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Research Article

Orientation and Effect Evaluation of Higher Education Features Based on Regional Economic Development Requirements – Henan Province*

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Abstract

Higher institutions are prime for cultivating talents to respond to the economic, cultural and social development in local areas. It is of great significance to explore the integration of higher institutions with regional economies. This paper sheds new light on the correlation model between China's regional economy and higher institutions. Herein, many colleges and universities in Henan Province are sampled as study cases, how the higher institutions serve local economy is thoroughly studied. The findings show that the higher education combining regional requirements for economic development can effectively push forward the internal reform of the institutions, enhance the linkage between the institutions and the society, achieve a good effect in discipline construction. It is also suggested that higher institutions should further establish a sound social evaluation system and supervisory authority in future development.

Keywords

Regional Economy • Correlation Model Analysis • Discipline Construction • Effect Evaluation

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Regional economic development underlies the national economic development. As an important part of economic strategy, it should be ensured to develop regional economy in a harmonized and healthy way. Since the 21st century, China has made a series of strategic deployments for regional economies, such as the Great Western Development Strategy, the rejuvenation of the Northeast industrial base, the coordinated development of Beijing-Tianjin-Hebei region, and the rise of the central China. With continuously deepening of the regional economy, the demand for talents in all regions increases day by day. As economic levels between regions are not balanced, the teaching emphasis in higher institutions should be planned according to the specific characteristics of the regional economy to make it not only meet the objective demand for talents during regional economic development, but also provide more space and opportunities for universities to develop themselves. (Boddewyn, 1996).

The contribution of higher institutions to the regional economy is diversified, that is, they have not only transported the required talents or commercialized patents for the industries, but also facilitates the transfer of knowledge and technologies towards the industry, for example, providing technical support for cooperation with regional industries (Bramwell & Wolfe, 2008). The integration of regional economy and higher institutions first appeared in the Massachusetts Institute of Technology (MIT) and Stanford, where the patent and technology transfer policies were developed, and a university-industry partnership was established (Dalmarco, Hulsink & Blois, 2018). Subsequently, it has got itself positioned as the cradle for academic entrepreneurs in universities in Western Europe and so on, providing the most direct source power for regional economic development (Elena, Venera, Timur & Artem, 2018). So far, the integration between regional economic development and higher institution usually uses a triple helix model that involves three parties, i.e. university, industry and government. The relationship among the three parties is studied in three dimensions, i.e. talent, information and product circulations (Etzkowitz, 1998). With the soaring of the economy, the demand in regional economy development has newly challenged the organizational structure and teaching system of higher institutions.

The regional economic development has influenced the higher institutions in the multiple levels (Heitor, 2015). At the strategic level, it prompts the universities to work out new development plans and set up specialized agencies; at the talent level, it expands local source of students and develop the innovate talent training model to be characteristic and adapt to economic development; at the scientific and technological level, it plays an important role in promoting the advancement of technologies, actively lead the transformation of university R&D technology into the industrial entities; at the cultural level, the improvement of education level not only raises the cultural level of colleges and universities, but also leads the overall progress of social culture (James, 2005). Although China has witnessed a long period of this integration between regional economy and higher institution, there are relatively few studies on the education orientation and practice effects of higher institutions in regional development requirements.

Based on the existing literature and practice, this paper analyzes the relation model between regional economy and higher institutions in China in Section 2. In Section 3, some colleges and universities in Henan Province are taken as the study object for investigation on its disciplinary planning and teaching characteristics. The Section 4 makes a thorough analysis on the integration of these institutions and regional economy and concludes the advantages and disadvantages of this model. The Section 5 gives the conclusion for the full text.

Analysis of the relationship between regional economy and higher institutions in China

Typical triple helix model systematically describes the university-industry -government relationship. This model uses the "Marketplace" concept to analyze how the three parties are independent of each other and interactive with each other (Etzkowitz & Leydesdorff, 2000). Based on this model and the characteristics of China's regional economy, this paper analyzes the relationship between regional economy and higher education in three dimensions, i.e. talent, information and product circulations. In the end, the adaptation of higher education to regional economy is also explored herein.

Talent circulation between regional economy and higher institutions

The so-called talent circulation refers to the flow of talents between the industrial entities and higher institutions. For talent circulation between China's regional economy and higher institutions, there are three cases as follows:

The flow from higher institutions to the industrial and regional economies is the basic model for talent flow. The general talents are transported into the process of regional economic construction after they have received education in higher institutions in the majors required for regional economic development. These talents usually constitute the actual foundation for the regional economy. Senior talents have experienced long-term learning and studying in the education or R&D system of higher institutions, and armed themselves with unique technology or vision to stimulate the development of industrial and regional economies. Driven by social and economic demands, these talents directly head to the entity economy from colleges and universities. In general, they can produce a strong driving role in the regional economy.

The flow from the industrial and regional economies to the higher institutions. First of all, talents require re-education. In practice, some talents have enough working experience, but what they serve for companies are always beyond their capabilities. In this case, talents need further education in universities, and this type of talents will eventually return to economic entities. Secondly, talents sometimes will return to colleges and universities due to their unique academic or development capabilities. As they own rich practical experience, they can increase the vitality to the single education system in high institutions.

