other means will be adopted to guide a number of ordinary undergraduate colleges and universities to transform into applied technology-oriented institutions of higher learning, focusing on offering undergraduate vocational education. Independent colleges that are changed into independently established institutions of higher learning are encouraged to position themselves as applied technology-oriented institutions of higher learning.

The channels for the diversified growth of vocational education talents will be improved. Examination enrollment methods such as "cultural literacy + professional skills", separate recruitment, comprehensive evaluation-based recruitment, and top skills talent recruitment without examination will be improved to provide students with opportunities to receive vocational education at different levels.

The "National Vocational Education Reform Implementation Plan" issued by the State Council in January 2019 proposes to clarify the orientation of vocational education and general education, optimize the professional structure, and build a modern vocational education system with complementary main functions.[5]

Therefore, current policies promote the scientific development of applied undergraduate and vocational undergraduate education in a coordinated manner to achieve functional

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complementarity. The "Vocational Education Quality Improvement Action Plan (2020-2023)" issued by nine ministries including the Ministry of Education proposes to steadily advance the pilot of undergraduate vocational education, and support eligible Chinese-characterized high-level higher vocational colleges and universities to pilot undergraduate vocational education programs[6]. It also promotes the transformation of qualified ordinary undergraduate universities into applied ones. According to industry needs and characteristics, appropriately expand the scale of cultivating master's and doctoral degrees in professional disciplines, and promote the development of professional postgraduate training models that are oriented by vocational needs, focus on practical ability training, and integrate industry, academia, research and application in various places.

As of June 2023, there were a total of 1,578 higher vocational colleges nationwide, including 1,545 secondary vocational schools and 33 undergraduate vocational colleges. There were 1,181 public vocational schools and 397 privately-run and Chinese-foreign cooperatively-run schools.[7]

4. PRACTICES OF CULTIVATING HIGH-LEVEL APPLIED TECHNOLOGY TALENTS IN FOREIGN COUNTRIES

There are certain differences between developed countries like Germany and China in terms of national conditions, management systems, and cultivating high-level applied technology talents. There are no concepts of "vocational bachelor's" and "applied bachelor's", but correspondingly there is applied technology university education, such as German Universities of Applied Sciences (FH), Finnish Universities of Applied Sciences, Japanese Institutes of Technology, etc.

German Universities of Applied Sciences differ from comprehensive universities in that their talent cultivation goal is to provide students with higher engineering technology education that closely integrates theory and practice, and through sufficient vocational training, enable students to become intermediate and high-level professional and technical personnel in a certain field. According to the training objectives, the career positioning of graduates from Universities of Applied Sciences is: practitioners of various specialized vocations and engineering professions with advanced applied skills, engaged in work such as product development, quality inspection, accounting, design, production, assembly, maintenance and marketing. They are the technical and management backbone of large and medium-sized enterprises.

The core strengths of Universities of Applied Sciences lie in their practicality and application-oriented talent cultivation, reflected in many aspects including majors, courses, faculty, resources, etc. Emphasis is placed on closely integrating theoretical teaching and practical teaching, not only imparting systematic professional knowledge, but also focusing on cultivating students' engineering thinking abilities and hands-on practical abilities. German companies work closely with universities and directly participate in curriculum design and project design to make the teaching process meet the needs of actual engineering projects. Students increase practical experience through university-enterprise cooperation. German Universities of Applied Sciences form close cooperation with regional industries to achieve integrated industry-academia-research-application development. They have successfully cultivated a large number of high-level technology application talents that meet economic and social needs. [8]

Universities of Applied Sciences in Finland have a clear orientation of serving local economic development. Finnish Universities of Applied Sciences emphasize application-oriented talent cultivation, requiring the talent cultivation process to focus not only on combining theoretical and cultural knowledge, but also highlighting their application and practical abilities. Research highlights applicability, faces social and economic life, and serves regional economic

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development as the goal of its school-running orientation. The school-running levels are built around undergraduate and master's degrees as the main levels.[9]

