

Evaluation System for Industry–Education Integration in the Sports Major of Henan Province

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Abstract

This article aims to systematically explore and analyze the key factors and their interrelationships in the process of industry education integration in physical education majors in Henan Province. The research focuses on four variables: government support, school investment, industry cooperation, and student participation. Adopting a combination of quantitative and qualitative methods, quantitative research is conducted through path analysis using partial least squares (PLS), while qualitative research is supplemented and validated through focus group interviews. The data analysis results show that government support (path coefficient 0.196, t-value 3.267, $P < 0.001$), school investment (path coefficient 0.309, t-value 4.754, $P < 0.01$), industrial cooperation (path coefficient 0.225, t-value 3.629, $P < 0.01$), and student participation (path coefficient 0.176, t-value 3.034, $P < 0.001$) all have significant positive effects on the integration of industry and education, verifying the hypothesis. Research has shown that government support, school investment, industry cooperation, and student participation are key factors in improving the integration of industry and education in physical education majors in Henan Province. They directly affect the quality of talent cultivation, resource sharing, and the effectiveness of educational and teaching reforms. Based on the research results and the actual situation in Henan Province, targeted suggestions should be put forward. The government should increase policy support and funding guarantee, and schools need to strengthen deep cooperation with industries to ensure that teaching content is in line with market demand. It is recommended that students enhance their practical abilities to better participate in the process of industry education integration. This study provides

theoretical and empirical support for the integration of industry and education in sports majors in Henan Province, which helps to improve the quality of education and students' employment competitiveness.

Keywords: Industry–Education Integration; Government Support; School Input; Industry Collaboration; Student Engagement

Introduction

Since the launch of China's "Expanded University Enrollment Plan" in 1998, higher education has gradually transitioned from elite to mass education. This shift also led to a diversification of higher education from a purely academic model to a co-existence of academic, applied, and vocational models. However, during this process, the structure and types of higher education did not adjust in time, with most ordinary undergraduate institutions still focusing on academic education, leading to several challenges.

The issue of homogenization in higher education is severe. Many institutions blindly set up popular programs without adequate planning or their own distinctive features, resulting in similar talent cultivation models. While moderate homogenization ensures basic quality, excessive homogenization weakens the unique characteristics and competitiveness of universities, making them unable to meet the diverse needs of society, and even causing resource waste and inefficiency.

There is a mismatch between the knowledge and skills of university graduates and market demands, resulting in both "difficulty in employment" and "difficulty in recruiting suitable talent." According to the "2019 Chinese University Graduate Employment Report", the employment rate of 2018 undergraduate graduates was 91.0%, down 1.6 percentage points from 2014, while the employment rate of vocational graduates increased by 0.5 percentage points. The proportion of undergraduates choosing to pursue further studies has significantly increased, reflecting the tension between employment pressures and the misalignment of higher education structures with societal needs (Chen, 2017).

In 2014, reform efforts to transition local ordinary universities into applied universities were widely launched across the country. Universities have prioritized innovative talent cultivation models and strengthened the link between industry and higher education as part of this challenge. Industry–

education integration, which fosters deep collaboration between industries and educational institutions to develop talent, is a strategic pathway for promoting industrial upgrading and higher education reform. The “Decision of the State Council on Accelerating the Development of Modern Vocational Education” first introduced the concept of industry–education integration and defined the development path for university transformation (State Council, 2017). In 2016, the Ministry of Education launched the “Higher Education Industry–Education Integration Innovation Project”, boosting the development of applied universities. In 2017, the “Opinions on Deepening Industry–Education Integration” elevated this approach to a national strategy, marking its role in both education reform and the socio–economic transformation of the country.

As the economy has rapidly developed, sports have become a significant part of people’s lives, with increasing demand for sports–related activities. However, compared to developed countries, China’s sports industry still lags behind, presenting considerable growth potential. By 2016, the sports industry required over 4 million professionals, but only about 2.5 million were employed, leaving a gap of 1.5 million. The growth of China’s sports economy has also expanded the demand for multidisciplinary talent in areas like sports rehabilitation, venue management, and cloud–based teaching on fitness apps, providing new opportunities for the sports sector.

