

The Status Quo, Problems and Countermeasures of Disciplinary and Professional Construction in Applied Universities Against the Background of Industrial Structure Upgrading

Empirical Analysis Based on 18 Transitional Pilot Universities in Sichuan*

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Abstract—Through a descriptive analysis of the changes in the discipline and industry structure of Sichuan's overall transformation pilot colleges and universities and an empirical analysis of the coordination between the two, the results show that: the discipline and specialty construction is basically coordinated with the industrial structure adjustment, and there is still a lack of professional dynamic adjustment, proactive and forward-looking nature, overall layout, duplication of some majors and cooperation and co-construction; three suggestions for the construction of the disciplines and specialties in the pilot universities are proposed: it is to proactively adapt to the adjustment of industrial structure and establish a professional dynamic adjustment mechanism, proactively connect industrial clusters and build regional disciplinary groups, and proactively build a community of interests and strengthen the practical results of integration of production and education.

Keywords: *industrial structure, application-oriented colleges, discipline construction, transformation, development*

I. INTRODUCTION

In October 2015, the three ministries and commissions jointly issued the "Guiding Opinions on Guiding the Transformation of Some Local Ordinary Undergraduate Universities to Application Types" [1] (hereinafter referred to as the "Opinions"), and put forward 14 major tasks for the transformation and development of local ordinary colleges and universities. The "application-oriented" positioning of the transformation of local colleges and universities and the transformational goals of serving regional economic and industrial development were clearly stated. "The identification of a group of pilot universities with conditions and willingness to take the lead in exploring application-oriented (including applied-technical universities and colleges) development models" was clearly proposed. The

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change of thinking has officially started the prelude to the transformation and development of local colleges and universities to the application-oriented college. Under the guidance of the "Opinions", with the continuous advancement of comprehensive education reform, Sichuan newly-established undergraduate colleges have gradually joined the tide of transformation and development. As of the end of June 2016, 18 colleges and universities have been identified as "pilots for the overall transformation and development of undergraduate institutions" by the Sichuan Province Education System Reform Leading Group Office Colleges and Universities.

The report of the Nineteenth National Congress of the Communist Party of China puts forward that "accelerating the modernization of education, accelerating the construction of first-class universities and first-class disciplines, and achieving the connotative development of higher education", indicates the important role of discipline construction in advancing the connotative development of higher education. Disciplines are the basic unit of colleges and universities, and they are the core elements and important carriers for fulfilling the functions of colleges and universities. "The transformation of local undergraduate colleges and universities into application-oriented institutions should focus on application-oriented discipline construction." The actual needs and future needs of regional economic and social development "will lay out disciplines and professional structures to enhance the ability to serve regional development. [2] After a period of exploration of application-oriented transformation, have the 18 transformational pilot universities achieved the goal of connecting regional economic and industrial development, and have they seized the development opportunities of new industries, new formats and new technologies and established them? The discipline and professional structure suitable for industrial development is the starting point for carrying out this research. This article aims at the status quo of discipline and specialty construction of pilot universities

in the overall transformation, development, and reform of 18 undergraduate universities in Sichuan, analyzes their coordination with the industrial structure, and finds existing problems, with a view to providing a reference for the discipline construction of applied universities.

II. STATUS QUO AND UPGRADING TRENDS OF THE THREE INDUSTRIES IN SICHUAN

Since the 18th National Congress of the Communist Party of China, Sichuan has implemented the "Three Development Strategies", strived to promote the "two leapfrogs", proactively adapted to the new normal of economic development, focused on promoting innovation-driven development, actively cultivated high-tech modern industries, continuously optimized the industrial structure, and leveled the industry Continuous improvement, industrial transformation and upgrading continue to advance.

A. Rationalization of industrial structure

As can be seen from "Fig. 1", as of 2015, the output value of the secondary industry in Sichuan has increased rapidly, occupying a larger proportion in the three industries. The tertiary industry has followed closely, and the output value has continued to increase in the past ten years. In 2016, the output value added value was 14,831.7 billion yuan, an increase of 9.1%, accounting for 45.4% of the three industries, exceeding the proportion of the secondary industry for the first time. The three industrial structures in Sichuan were adjusted from 12.2: 44.1: 43.7 in 2015 to 12.0: 42.6: 45.4 in 2016, realizing the optimization from "two three one" structure to "three two one" structure, which is in line with the general evolution of modern industrial structure Law, the industrial structure tends to be rationalized.

