Research on Teaching Innovation and Effectiveness Assessment of Industry-Academic Integration Project Class under the Demand of Regional Economic Development

Jingxiao Ma, Yang Yang*

Huizhou Engineering Vocational College, Huizhou, 516023, Guangdong, China

*Corresponding author

Keywords: Regional Economic Development Needs; Industry-Academic Integration; Teaching Innovation of Project Class; Effectiveness Assessment Indicators; Assessment Methodology

Abstract: With the development of regional economy and the upgrading of industrial structure, the industry-academic integration has become increasingly important for personnel training. This article focuses on the industry-academic integration project class under the guidance of regional economic development demand. Through literature research and theoretical analysis, this article analyzes the theoretical basis of regional economic development demand and the industry-academic integration, and discusses the teaching innovation content of the project class of industry-academic integration in curriculum system, teaching methods and teacher team construction. In this article, the effectiveness assessment indicators covering the dimensions of knowledge and skills, professionalism and innovation ability, and social and economic benefits are constructed, and the applicability and implementation steps of assessment methods such as analytic hierarchy process and fuzzy comprehensive assessment method are analyzed. Scientific teaching innovation and effectiveness assessment will help the project class of industry-academic integration to better meet the needs of regional economic development, improve the quality of personnel training, and provide strong support for promoting the coordinated development of regional economy and education.

1. Introduction

Under the background of global economic integration and domestic economic transformation, the vigorous development of regional economy has become an important engine to promote the overall economic progress of the country [1]. Based on their own resource endowments, industrial bases and policy orientations, different regions are actively exploring differentiated economic development paths, and the demand for talents and technology is diversified and dynamic [2]. In this situation, the industry-academic integration, as a development model that deeply integrates industrial demand and educational resources, increasingly highlights its key role in promoting regional economic growth, optimizing industrial structure and improving the quality of personnel training [3].

As a concrete practical form of industry-academic integration, the project class of industry-academic integration aims to break the barrier between traditional education and industrial practice, and cultivate high-quality applied talents that are more in line with the needs of regional economic development by innovating teaching mode, optimizing curriculum and strengthening school-enterprise cooperation [4]. At present, the teaching innovation practice of the project class of industry-academic integration is still in the stage of continuous exploration and improvement, and there are still many problems to be solved urgently in teaching content, teaching methods and the construction of teachers [5]. The scientific assessment system for the teaching effect of the project class with the industry-academic integration has not been fully established, which makes it difficult to comprehensively and objectively evaluate the implementation effect of the project class, which is not conducive to the continuous deepening and high-quality development of the industry-academic integration [6].

Based on the above, it is of great practical significance to carry out the research on teaching

  DOI: 10.25236/icfmhss.2025.055

innovation and effectiveness assessment of industry-academic integration project class under the guidance of regional economic development demand. The purpose of this study is to deeply analyze the internal relationship between the needs of regional economic development and the teaching of the project class of industry-academic integration, explore the teaching innovation path that conforms to the characteristics of regional economy, and build a scientific and reasonable effectiveness assessment system. This study provides theoretical support and practical guidance for the optimal development of the project class of industry-academic integration, and then promotes the coordinated progress of regional economy and education.

2. The demand of regional economic development and the theory of industry-academic integration

The demand of regional economic development contains rich theoretical connotation. The theory of regional economic growth emphasizes the role of capital, labor force and technology in promoting regional economic growth. In the development process, different regions have different demands on these elements [7]. The theory of industrial structure shows that the upgrading and adjustment of regional industrial structure has prompted a new demand for professional skills and knowledge structure of talents. The theory of industry-academic integration takes the coordinated development of education and industry as the core, aiming at realizing the organic combination of educational resources and industrial resources [8]. From the international "dual system" mode to various forms of school-enterprise cooperation practice in China, the industry-academic integration has been developing and evolving. Its essence is to make the education supply better match the needs of the industry through the in-depth cooperation between schools and enterprises in personnel training and technology research and development.