The dual identity in regional economy and higher institution. These talents have jobs in universities and economic entities. In the scientific development system, some talents start up business in the developing or learning process of higher institutions, so that the findings from universities can be quickly transformed into products. In the management system, managers can play an important role in universities or in the industries thanks to their outstanding personal skills.

Information circulation between regional economy and higher institutions

After China has ushered in the information age, the timely and effective information exchange has great implications for industries and universities (Mcpherson, 1999). The scientific R&D information in universities needs to be timely transmitted to the industries to obtain real-time R&D dynamics, thus creating advantages for them in the market competition; the market information of the industries needs to be transmitted to higher institutions in a timely manner. After they get wise to the market dynamics and requirements, education and development strategies can be adjusted to make it closer to the demands of the regional economy in terms of talent cultivation and R&D direction.

Product circulation between regional economy and higher institutions

The business R&D is sometimes partially or completely undertaken by a university. After the product has been developed, the university will feed it back to the corresponding industries. This process constitutes a product circulation between the regional economy and the higher institutions. The product circulation provides a capital source for higher institutions to a certain extent. In addition to R&D of appropriate products, it can also maintain the daily operation and maintenance consumption, and has a certain support for universities. The delivery of R&D products to universities will save a lot of labor force and R&D costs for companies, thus making them more competitive in market operations.

Adaptation of higher education to regional economy

The adaptation of higher education to the regional economy can be carried out from the following perspectives. First, the existing teaching thought and methods in talent cultivation should be maintained, but it is required to adjust the enrolment scale, major setup, curriculum settings to enable talents to meet the demand of the industrial entities quantitatively and qualitatively. Second, in deep teaching and development process, in addition to a few basic disciplines, the R&D direction of high-end talents such as master and doctors should more fit the market, and in line with the product positioning of companies; establish appropriate incentive mechanism, and provide financial assistance and support for R&D team and excellent talents from companies and government. The brain drain should be avoided to a certain extent while ensuring the smooth progress of R&D in higher education; finally, the operation mode between higher institution and companies should be enhanced. The two parties should give play to their respective advantages in the corresponding fields, achieve the overall integration and allocation of resources, and further promote the development of companies and universities in the context of the regional economy. In the following text, some colleges and universities in Henan Province are used as study objects to further explore the practical integration between regional economy and teaching practice in China.

Investigating teaching practice in higher institutions in Henan

Analysis of the current situation of regional economy in Henan

The findings in Henan's regional economy in recent years have shown that the proportion of its primary industry continues to decline, but the proportions of the secondary and tertiary industries go the other way around; the economic structure is continuously optimized, and the secondary and tertiary industries account for about 90% of Henan's total economic output. Among them, the industry is mainly composed of industries such as energy resources, chemical industry and non-ferrous metals. The industrial institutions are relatively reasonable; In the service industry, leasing and commercial services, transportation, warehousing and postal services occupy an important position. Due to the improvement of consumer consumption level and consumption upgrading requirement, the overall service industry also shows a fast-rising trend. According to the characteristics of regional economy, the teaching characteristics of some universities in Henan and the relevant situation of industries are investigated hereinafter.

Table 1
Characteristic Specialty List of Henan Colleges and Universities

University	Type	Characteristic Specialty
Zhengzhou University	Comprehensive	Chemistry, Physics, Material science, Water conservancy project, Communication engineering
Henan University	Comprehensive	Applied Chemistry, Clinical medicine, Computer science, Economics
Henan University of Science and Technology	Comprehensive	Machinery Manufacturing and Automation, Material science, Vehicle engineering
Henan Agricultural University	Agriculture	Agronomy, Forestry, Veterinary Medicine, Landscape architecture
Henan Normal University	Normal (Comprehensive)	Law, Information and Computing Science, Musicology, History
Henan Polytechnic University	Engineering Course	Mechanical Design Manufacturing and Automation, Electrical Engineering and Automation, Civil Engineering, Business Administration
Henan University of Technology	Engineering Course	Civil Engineering, Food Science and Engineering, Electronic Commerce, Biotechnology
Henan University of Chinese Medicine	Medicine	Traditional Chinese Medicine, Chinese pharmacy, Acupuncture and massage, Nursing
North China University of Water Resources and Electric Power	Engineering Course	Geological Engineering, Water conservancy and Hydropower Engineering, Civil Engineering, Traffic engineering
Henan University of Economics and Law	Financial and Political law	Finance, Accounting, Business Administration, International Economy and Trade

Survey on positioning teaching characteristics of universities in Henan

The top 10 universities in Henan Province are Zhengzhou University, Henan University, Henan University of Science and Technology, Henan Agricultural University, Henan Normal University, Henan Polytechnic University, Henan University of Technology, Henan University of Traditional Chinese Medicine, North China University of Water Resources and Electric Power, Henan University of Finance and Economics. The teaching characteristic specialty and characteristic discipline construction of these universities are investigated, among which Zhengzhou University has established the national specialties including chemistry and material science; Henan University has established the international specialties such as the economics, linguistics and biological sciences; Henan University of Science and Technology has established the national specialties such as the

mechanical manufacturing and automation, materials, control, etc.; the crop science in Henan Agricultural University is a national-level key discipline; several other key universities have also established the national specialties such as agronomy, energy engineering, civil engineering, business management, etc. The findings, as shown in Table 1, show that under the guidance of national planning and regional economic development, the characteristics specialties in each university in Henan Province cover all directions of sciences, agriculture and medicine, and the overall education system can adapt to the demand for industrial development.