Employment, being a fundamental concern for people's livelihoods, is particularly critical in populous provinces like Henan. Statistics show that the employment rate of sports graduates from the top five universities in Henan has been declining year by year, with one–time employment rates for 2011–2014 graduates at 63.9%, 58.3%, 54.1%, and 51.1%, respectively (Andy, 2015). Despite the shortage of talent in the sports industry, the employment rate of sports majors in Henan is below the national average, indicating issues in talent cultivation involving society, enterprises, and universities.

Industry–education integration is an important pathway for talent cultivation reform, aiming to align academic programs with industry needs, match curricula with job competencies, and connect faculty development with industry experts. To improve the employment rate of sports majors in Henan Province, it is crucial to identify the key factors influencing industry–education integration and explore the relationship between these factors and integration outcomes. By employing qualitative and quantitative analysis, along with surveys, this research will analyze the relationship between influencing factors and the effectiveness of industry–education integration. The goal is to foster collaboration among

the government, universities, and enterprises to better meet the demand for diverse sports professionals, ultimately enhancing the employment prospects of sports major students.

Research objectives

1. To study the factors affecting the industry–education integration in the sports major of Henan province
2. To examine the relationship between government support, school input, industry collaboration, student engagement and industry–education integration in the sports major of Henan province
3. To propose the Evaluation System of industry–education integration in the sports major of Henan province.

Research Methodology

According to the research objectives, this study adopts a mixed research design that combines quantitative and qualitative methods to investigate the relationship between government support, school input, industry collaboration, student engagement, and industry– education integration in sports majors

1. Literature review: This article systematically reviews and analyzes existing academic literature to gain a comprehensive understanding of the theoretical basis and related research results of industry–education integration. This provides solid theoretical support and research background for this study, making the research design more scientific.

2. Quantitative research:

(1) Based on relevant literature and theoretical frameworks, a questionnaire project was designed, including the government support scale, school input scale, industry collaboration scale, student engagement scale, and industry–education integration in sports major scale. After expert review and pre–testing, 66 items were retained. All scale items were assessed using a 5–level Likert scale (Yoshida & James, 2010), and participants were asked to self evaluate based on their actual situation in the integration of industry and education in the sports profession. Participants were asked to mark "√" on the most suitable scale according to their actual situation, ranging from "1– strongly disagree", "2– strongly disagree", "3– generally", "4– somewhat agree", and "5– strongly agree".

(2) This part of the study mainly uses PLS–SEM to evaluate and analyze the structure model of industry education integration in sports major in Henan Province, including variable explanatory power, coefficient of determination f^2 test, prediction correlation Q^2 statistics, and path coefficient test.

3. Qualitative research:

The core viewpoint of qualitative research is to explore and understand the complexity and deeper meanings behind social phenomena, rather than simply quantifying them. This research method focuses on individual experience, social background, and cultural significance, usually starting with open-ended research questions, guiding questions, and exploring the reasons behind phenomena. Therefore, this article will adopt focus group interviews to obtain participants' perspectives, experiences, and opinions, and enrich and validate quantitative research results through data collection.

Using purposive sampling method to select members to participate in the focus group, and finally selecting 15 experts through expert authority coefficient to ensure that the selected participants have representativeness and professionalism in the research content. Divide the selected experts into 3 discussion groups, each consisting of 5 people, and distribute 6 open-ended questions designed to guide the discussion, such as opinions on each variable and evaluations of influencing factors. Finally, through thematic analysis, the model is validated to obtain comprehensive and specific data.

Conceptual Framework

This article takes the relevant documents on the integration of industry and education released by the state as the guiding ideology, identifies the policy measures for the integration of industry and education in sports majors introduced by Henan Province, and uses the triple helix theory and stakeholder theory as the research basis. By reviewing a large amount of literature, the effect of industry education integration in physical education majors in Henan Province was set as the dependent variable, with policy support, school investment, industry cooperation, and student participation as the four independent variables. Meanwhile, taking the positive impact of these four independent variables on the dependent variable as the four hypotheses of this article, the following research framework is constructed.