There is a close internal relationship between the demand of regional economic development and the industry-academic integration. The demand of regional economic development points out the direction for the industry-academic integration, and determines the key areas and personnel training specifications of the industry-academic integration [9]. The industry-academic integration strongly supports the sustained growth of regional economy and the optimization and upgrading of industrial structure by conveying high-quality talents and innovative technological achievements, which promote and complement each other.

3. Innovative teaching content of industry-academic integration project class

In the teaching practice, the project class of industry-academic integration meets the needs of regional economic development through various innovations, and realizes the seamless connection between talent training and industrial demand. Curriculum system innovation is the core content of teaching innovation. According to the development trend of regional industry and the post demand of enterprises, the project class of industry-academic integration breaks the boundaries of traditional courses and builds a curriculum system oriented to professional ability. Teachers should abandon the complicated theories of previous subject courses and focus the course content on the skills and knowledge needed in actual work situations. Innovation of teaching methods is the key means to improve teaching quality. Project-based teaching method is widely used in project classes, and teachers take real projects of enterprises as the carrier to guide students to complete tasks in groups. From project planning, implementation to final acceptance, students participate in the whole process and exercise their ability to solve practical problems in practice. The case teaching method has also been fully used. Teachers introduce a large number of practical cases of enterprises in the region, so that students can analyze the problems in the cases and propose solutions to cultivate students' critical thinking and decision-making ability. Work-study alternation teaching method enables students to study theoretical knowledge in school and practice in enterprises alternately, realizes the deep integration of theory and practice, and helps students better understand and master professional knowledge and skills.

In order to build a "double-qualified" teaching team to adapt to the industry-academic integration,

the project class introduced technical backbones and managers with rich practical experience from enterprises as part-time teachers, bringing the latest technology and management concepts of enterprises into the classroom. The project class should arrange teachers in the school to work in the enterprise regularly, participate in the actual project research and development and production management of the enterprise, and improve the teachers' practical ability. In addition, by carrying out joint teacher training activities between schools and enterprises, it invites industry experts and education experts to teach teachers together, so as to improve teachers' professional quality and teaching ability, and ensure that teachers can not only impart solid theoretical knowledge, but also guide students to carry out effective practical operations.

4. Construction of effectiveness assessment index of industry-academic integration project class

4.1 Dimension indicators of knowledge and skills

It is of great significance to construct a scientific and reasonable assessment index for the effectiveness of the project class of industry-academic integration for comprehensively and objectively evaluating the teaching effect of the project class and promoting its continuous optimization and development [10]. In the process of construction, we should follow the principles of scientificity, systematicness and operability, and consider from multiple dimensions.

The mastery of knowledge and skills is the basic dimension to measure students' learning effectiveness. Under this dimension, teachers can set indicators such as professional knowledge assessment results and practical skills operation level. Professional knowledge assessment results are evaluated through regular theoretical examinations to test students' understanding and memory of professional core knowledge. The operation level of practical skills is graded according to the performance of students in various practical courses and training projects, and their practical operation ability is evaluated. As shown in Figure 1, in computer programming related project classes, students' practical skills and operation level can be comprehensively evaluated from the aspects of code specification, function realization and algorithm efficiency through the completion of specific programming tasks.