Table 2
List of cooperation projects

University	Number of major projects	Key regional projects
Zhengzhou University	228	Construction of Engineering Big Data Technology Center Industrialization of Gear Surface Hardening Equipment with Synchronous Dual-frequency Induction Heating
Henan University	84	Research and Application of High Voltage Equipment State Monitoring Platform with Big Data in Electric Power Study on Key Technologies of Synthesis of Polyaspartic Acid Derivatives as Green and High Efficiency Industrial Circulating Water Treatment Agent
Henan University of Science and Technology	43	Key Technologies of Human-Computer Interaction-Oriented Facial Expression Recognition Preparation of LifePO4/C Composites by Carbothermal Reduction Assisted by Water-based Rheological Phase
Henan Agricultural University	52	Study on Low Accumulation Characteristics of Lead and Cadmium in Different Wheat Varieties and Their Rapid Screening Indicators Research and Development of Soil Nutrient Sensing Equipment for Winter Wheat
Henan Normal University	40	Research on Sustainable Development of Sports Performance Market in Henan Province Vectorless Image Information Hiding Based on Generation Model
Henan Polytechnic University	41	Development of lightweight high strength sandwich foam composite Study on Ferroelectricity and Ferromagnetism of LiNbO3
Henan University of Technology	21	Research on Media Strategies of Intellectual Property Cultural Construction under the Background of All-media Research on Key Technologies of Digital City 3D Modeling
Henan University of Chinese Medicine	30	Effect of Ganmai Dazao Decoction on Transport Stress Model Rats and Its Mechanism Based on Intestinal Microorganisms SYNTHESIS AND ANTICANCER ACTIVITY OF CHARDONE SCHIFF BASE COMPLEXES
North China University of Water Resources and Electric Power	13	Bending Behavior Test and Calculation of Reinforced Concrete Short Beams Strengthened with Basalt Fiber Cloth Research on Key Technologies of water quality information perception and security early warning based on Internet +
Henan University of Economics and Law	10	Research on Dynamic Equity Incentive Model and Application of Top Management Team in Venture Enterprises Research on Fine Monitoring of Three-dimensional Surface Deformation in Mining Area Based on Spaceborne SAR

These universities have also actively participated in the regional economic construction, intensified the cooperation with regional industries. The main cooperation contents and project implementation are investigated with two key projects selected, as shown in Table 2.

Evaluation of teaching effect based on regional economy

After the investigation on the teaching practice of many universities in Henan and the integration of them with regional industries, it is found that the integration of teaching orientation and regional economy in China has its own unique features, and there are also some gaps, reflected in the following respects:

The embodiment of the government and policy advantages. In the professional setting and teaching direction, the university also accepts government guidance and financial support on the basis of the regional economic environment. In the process of integrating the economy and education, the development of reasonable policies can make the teaching orientation of higher institutions more precise, thus improving the efficiency of two-way adaptation;

The comprehensive majors and complementary to each other. The findings also show that higher institutions rely on their respective professional advantages to set up the international and national key disciplines in various majors. The deployment of these majors can not only achieve mutual promotion with regional advantageous industries, but also covers all kinds of industries in an all-round way, complement each other on the basis of mutual collaboration. While driving regional economic development, it can also provide backup support for diversified development in the future;

The organic integration between higher education and industry. There is a considerable degree of cooperation between the university's characteristic specialties, industries and governments, which has promoted the transfer of academic achievements into the market. Regional economy has driven technological innovation and improvement, while the higher education gets closer to the industry and the market to expedite the diversification of industry and economic structure;

The education level still has room for improvement. The teaching system and major setup depend on the regional economy. However, the hardware and software strengths in higher institutions usually cannot fully cover the industrial chain, the cultivation level of talents in some majors has fallen short of industrial demand. This phenomenon may trigger a chain of social and economic issues;

The system and mechanism still need to be improved. The teaching management in higher institutions is usually a closed system based on the universities, which lacks the appropriate public supervision and evaluation mechanism to some extent. There are some information clogs among universities, industries and governments. It is imperative to build an instant information communication among them to strengthen the supervision of society over the teaching processes, thereby promoting the optimal development of the education system.

Conclusion

This paper first analyzes the relationship between regional economy and higher institutions, and investigates the specific measures for teaching practice in order to adapt to regional economy. Based on the investigation of teaching practice in some universities in Henan Province, there is a wrap-up for strengths and weaknesses of

the teaching model in regional economic development requirement. Although the development of regional economy can promote the education system reform in higher institutions, there are still issues such as supervision and evaluation system. How to make the integration of the two more reasonable and efficient, and build a more improved adaptation mechanism are still topics that require a deep-going study.

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