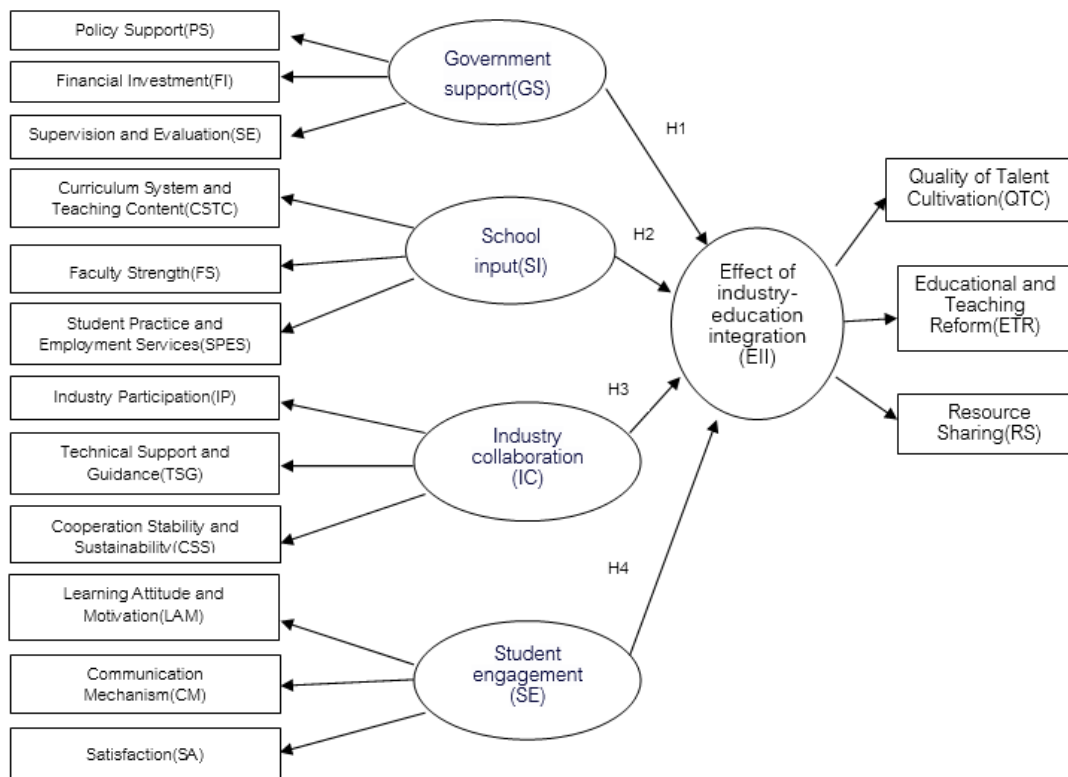


Figure 1 Conceptual Framework (Source: Constructed by researcher, 2021)

Research Results

1. Quantitative analysis results

In order to comprehensively evaluate the influencing factors of the Effects of Industry Education Integration (EII), this study established a structural equation model as shown in Figure 2. This model aims to examine the comprehensive impact of Government Support (GS), School Input (SI), Industry Collaboration (IC), and Student Engagement (SE) on EII. The comprehensive influence relationship between variables is tested, and the specific test results of each parameter are as follows.