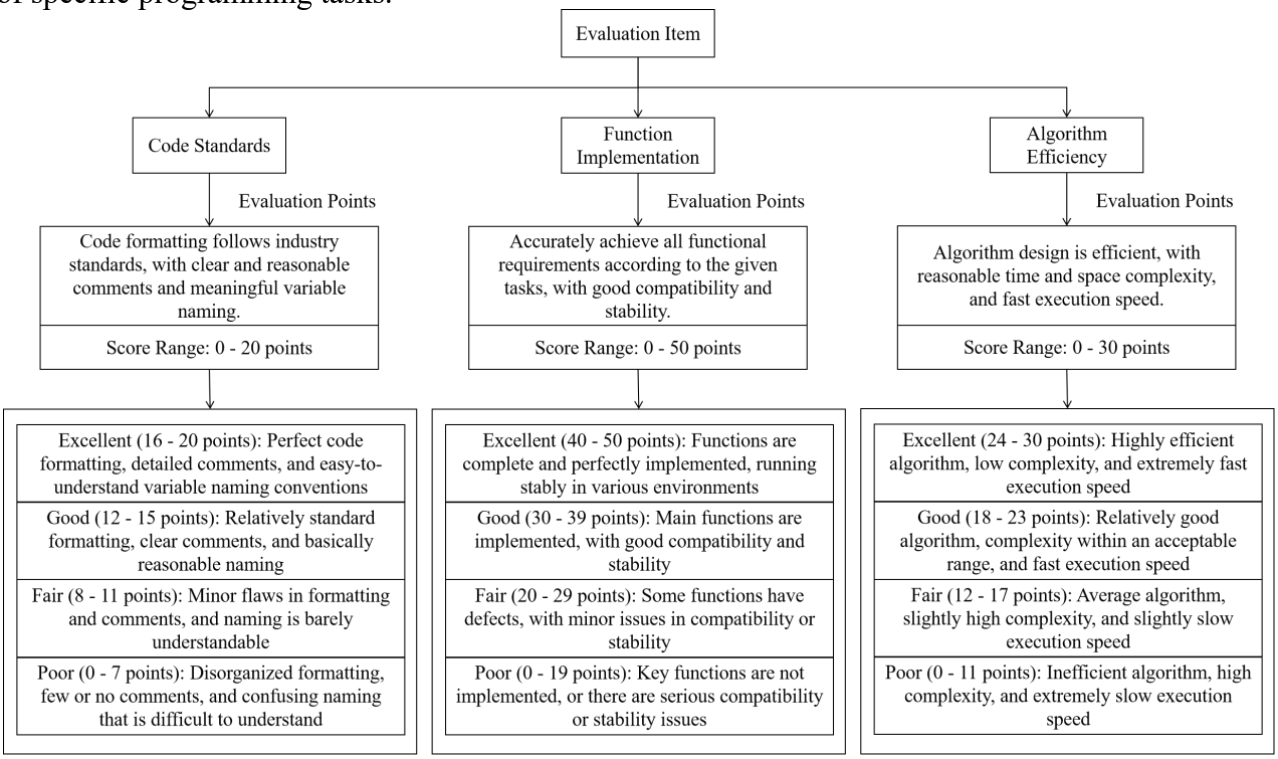

Figure 1 Detailed Assessment Rules for Practical Skill Operation Level in Computer Programming Project Class

4.2 Dimension index of professional accomplishment and innovation ability

Professional accomplishment and innovation ability are the key abilities for students to adapt to the future development of the workplace. In terms of professional quality, it can be evaluated from the indicators of professional ethics, teamwork and communication ability. Professional ethics is judged by students' professional ethics performance in practical projects, such as whether they abide by industry norms and whether they are honest and trustworthy. Teamwork and communication skills observe students' participation in team projects, collaborative contributions and communication effects with team members. The dimension of innovation ability, setting indicators such as the activity of innovative thinking and the number of innovative achievements. The activity of innovative thinking can be measured by the frequency of new ideas and new ideas put forward by students in classroom discussion and project design; The number of innovative achievements counts the achievements of patents and innovative reports obtained by students participating in innovative practice during project learning.

4.3 Dimension index of social and economic benefits

The contribution of the project class of industry-academic integration to society and economy is also an important assessment content. From the social level, considering the satisfaction degree of graduates to the demand for regional talents, it can be expressed by the employment rate of graduates, that is, the proportion of the number of students who are employed in the relevant industrial positions in the region to the total number of graduates. Enterprise satisfaction reflects the degree of enterprise's recognition of the quality of project class graduates. Through the questionnaire survey of cooperative enterprises, it is obtained from the comprehensive scores of graduates' work ability and professional accomplishment. In the dimension of economic benefit, we can pay attention to the economic benefit indicators such as the improvement of production efficiency and the reduction of cost brought by the project class students after graduation. Although these indicators are difficult to quantify, they can be roughly estimated through the comprehensive assessment of enterprises, so as to comprehensively evaluate the promotion of the industry-academic integration project class to regional economic development.