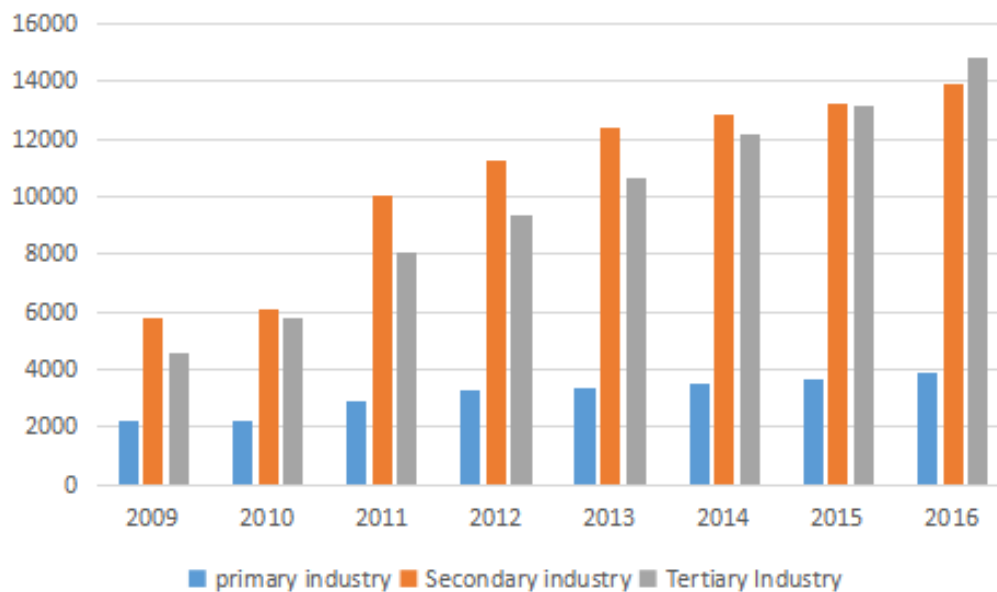


Fig. 1. Changes in Sichuan's industrial structure from 2007 to 2016 (Unit: 100 million yuan) (Data source: Sichuan Statistical Yearbook (2008-2015), National Economic and Social Development Statistics Bulletin of Sichuan Province in 2015 and 2016).

B. Industrial upgrading and modernization

During the "Twelfth Five-Year Plan" period, in order to promote industrial upgrading, Sichuan actively cultivated and promoted the development of high-end modern industries, focusing on cultivating aviation and gas turbines, information security, new energy vehicles, rail transit, biomedicine and other industries. The leading role of upgrading, the total output value of high-tech industries reached 1.6 trillion yuan, an increase of 128%, and the industrial structure adjustment highlighted the characteristics of modernization. In the "Thirteenth Five-Year Plan", Sichuan clearly put forward the upgrading goals of cultivating and expanding emerging industries, developing advanced manufacturing industries, developing modern service industries, and developing modern agriculture, and

established a blueprint for the development of a modern industrial system with Sichuan characteristics.

C. Clustering of industrial layout

Under the direction of General Secretary Xi, Sichuan implements the development strategy of "one trunk and multiple branches", builds a new regional development pattern of "one trunk, multiple branches, and cooperation in the five regions", and realizes the industrial cluster layout of coordinated regional development. According to the regional characteristics and development potentials of the major economic zones, the industrial development goals of the five major economic zones are clarified: Chengdu Plain Economic Zone is a cluster of modern high-end industries, South Sichuan Economic Zone is an advanced manufacturing base, and Northeast Sichuan Economic Zone

is clean energy. Chemical base, characteristic agricultural product base, ecological and cultural tourism zone, Panxi Economic Zone is a hydropower development base, modern agricultural demonstration base, and a sunshine recreation resort. The ecological and economic zone in northwestern Sichuan is an ecological and cultural tourism destination, renewable and clean energy base.¹ The five major economic zones have their own industrial development goals. With the central city as the medium, they have gathered and formed a clustered industrial chain, which has promoted the organic integration of industrial layout and urban agglomeration development.