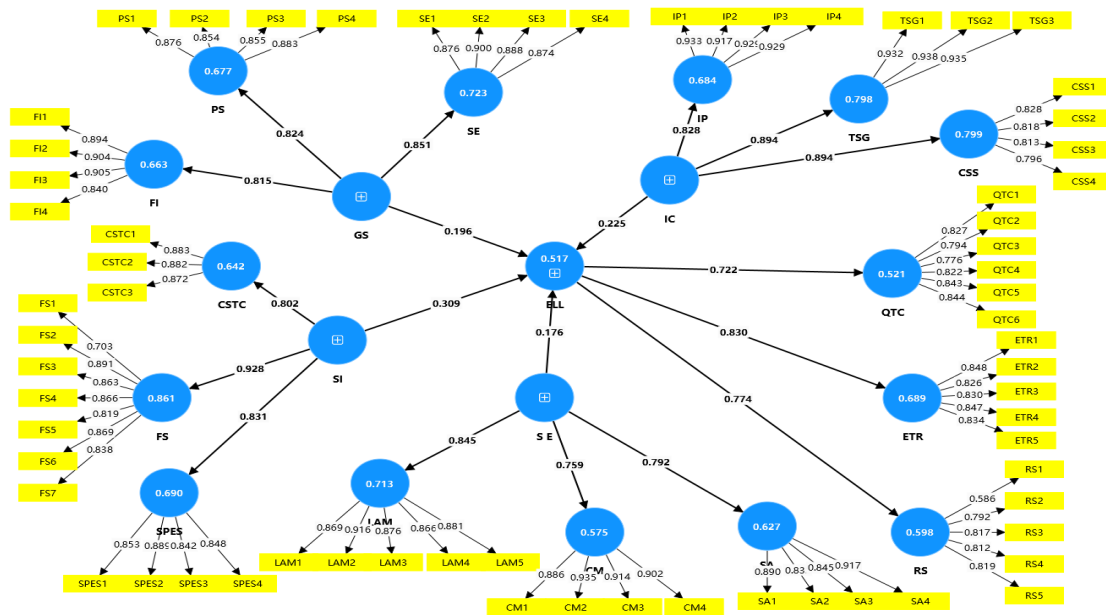


Figure 2 Schematic diagram of structural model (Source: Constructed by researcher, 2021)

(1) Variable explanatory power

The quality of structural models is usually judged by parameters such as explanatory power R^2 , coefficient of determination f^2 , and predictive correlation Q^2 . Among them, the explanatory power index is an indicator of the explanatory ability of popular regression equations. It is between 0 and 1. When the explanatory power is high, the prediction accuracy of the model is stronger and the model is more meaningful. On the contrary, when the explanatory power is high, if it is low, it indicates that the independent variable has a weaker predictive ability for the dependent variable. At this point, even if the indicators have a significant impact, it is impossible to determine whether the model is better.

$$R\text{-square} = SSR/TSS = 1 - RSS/TSS$$

Table 1 Variable explanatory power

	R-square	R-square adjusted
Effects of industry-education integration	0.517	0.509

The calculation results show that the predictive explanatory power of the four independent variables (Government support, School input, Industry collaboration, Student engagement) in the model for the dependent variable (Effects of industry education integration) is 0.517, indicating that the model has above average explanatory power. The adjusted R-square is 0.509, slightly lower than the

R-square value, indicating good model robustness and explaining more than half of the variation in the effect of industry education integration.

Although the explanatory power of the model reached 51.7%, 48.3% of the variation remained unexplained, indicating that future research may consider introducing other potential factors, moderating variables, or mediating variables to further enhance explanatory power. Overall, the model provides good statistical support for understanding the effectiveness of industry education integration and points out the direction for exploring other influencing factors in future research.

(2) Determination coefficient f^2 test

The coefficient f^2 for determining the size of model effects represents an indicator of effect size, which has basic properties such as being independent of measurement units, monotonic, and not affected by sample size. Under normal circumstances, it is easier to obtain significant results when the sample size is large. Therefore, it is impossible to accurately determine whether the influence between variables is related to the sample size from the significance test results. As an indicator of the true effect size or variable correlation strength of the experiment, the effect size is not affected by the sample size. In structural model experiments, when f^2 is below 0.02, it can be considered that the influence of the variable is low, and when it is around 0.02–0.15, it is a moderate influence relationship. When f^2 is about 0.35, it means that the variable has a high impact.

Table 2 Variable Prediction Determination Coefficient

	f-square
Government support →Effects of industry-education integration	0.059
School input→Effects of industry-education integration	0.051
Industry collaboration →Effects of industry-education integration	0.042
Student engagement →Effects of industry-education integration	0.111

The calculation results show that the determination coefficients of the four independent variables Government support, School input, Industry collaboration, and Student engagement on the dependent variable Effects of industry education integration are not less than 0.02, indicating relatively good predictive performance of the model.