5. Industry-academic integration project class effectiveness assessment method

It is very important to choose a reasonable assessment method when evaluating the effectiveness of the project class of industry-academic integration. This is related to the accuracy and reliability of the assessment results, and it also affects the effectiveness of the improvement measures based on the assessment results. There are many common effectiveness assessment methods, each with its own characteristics. Analytic Hierarchy Process (AHP) decomposes a complex problem into multiple levels, constructs a hierarchical structure model, determines the relative importance of each level element by pairwise comparison, and then calculates the index weight. Fuzzy comprehensive assessment method is suitable for dealing with the fuzzy problems existing in assessment. It combines qualitative assessment with quantitative assessment, and comprehensively evaluates the assessment object by establishing fuzzy relation matrix. Data Envelopment Analysis (DEA) is mainly used to evaluate the efficiency of multi-input and multi-output, which can effectively measure the relative effectiveness of decision-making units.

The effectiveness assessment of industry-academic integration project class involves multiple dimensions of indicators, and some indicators are fuzzy and difficult to quantify. Analytic Hierarchy Process (AHP) has an advantage in determining the index weight, because the importance of different assessment dimensions such as knowledge and skills, professionalism and innovation ability, social and economic benefits of the project class of industry-academic integration is different, and AHP can reasonably determine the index weight through expert judgment (Table 1).

Fuzzy comprehensive assessment method is suitable for dealing with fuzzy index assessment such as professional accomplishment. When evaluating students' professional ethics, it is difficult to

measure it with accurate numerical values. The fuzzy comprehensive assessment method can divide the assessment grades into fuzzy concepts such as "excellent, good, medium and poor", and determine the membership degree of each grade through membership function, so as to realize the comprehensive assessment of such fuzzy indicators. Data Envelopment Analysis (DEA) is suitable for evaluating the relative efficiency of project classes in terms of resource input (such as teachers, teaching equipment, etc.) and output (student performance, employment quality, etc.), and can help find out the advantages and disadvantages of resource utilization.

Table 1: Process of Determining the Weight of Assessment Indicators for Industry-Education Integration Project Classes Using the Analytic Hierarchy Process

Step	Participants	Estimated Time Required	Main Tools/Methods	Key Considerations
Construct the hierarchical structure model	Experts in the education field, senior industry practitioners	1-2 days	Brainstorming method, literature research method	Ensure that each level is reasonably divided and comprehensively covered
Construct the judgment matrix	Education experts, enterprise technical backbones, project class leaders	2-3 days	Delphi method	Ensure the professionalism and independence of experts, and avoid subjective biases
Calculate the weight vector and conduct consistency tests	Professional statisticians, data analysis experts	2-3 days	Statistical analysis software (Excel, SPSS)	The CR value should be less than 0.1; otherwise, the judgment matrix needs to be readjusted
Review and provide feedback on results	Education experts, industry experts, project leaders	1-2 days	Group discussion method	Ensure that the weight results align with the actual project situation and industry perceptions
Determine and apply weights	Project decision-making team	1 day	-	Strictly execute assessment work according to the determined weights

The analytic hierarchy process (AHP) is combined with the fuzzy comprehensive assessment method. Firstly, the weight of each assessment index is determined by AHP. According to the above process, the hierarchical structure model, judgment matrix, weight vector and test are constructed. Then, for each assessment index, the assessment grade and membership function are determined according to the fuzzy comprehensive assessment method. Collect relevant data, construct fuzzy relation matrix, and finally get comprehensive assessment results through fuzzy synthesis operation. In this way, through the organic combination of the two methods, we can comprehensively and accurately evaluate the effectiveness of the project class of industry-academic integration, and provide scientific basis for the continuous improvement of the project class.