Finnish Universities of Applied Sciences were authorized to grant bachelor's degrees from the outset. Later the authority was extended to granting master's degrees. At the beginning of this century, Finland amended relevant laws to clearly stipulate that Universities of Applied Sciences can issue bachelor's degrees. In 2005, the law further clarified the cancellation of associate degrees and granting authority for master's degrees. The continuous improvement of the levels of Finnish Universities of Applied Sciences has greatly enhanced the attractiveness of Finland's application-oriented vocational education, thus better meeting the needs of social and economic development. The diverse needs of students are met.[9]

The curriculum structure of Finnish Universities of Applied Sciences consists of five aspects: elective courses, professional studies and basic studies, thesis and practical training. From the curriculum design we can see that Finnish Universities of Applied Sciences integrate theoretical learning and social practice, focusing on cultivating students' abilities in independent analysis and problem solving.

High standards are set for teacher team building. Quality education and quality teacher resources are inseparable. One of the important reasons for the success of Finnish Universities of Applied Sciences is their extra emphasis on teacher team building.

Modular and project-based teaching is emphasized. Teaching activities are designed based on project tasks, and students are encouraged to take initiative in learning and teamwork. Theoretical courses revolve around project tasks, emphasizing the cultivation of hands-on skills. Higher vocational education is closely integrated with industries, with curriculum design and project design taking into account industry demands to ensure graduates have good professional skills. Graduates can directly meet job requirements with over 90% employment rate. Finnish higher vocational education has established a good social reputation, and parents and students have relatively strong recognition.

Over the past forty years since the development of Institutes of Technology in Japan, they have always adhered to the school-running positioning and talent training objectives of cultivating technology-oriented talents. They have continued to deepen, innovate and integrate in the field of "technology" education, improving students' academic qualifications while enabling them to master cross-field composite technology R&D capabilities.[10]

In addition, through connecting with technical college education, Institutes of Technology in Japan have effectively connected higher vocational education with undergraduate professional education. Their implementation of the "undergraduate-master" seamless education system has also constructed a professional education system that connects undergraduate and graduate studies.

In this way, Institutes of Technology in Japan have expanded Japanese vocational education from secondary vocational schools all the way to the doctoral level. It can be said that such a seamless vocational education system that connects effectively meets the development needs of most students and provides strong support for the training of Japanese technology-oriented talents.

Studies have shown that the boundaries between applied and research-oriented universities are clear in foreign countries. Applied education and vocational education develop in parallel, with governments attaching great importance to high-level applied technology education at the policy level, regarding it as a socialized system project.

In terms of talent cultivation models, they have clear talent cultivation goals for applied technology talents, emphasize practical ability development, align major settings with regional

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industrial demands, build a curriculum system that closely combines with production realities, improve dual-teacher faculty teams, and actively engage in school-enterprise cooperation.

These successful experiences have important reference value for the development of applied undergraduate programs and vocational undergraduate programs in China.

5. CHINESE APPLIED UNDERGRADUATE PROGRAMS AND VOCATIONAL UNDERGRADUATE PROGRAMS HAVE SOME PROBLEMS.

The positioning of applied undergraduate programs is not clear enough, and the boundary with regular undergraduate programs is blurred. The development of applied teacher teams needs to be strengthened. The connection between curriculum content and industry demands is not close enough. More efforts are needed to improve applied skills training. The quality assurance system is imperfect.

Regarding vocational undergraduate programs, some overly pursue academic orientation. The quality of student enrollment is uneven. Students' practical and hands-on abilities are weak. Teachers' applied abilities need improvement. School-enterprise cooperation is not close enough. Curriculum development deviates from industry demands. Majors offered are too singular and update slowly.

Currently the boundary between applied undergraduate programs and vocational undergraduate programs is also unclear. Applied undergraduate programs focus on applied skills training, while vocational undergraduate programs focus on vocational skills directly required for employment. But both emphasize application in curriculum design and teaching, making them hard to distinguish. This leads to confusion in society regarding the two types of programs. Students also find it hard to differentiate when selecting majors. Their positioning should be clarified, with applied undergraduate programs highlighting the development of students' comprehensive applied abilities, and vocational undergraduate programs focusing on professional technical skills.

Therefore, the orientations of these two types of programs need to be further clarified. More investment is needed in teacher team building. Integration of industry and education as well as school-enterprise cooperation should be strengthened. Quality supervision should be enhanced and scientific evaluation mechanisms need to be established.