(3) Prediction correlation Q^2 statistics

In the structural model, Q^2 ($Q^2=1-E/O$) represents the predictive correlation of variables, and the larger the value, the stronger the predictive correlation. The closer SSE is to 0, the better the model selection and fitting, and the more successful the data prediction.

Table 3 Analysis of Correlation Values of Predictive Ability

	SSO	SSE	Q^2 ($=1-SSE/SSO$)
Government support	1440	1180.800	0.180
School input	1080	834.600	0.230
Industry collaboration	1440	1137.600	0.210
Student engagement	1440	1310.400	0.090

The calculation results show that the Q^2 value of school input (SI) is 0.230, which has the strongest predictive ability among 347 observed values and can explain about 23% of the variation in industry education integration effect. The Q^2 value of Industry Collaboration (IC) is 0.210, which can explain about 21% of the variation, ranking second. The Q^2 value of Government Support (GS) is 0.180, ranking third and capable of predicting approximately 18% of variation. The Q^2 value of Student engagement (SE) is 0.090, which is the lowest but still positive and can explain about 9% of the variation. This result is consistent with the previous path coefficient analysis, further confirming the crucial role of industry collaboration and school input in industry education integration.

(4) Path coefficient test

In the regression model variable influence coefficient test, the regression coefficient is a parameter in the regression equation that represents the magnitude of the influence of the independent variable on the dependent variable. The larger the absolute value of the regression coefficient, the greater the influence of the independent variable on the dependent variable. When the regression coefficient is positive, it indicates that as the value of the independent variable increases, the value of the dependent variable will also increase, and vice versa, it will gradually decrease. The significance test of regression coefficients generally uses $p < 0.05$ as the critical criterion. When $p > 0.05$, regardless of the value of the regression coefficient, it can be considered that the independent variable does not have a significant impact on the dependent variable.

Table 4 Variable Regression Coefficient Test

Regression path	β	SE	t	p	95%	95%
					Lower	Upper
Government support → Effects of industry–education integration	0.196	0.060	3.267	0.01	0.078	0.314
School input → Effects of industry–education integration	0.309	0.065	4.754	0.001	0.181	0.437
Industry collaboration → Effects of industry–education integration	0.225	0.062	3.629	0.001	0.103	0.347
Student engagement → Effects of industry–education integration	0.176	0.058	3.034	0.01	0.062	0.290

The data analysis results show that government support (path coefficient 0.196, t–value 3.267, $P < 0.001$), school input (path coefficient 0.309, t–value 4.754, $P < 0.01$), industry collaboration (path coefficient 0.225, t–value 3.629, $P < 0.01$), and student engagement (path coefficient 0.176, t–value 3.034, $P < 0.001$) all have significant positive effects on effects of industry education integration, verifying the validity of their respective hypotheses.

2. Qualitative analysis results

Select experts and scholars of different ages and genders, with rich work experience, high education level, and participation, and use focus group interviews to conduct a qualitative study on the effect of industry–education integration in sports majors in Henan Province. After organizing interview records, recordings, and other content related to research questions and objectives, content analysis and word cloud analysis were used to explore the interview results.

In group discussions, Yang** believes that the government's role in promoting industry–education integration is crucial, especially in terms of policy support, which is essential for the successful implementation of projects. He also points out that government financial investment and effective supervision are key foundations for ensuring smooth project execution. He** emphasizes that adequate financial investment is one of the key factors for the success of industry–education integration. He believes that the proper use of funds, combined with policy support, can significantly enhance the sustainability and long–term benefits of projects. Liu** highlights the importance of continuous

supervision and evaluation mechanisms in the implementation of industry–education integration projects. He believes that only through ongoing assessment and optimization can the quality of projects be ensured and long–term cooperation be deepened. Leng* argues that the success of industry–education integration depends on the stability and continuity of cooperation. He stresses that sustained policy support and consistent cooperative efforts are the foundation for the long–term development of such projects. Zhang** focuses specifically on the integration of industry and education in sports programs. He believes that policy, funding, and supervision must work closely together to achieve effective industry–education integration in the sports field and to reach the desired outcomes in sports programs.