6. Conclusions

This article focuses on the teaching innovation and effectiveness assessment of the project class of industry-academic integration under the demand of regional economic development. When analyzing the theoretical basis of regional economic development demand and the industry-academic integration, it is clear that the two are interdependent and mutually reinforcing. The demand of regional economic development points out the direction for the industry-academic

integration, which provides talent and technical support for regional economic development.

In terms of teaching innovation content, the project class of industry-academic integration breaks the boundaries of traditional disciplines through the innovation of curriculum system, and builds a curriculum system oriented to professional ability, so that students' learning can better meet the actual needs of the industry. Adopting project-based and case-based teaching methods to innovate can improve students' practice and innovation ability; Through the innovation of teaching staff construction, we will create a "double-qualified" teaching staff and ensure the teaching quality. On the construction of effectiveness assessment index, the article starts from knowledge and skills, professionalism and innovation ability, and social and economic benefits to ensure a comprehensive and objective measurement of the teaching effectiveness of project classes. In the selection of assessment methods, the characteristics of each method and the reality of the project class are comprehensively considered to make the assessment more scientific and accurate.

To sum up, the teaching innovation and scientific effectiveness assessment of the industry-academic integration project class are of great significance to meet the needs of regional economic development and improve the quality of personnel training. In the future, we can further strengthen the construction of school-enterprise cooperation mechanism and continuously optimize the assessment indicators and methods, so as to promote the industry-academic integration projects to better adapt to the dynamic needs of regional economic development and inject new impetus into the coordinated development of regional economy and education.

Acknowledgements

The authors acknowledge the Department of Education of Guangdong Province 2024 Fiscal Year Key University Research Platforms and Projects — Guangdong Higher Vocational Colleges Industry-Education Integration Innovation Platform: Digital Openness and Application Industry-Education Integration Innovation Platform, Project Number: 2024CJPT007.

References

[1] Liu Yanbing. Innovative Iteration to Construct a Vocational Education System Integrating Industry and Education in the New Era[J]. China Higher Education, 2024(23):14-19.

[2] Xiao Huayi, Li Xinsheng. Industry-Education Integration in Regional Higher Vocational Education: Content System and Implementation Pathways[J]. Vocational and Technical Education, 2021, 42(12):21-25.

[3] Liu Haiming. Deep Industry-Education Integration: A Strategic Choice for Higher Vocational Colleges to Promote Regional Industrial Transformation and Upgrading[J]. Research in Higher Education of Engineering, 2020(06):129-135.

[4] Xu Mingxin, Tan Shuang. The Relevance and Multiple Strategies of Industry-Education Integration in Vocational Undergraduate Education Under the New Mode of Knowledge Production[J]. Theory and Practice of Education, 2024, 44(12):22-26.

[5] Li Jun, Huang Meixue, Yang Ruiqi. Mechanism Analysis of the Development and Construction of Industry-Education Integration Cities: From the Perspective of Economic Geography[J]. Research in Educational Development, 2024, 44(5):70-76.

[6] Zhu Tao, Ji Zhi. Research and Practice on Modern Apprenticeship Education in Higher Vocational Colleges from the Perspective of Industry-Education Integration[J]. Chinese Vocational and Technical Education, 2020(10):90-92.

[7] Liu Zishi, Ma Haitao. Practice and Reflection on the Training Model of Innovative Sports Talents Under the Background of Industry-Education Integration[J]. Journal of Beijing Sport University, 2023, 46(10):73-79.

[8] Shi Qinghui, Zhang Guihua. Research on the Innovation of Industry-Education Integration

Teaching Models in Adult Education Empowered by Digital Platforms[J]. Continuing Education Research, 2025(07):8-13.

[9] Liu Changxing, Liu Yuan. Research on the Development and Promotion Strategies of Industry-Education Integration in Higher Vocational Education[J]. Theory and Practice of Education, 2021, 41(21):20-23.

[10] Li Yan. Reflections on Deep Modular Teaching Reform in Application-Oriented Undergraduate Education Based on Industry-Education Integration[J]. Education and Vocation, 2020(12):92-97.