III. COORDINATION ANALYSIS OF DISCIPLINE CONSTRUCTION AND INDUSTRIAL UPGRADING IN SICHUAN APPLIED UNIVERSITIES

A. *Basic coordination between discipline construction and industrial adjustment in application-oriented universities*

According to the list of colleges and universities nationwide released by the Ministry of Education, as of the end of May 2017, there were 109 ordinary colleges and universities in Sichuan, including 51 undergraduate colleges, which accounted for about half of the province's ordinary colleges and universities. "Half the Sky" has trained a large number of talents for the economic and social development and industrial upgrading of the province. Among the 51 undergraduate colleges, there are 18 application-oriented transformation pilot universities² (Hereinafter referred to as "pilot colleges and universities"), established a school running position serving regional economic and social development and industrial transformation and upgrading, and established a development strategy of discipline construction to serve industrial transformation. According to "Table I", the number of first-level disciplines set by pilot universities in 2017 was 59, and the number of second-level disciplines (hereinafter referred to as "specialties") was 626. (Year) (hereinafter referred to as the "catalog"), the 59 first-level disciplines set up by pilot universities accounted for 64.13% of the first-level disciplines in the catalogue, and the 626 majors deployed accounted for 40.78% of the number of majors in the catalogue.

It can be seen from "Table I" that among the twelve university disciplines set in the list, the pilot universities have fully covered the four first-level disciplines of pedagogy, literature, history, and management. The highest

proportions are: art (87.88%), management (63.04%), education (56.25%), and economics (52.94%), which are the corresponding disciplines of the tertiary industry, which are in line with the rapid development of the tertiary industry in Sichuan need. By comparing with the setting of disciplines and specialties in 2016, we can find that some of the new specialties established in 2017 are closely integrated with regional development strategies and the development of emerging industries. "Science and Big Data Technology", "Internet of Things Project", etc. meet the development needs of emerging industries. The existing characteristics and evolutionary trends of the discipline setting of the pilot universities show that the discipline construction of Sichuan applied universities basically conforms to the direction of industrial transformation and upgrading.

In addition, through the selection process of college application and expert review, the Sichuan Provincial Department of Education initiated the construction of the first 100 local undergraduate college application-type demonstration programs in February 2017. Among them, 45 of the pilot universities were approved to enter the project construction ranks it accounts for 45% of the province's demonstration majors. This is an affirmation of the level of construction of applied disciplines in pilot universities, and indicates that the applied disciplines of pilot universities have a certain degree of competitiveness in the province. From the perspective of the specialty of project construction, some pilot universities and colleges can meet the tradition of running schools and the needs of regional economic and social development. For example, the project construction of pilot universities in Panxi Economic Zone focuses on engineering and agronomy. The existing demand also meets the potential demand of the characteristic subtropical agricultural base in Panxi Economic Zone.

¹ Notice of the General Office of the Sichuan Provincial People's Government on Printing and Distributing the "13th Five-Year Plan"

² 18 application-oriented transformation pilot universities are Xichang College, Sichuan Media College, Southwest Jiaotong University Hope College, Sichuan Film and Television College, Sichuan College of Business and Technology, and Sichuan University of Arts and Sciences, Chengdu Neusoft College, Sichuan Institute of Culture and Arts, Jincheng College of Sichuan University, Chengdu College of Sichuan International Studies University, Tianfu College of Southwestern University of Finance and Economics, Yibin College, Panzhihua University, Chengdu Institute of Technology, Sichuan Tourism College, Chengdu Teachers College, Leshan Teachers College, Mianyang Normal University.