6. COMPARISON OF TALENT CULTIVATION IN APPLIED UNDERGRADUATE PROGRAMS AND VOCATIONAL UNDERGRADUATE PROGRAMS

6.1. Similarities

(1) Same level of talent cultivation

Both applied undergraduate programs and vocational undergraduate programs belong to undergraduate education and require undergraduate degrees. The student sources for both are high school graduates. Graduates from both can apply for master's programs. In terms of academic credential levels, the two are consistent.

(2) Emphasis on practical ability development

Both applied and vocational undergraduate programs emphasize the integration of theoretical teaching and practical teaching, and stress school-enterprise cooperation. Through training, internships, and project-based learning, they cultivate students' hands-on practical abilities and problem-solving abilities. Approaches include establishing off-campus training bases, introducing project case studies, and holding various innovation and entrepreneurship competitions. Through training, internships, and project-based teaching, students' practical operation skills and abilities to solve real problems are cultivated.

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(3) Building dual-teacher faculty teams

Both applied and vocational undergraduate programs emphasize building "dual-teacher" faculty teams, requiring teachers to have good teaching skills and industrial/enterprise practical experience. The engineering practice abilities of teachers are continuously improved.

(4) Strengthening application-oriented major offerings

Both types of programs are oriented to local economic development needs and actively offer application-oriented new majors that serve regional economic growth. Innovation and entrepreneurship education contents are increased in talent cultivation programs, related courses and entrepreneurship competitions are held to foster students' innovative spirit.

6.2. Differences

(1) Different administrative bodies

Applied undergraduate programs are mainly established by regular undergraduate institutions by adjusting their major offerings and curriculum systems and setting up some application-oriented majors. The administrative bodies still belong to the regular higher education system.

Vocational undergraduate programs are mainly offered by higher vocational colleges, belonging to the secondary vocational education system. Higher vocational colleges establish some vocational undergraduate majors by elevating their program levels. The administrative bodies belong to the vocational education system.

(2) Different major settings

Applied undergraduate majors focus on emerging interdisciplinary fields, serving local economic development. Vocational undergraduate majors serve the talent needs of related industry sectors.

(3) Different faculty structures

The faculty teams of applied undergraduate programs mainly come from regular undergraduate institutions and are more adapted to theoretical teaching. Their engineering practical abilities need further enhancement.

The faculty of vocational undergraduate programs mostly come from higher vocational colleges and are more used to skills training teaching. Over-academization needs to be prevented, with an emphasis on skills training retained.

(4) Different curriculum systems

Applied undergraduate programs emphasize general education while vocational undergraduate programs stress professional education. Applied undergraduate programs have more balanced curriculum structures.

(5) Different teaching organizations

Applied undergraduate programs are relatively flexible, making full use of the teaching resource advantages of regular undergraduate institutions, such as research platforms and innovation training bases, with an emphasis on heuristic teaching. Vocational undergraduate programs stress skills training, utilizing the practical training and internship platforms of higher vocational colleges to organize skills training in a more systematic manner.

(6) Different evaluation methods

Quality monitoring of applied undergraduate programs is based on regular undergraduate standards, emphasizing process-oriented evaluation, innovative thinking and problem-solving abilities. Applied undergraduate programs should establish evaluation systems that fully reflect students' innovative thinking and practical engineering problem-solving abilities. Quality monitoring of vocational undergraduate programs follows vocational education standards,

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focusing on evaluating students' mastery of professional technical skills. Vocational undergraduate programs should establish systematic professional technical skill requirements and evaluation criteria.

In summary, applied and vocational undergraduate programs share similarities in talent cultivation levels and practical skills development, but differ significantly in administrative bodies, orientations, and cultivation goals. The relationship between the two should be properly handled to achieve complementary advantages and jointly improve the quality of applied technology talent cultivation.

7. ETHICAL APPROVAL

This article does not contain any studies with animals performed by any of the authors.

8. ETHICAL APPROVAL

This article does not contain any studies with human participants or animals performed by any of the authors.

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10. DATA AVAILABILITY STATEMENT

No data were used to support this study.

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