Summary, the experts generally agree that government policy support, financial investment, supervision and evaluation mechanisms, and stable industry participation are key factors for the success of industry–education integration. The combined effect of these elements can effectively promote the long–term benefits and sustainability of industry–education integration projects.

Discussion

The four major influencing factors discovered in this study (government support, school input, industry cooperation, and student participation) are basically consistent with the findings of existing literature in the overall framework, but reflect the particularity of the sports major in Henan Province in terms of specific content and weight:

1. The importance of government support:

Compared with other regions or majors, government support has played a more crucial role in the industry education integration of sports majors in Henan Province. This may be related to the economic development level and sports industry structure of Henan Province. Research shows that the direct path coefficient of government support for industry education integration is 0.285 ($p < 0.01$), which is not the highest but still significant. This finding is consistent with the research findings of Zhong Binglin (2017) and Liu Yidong (2016), emphasizing the guiding role of the government in industry education integration. Especially in central provinces like Henan, government policy support and funding investment are of greater significance in promoting the development of the sports industry and talent cultivation in universities. For example, in recent years, Henan Province has vigorously promoted the "Sports+" strategy, which has facilitated the integration of sports with tourism, culture, health and other industries

through policy guidance and financial support, providing a favorable external environment for industry education integration.

2. Diversification of school input:

Research has found that the input in sports schools in Henan Province not only includes traditional curriculum and faculty construction, but also places special emphasis on the construction of practical bases. This reflects the importance of practical teaching in sports majors. The direct path coefficient of school investment in industry–education integration is the highest, at 0.324 ($p<0.001$), highlighting the core position of universities in industry– education integration. This discovery supports Clark's (1998) theory of entrepreneurial universities, and also echoes the research by Zhou Wen (2022) on universities actively adapting to industry demands. In the specific practice of sports majors in Henan Province, many universities not only focus on the reform of theoretical courses, but also actively build on campus and off campus practice bases, such as sports event training centers, fitness guidance training rooms, etc., providing students with more practical opportunities. For example, the "Provincial school joint construction" practical teaching base established by the School of Physical Education of Zhengzhou University and the Henan Provincial Sports Bureau has effectively enhanced students' practical abilities and employment competitiveness.

3. Depth of industrial cooperation:

Compared to other majors, industry cooperation in sports emphasizes practicality and applicability, especially in areas such as event organization and sports training. Research shows that the direct path coefficient of industrial cooperation on industry education integration is 0.301 ($p<0.01$), second only to school investment. This is consistent with the research results of Perkmann et al. (2013) on university industry cooperation, and also reflects the particularity of the sports industry. In Henan Province, the cooperation between the sports industry and universities presents diversified and deep-seated characteristics. For example, many universities have established close cooperative relationships with local sports bureaus, sports venues, fitness clubs, etc., not only providing internship positions for students, but also jointly developing courses and conducting scientific research cooperation. The "school land co construction" model of cooperation between Luoyang Normal University and Luoyang Sports Bureau is a typical case, which achieves deep integration of industry and education through jointly organizing sports events, conducting social sports guidance and other activities.

4. Characteristics of student participation:

Research has found that the career planning and practical participation of sports majors have a particularly significant impact on industry education integration, which may be related to the particularity of the sports industry. The direct path coefficient of student participation in industry education integration is 0.278 ($p < 0.01$), which is relatively low but still statistically significant. This discovery supplements the traditional theory of industry education integration, emphasizing the subject status of students in this process, which is consistent with the research of Li Jinlian & Chen Yapeng (2024) that industry education integration should focus on cultivating students' practical abilities and innovative spirit. In the practice of sports majors in Henan Province, students have shown high enthusiasm and initiative in participating. For example, many students actively participate in sports event volunteer services, community sports guidance and other activities, which not only enhance their practical abilities, but also promote the in-depth development of industry education integration. The case of students from the School of Physical Education of Henan Normal University participating in the "National Fitness into the Community" activity is a typical representative of students actively participating in industry education integration.