TABLE I. THE SETTING OF SUBJECT MAJORS IN PILOT UNIVERSITIES IN 2017

Disciplines	Number of first-level subjects in the catalog	Number of first-level disciplines	First-level discipline ratio (%)	Number of secondary subjects in the catalog	Number of secondary subjects	Secondary discipline ratio (%)	Number of points for secondary subjects
Philosophy	1	0	0	4	0	0	0
Economics	4	3	75	17	9	52.94	21
Jurisprudence	6	3	50	32	3	9.37	11
Pedagogy	2	2	100	16	10 ^b	56.25	32
Literature	3	3	100	76	25	32.89	88
History	1	1	100	6	2	33.33	4
Neo-confucianism	12	7	58.33	36	13	36.11	43
Engineering science	31	19	61.29	169	53	31.36	170
Agronomy	7	6	85.71	27	11	40.74	14
Medical science	2	2	18.18	44	2	4.55	2
Management science	9	9	100	46	30 ^c	63.04	130
Art science	4	4	80	33	29	87.88	111
Total	59	59	64.13	503	187	40.78	626

^a. Data source: "Category of Undergraduate Programs for General Colleges and Universities (2012)", professional settings announced by each pilot college.

^b. The second discipline "Education and Rehabilitation" was added to the pedagogy discipline, which is not included in the "Catalogue" and was not included in the calculation when the proportion of the secondary disciplines was set.

^c. The addition of the second-level discipline "Health Services and Management" in the management discipline is not included in the "Catalogue", and it is not included in the calculation when the proportion of the second-level discipline is set.

In summary, in the context of the continuous advancement of Sichuan's two leapfrogs and the overall transformation of the economy and society, certain achievements have been achieved in the construction of disciplines and specialty programs in Sichuan's application-oriented pilot universities, which have basically coordinated with industrial upgrading and are basically consistent with the need for industrial adjustment can cultivate a group of application-oriented, composite and innovative talents for the frontline of production and service for the economic and social development of Sichuan.

B. Existing problems

1) *Lack of initiative and foresight in professional dynamic adjustment:* A review of the discipline and specialty adjustments of the pilot universities in recent years shows that the newly added majors in the pilot universities are basically the majors set in the directory (except for "education and rehabilitation" and "health services and management" which are beyond the scope of the directory). It shows that the pilot colleges and universities majored on the catalog as the basis for dynamic adjustment, and lacked a professional dynamic adjustment mechanism that actively adapted to the industrial transformation. The catalog was revised in 2012, and it has been 5 years since then. In these

5 years, the economic and social needs of Sichuan have changed. The development of new industries, new formats and new technologies urgently needs the support of universities for emerging technologies and talents. . And the pilot universities that basically use the directory as the basis for their professional dynamic adjustment can be regarded as a discipline whose professional construction lags behind economic development and industrial transformation for 5 years, and it is difficult to closely meet the needs of industrial transformation and upgrading. According to "Table II", in 2016, Sichuan's industrial structure has undergone landmark changes. The proportion of the tertiary industry surpassed that of the secondary industry for the first time. The three industrial structures were adjusted to 12: 42.6: 45.4, forming a "Three Two One" modern industrial structure. Judging from the distribution ratio of the corresponding majors, the distribution ratio of the corresponding professions in the three industries is 2.24: 34.03: 63.74. Although it also has a "three two one" structure, the number of corresponding majors in the first industry is relatively small, only 14. The proportion of distribution points is low, accounting for 2.24%, and there is a certain gap between the actual needs of Sichuan to promote the development of modern agriculture.

TABLE II. INDUSTRIAL STRUCTURE AND CORRESPONDING PROFESSIONAL DISTRIBUTION IN 2016

Industry	Output value	Proportion of output value (%)	Professional points	Professional layout ratio (%)
primary industry	3924.1	12.0	14	2.24
Secondary industry	13924.7	42.6	213	34.03
Tertiary Industry	14831.7	45.4	399	63.74

^a. Data source: National Economic and Social Development Statistics Bulletin of Sichuan Province in 2016

IV. LACK OF OVERALL LAYOUT, DUPLICATION OF SOME MAJORS

The number of majors deployed in the pilot universities is 626, covering 186 majors in the catalog. Among them, 139 majors have repeated settings at different levels, accounting for 74.73%. The major subject categories with a large number of majors are engineering (35), Management (23), art (20). As shown in "Table III", there are 10 majors with a repetition rate of 50% (that is, half or more of the pilot universities have set up this major). There are 10 majors in English, computer science and technology. % and 72%, that is, 14 and 13 of the 18 pilot universities have set up this major. Pilot universities have their own disciplines in the setting of disciplines and specialties, and the lack of a coordinated layout of the government has created a serious

problem of duplication of professional settings. This has created a phenomenon of homogeneity in the specialty of pilot universities, which not only caused a waste of limited educational resources in the region but also brought educational output Structural surplus problems, such as the English majors with the most points, because the supply far exceeds the social demand, the employment rate has continued to decline in recent years, many graduates can only choose non-major employment, and the professional counterparts of graduate employment Lower. In addition, the phenomenon of professional homogeneity forming a multi-university aspect is not conducive to the establishment of school characteristics for each pilot university, and it is difficult to achieve a competitive advantage among similar universities.

TABLE III. DUPLICATE SETTINGS OF PILOT UNIVERSITIES

Disciplines	First-level discipline	Secondary Discipline	Number of points for secondary subjects	Repetition rate (%)
Economics	Economy and trade	International Economy and Trading	9	50
Art Science	Design	Product Design	9	50
Art Science	Music and Dance Studies	Music	9	50
Engineering Science	Computer	Digital Media Technology	10	56
Management Science	Business Management	Financial Management	10	56
Art Science	Design	Visual Communication Design	11	61
Art Science	Design	Environmental Design	11	61
Management Science	Logistics Management and Engineering	Logistics Management	11	61
Engineering Science	Computer	Computer Science and Technology	13	72
Literature	Foreign Language and Literature	English	14	78

^a. Data source: Major settings announced by each pilot institution

V. LACK OF COOPERATION AND CO-DEVELOPMENT

Since the transformation pilot, the pilot universities have opened the door of the ivory tower, and actively explored the cooperation path between the combination of industry and education, and the joint construction of shared disciplines between universities and docking industries. From the development status of cooperation and co-construction, some majors in the pilot universities have cooperated with related industries, but these majors are usually practical science and engineering majors, based on consciousness and operational barriers, and some humanities majors. No close cooperative relationship has been established with the industry. Industry-academia is divided into two different systems. Pilot universities have high enthusiasm for industry-academia cooperation due to the needs of transformation and development, while related companies have difficulty in obtaining benefits directly from it. The academic cooperation is not deep. Pilot universities cannot integrate closely with the actual needs of the industry in scientific research and development and personnel training, resulting in difficulty in transforming scientific research results and talent training that does not meet the actual needs of enterprises. In general, the industry-academia cooperation is mainly manifested in

the "hot spot" of pilot universities, insufficient corporate participation, the two sides failed to establish a scientific and reasonable cooperation mechanism, lacked all-round in-depth cooperation, and cooperation flowed on the surface; it is mainly for the construction of practical training bases and laboratories. Enterprises have less direct participation in the education process, failing to play their due role, and failing to achieve the goal of "collaborative education." There is still a gap between the actual needs of enterprise R & D and the effect of cooperation.

VI. SUGGESTIONS ON THE CONSTRUCTION OF DISCIPLINES AND SPECIALTIES IN PILOT UNIVERSITIES IN SICHUAN

A. Actively adapting to industrial structure adjustment and establishing a professional dynamic adjustment mechanism

Pilot universities should enhance their market sense and sensitivity to Sichuan's new industries, new formats and new technologies, actively adapt to the new demand for talent structure in the adjustment of Sichuan's industrial structure, formulate plans for the construction of medium- and long-term disciplines in schools, establish professional dynamic adjustment mechanisms, and promote professional supply,

and reforms to improve the degree of fit between discipline construction and industrial structure adjustment. First, establish a professional access mechanism, relying on regional industrial adjustment and upgrading planning, and actively build professional professions that are in urgent need of industrial development under the premise of careful demonstration and scientific prediction. According to the evolution trend of Sichuan's industrial structure as "three two one", pilot universities should appropriately add specialties related to the tertiary industry; in the face of the talent needs of the Sichuan system to promote the construction of a national comprehensive reform and innovation pilot zone, pilot universities should continue to innovate in discipline construction Model, training innovative talents that are in short supply in emerging industries; implementing education for targeted poverty alleviation, training new agricultural talents, and serving the needs of modern agricultural development. Second, innovate professional evaluation mechanisms, formulate professional evaluation indicators, and strengthen monitoring and supervision of the professional construction process. Combined with the development strategy of the new round of western development, the "Belt and Road" and the construction of the Yangtze River Economic Belt, pilot universities should take scientific professional evaluation indicators as the measure of professional construction, and continuously improve professional construction related to advanced manufacturing and modern agriculture. Third, establish a normalized professional early warning and exit mechanism, take industry adjustment demand changes as the vane, and take graduates' employment conditions as a reference to carry out "de-capacity" on the professional supply side, and transform or eliminate majors that are not suitable for industrial development.