5. The manifestation of regional characteristics:

In addition to the four factors mentioned above, this study also found that the industry education integration of sports majors in Henan Province presents obvious regional characteristics. This is mainly reflected in the following aspects: Firstly, as a populous province, Henan has a huge demand for sports education and fitness guidance talents, which has driven universities to pay more attention to the cultivation of practical talents. Secondly, Henan's profound cultural heritage provides unique advantages for the integration of sports and culture, such as the development and teaching of traditional sports such as Shaolin Kung Fu and Tai Chi. Once again, Henan Province is vigorously developing the sports tourism industry, which provides new directions and opportunities for the integration of sports industry and education. For example, the development of sports tourism in places such as Songshan Shaolin Scenic Area and Yuntai Mountain provides a new platform for sports majors to practice and find employment. These regional characteristics not only affect the specific implementation of industry education integration, but also point out the direction for the development of sports majors in Henan Province.

In summary, although the industry education integration of sports majors in Henan Province is consistent with general theories in terms of overall framework, it presents unique characteristics and advantages in specific practice. These peculiarities not only reflect the regional characteristics of Henan

Province, but also provide useful references and inspirations for other regions and professional industry education integration practices.

Suggestions

1. At the government level:

(1) Intellectual property protection: Establish a special mechanism to clarify property ownership and benefit distribution, enhance transparency, and regularly disclose project progress and fund utilization.

(2) Financial support: Establish a development fund, focusing on supporting characteristic projects, innovative models, and demonstration bases, rewarding excellent demonstration projects, and setting up special funds for talent cultivation.

2. At the school level:

(1) Curriculum system optimization: Add practical courses, introduce project-based learning, and strengthen the combination of theory and practice.

(2) Deepening school enterprise cooperation: expanding the scope of cooperation, establishing a diversified network of practice bases, recognizing demonstration bases, and building a platform for school enterprise cooperation and exchange.

3. At the industry level:

(1) Talent attraction: Establish industry scholarships to attract outstanding students and provide internship and employment opportunities.

(2) Technical support: Invest in advanced equipment, establish virtual simulation training bases, covering sports events, venue management, and other fields.

(3) Industry university research alliance: Establish an innovation alliance to integrate resources from universities, enterprises, and research institutions, and promote collaborative innovation.

4. At the student level:

(1) Career planning: Strengthen career planning education, offer compulsory courses and career experience camps, and help students clarify their career direction.

(2) Feedback mechanism: Establish a student feedback system, select experience officers to collect opinions, and adjust production education integration strategies in a timely manner.

5. Evaluation system:

(1) Effect evaluation: The annual evaluation system comprehensively reflects the implementation effect and adjusts strategies in a timely manner.

(2) Comparative research: Cross regional and cross institutional exchanges to promote experience sharing and mutual improvement.

In summary, through government guidance, school reform, industry support and student participation, as well as a scientific evaluation system, the integration of industry and education in sports majors in Henan Province will achieve a qualitative leap, contributing to the cultivation of high-quality sports talents and the development of the sports industry. This requires long-term collaboration and sustained investment from multiple parties to jointly build a new ecosystem of integration between sports education and industry.

References

- Andy. (2015). *Research on the employment status and countermeasures of sports major students in universities of Henan Province* [Master's thesis, Soochow University].
- Chen, J. (2017). Promoting industry–education integration: Consolidating and improving the achievements of demonstration construction. *China Higher Education*, (Z1), 54–56.
- Li, J., & Chen, Y. (2024). Strategies to enhance college students' employability under the background of industry–education integration. *Journal of Anhui Metallurgical Science and Technology Vocational College*, (02), 74–76.
- Liu, Y. (2016). The development and changes of higher education evaluation in China over 30 years. *University (Research Edition)*.
- Ministry of Education of the People's Republic of China. (2017, December 19). *Several opinions of the General Office of the State Council on deepening the integration of industry and education*. http://www.moe.gov.cn/jyb_xxgk/moe_1777/moe_1778/201712/t20171219_321953.html
- Zhong, B. (2017). First-class undergraduate education is the core task and important foundation of "Double First-Class" construction. *China Higher Education*, (19), 16–17.
- Zhou, W. (2022). Research on the long-term mechanism of school–enterprise cooperation in sports resources in vocational colleges based on SWOT analysis. *Journal of Hunan Industrial Polytechnic*, (03), 119–122.