B. Actively docking industrial clusters and building regional subject clusters

Worldwide, the "California Higher Education Master Plan of the United States" in 1960 was regarded as a model for the formulation of regional master plans for higher education. It conformed to the characteristics of regional public policies and determined the reasonable public higher education system in California. Economic development has provided a reasonable talent structure and a constantly updated knowledge base. [3] A rationally structured higher education discipline structure is the most important factor in promoting regional economic development. Reasonable planning and construction of higher education disciplines and professional layouts can maximize the effectiveness of higher education to promote economic development. On the one hand, in accordance with the development plans of the five major economic zones, based on the development of regional industrial clusters, the education authorities strengthened the macro planning of higher education and formulated a strategy for the construction of regional application-oriented professional groups. The design of Sichuan Higher Education Discipline Specialty Clusters must first identify the changes in regional leading industries, characteristic industries and industrial adjustments according

to the industrial planning of different regions; second, determine the advantages of close integration with the industry based on the existing spatial layout of applied disciplines Discipline majors, find the disciplinary majors that are inadequately connected with the industry; finally, based on the needs of the development of regional industrial clusters, and based on the existing disciplines and professional conditions, design an overall master plan for applied disciplines. On the other hand, based on the construction of professional groups, colleges and universities must strengthen communication, accurately locate, and carry out reasonable division of labor and cooperation according to their respective advantageous disciplines and majors to avoid waste of resources caused by disorderly competition.

C. Proactively building a community of interests and strengthening the effectiveness of the integration of production and education

The General Office of the State Council issued "Several Opinions on Deepening the Integration of Industry and Education" [4], formulated a macro policy on the integration of industry and education, and proposed "building a development pattern of integrated education and industry integration", "promoting the construction of disciplines and industry and industry The policy framework of "adapting to transformation and upgrading" and "strengthening the important role of enterprises" stipulates the rights and responsibilities of industry, government, and education in the integration of production and education, and provides a systemic guarantee for industry-academia cooperation at a macro level. However, the implementation of the system is difficult to achieve the desired results only by the intervention of administrative means, and must be jointly recognized by the three parties of industry, politics, and science for the integration of industry and education. However, industry politics comes from different social organizations, represents different interest subjects, and has complex and diverse interest needs. Marx's view of interests holds that respecting and protecting interests is an inexhaustible driving force for social development. [5] Only by respecting and safeguarding the interests of all parties and building a community of interests on the basis of mutual consultation can we ensure the implementation of the Opinions, ensure the joint participation of all parties, and truly achieve the purpose of industry-academia cooperation. From the perspective of colleges and universities, the integration of production and education is an important opportunity to promote the transformation and development of application-oriented colleges and universities, which has great value for establishing application-oriented disciplines in colleges and universities. Therefore, colleges and universities should take the initiative to attack, in accordance with the spirit of the "Opinions", open up ideas, actively explore the points of interest between government and enterprises, actively build a community of interests, and strengthen the practical effect of the integration of production and education.

VII. CONCLUSION

In summary, Sichuan's industrial structure has been continuously optimized, the level of industrial clusters has been continuously improved, and industrial transformation and upgrading have been rapidly advanced, which has put forward new requirements for the talent structure. Through analysis, it is found that the discipline construction of applied universities in Sichuan Province lags behind the industrial transformation and upgrading, and the structure and quality of its talent training cannot meet the needs of industrial transformation and upgrading. Application-oriented colleges and universities in Sichuan Province need to actively adapt to the adjustment of industrial structure and establish a professional dynamic adjustment mechanism, actively connect industrial clusters and build regional disciplinary groups, actively build a community of interests and strengthen the effectiveness of the integration of production and education, and effectively play a role in serving society.

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