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Article

The suitability of skilled talent training in higher vocational colleges based on AI and 5G network connection in the context of educational transformation and upgrading

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Abstract: The development of artificial intelligence (AI) and 5G network technology has changed the production and lifestyle of people. AI also has promoted the transformation of talent training mode under the integration of college industry and education. In the context of the current transformation of education, AI and 5G networks are increasingly used in the education industry. This paper optimizes and upgrades the training mode of skilled talents in higher vocational colleges by using its advanced methods and technologies of information display. This means is helpful to analyze and solve a series of objective problems such as the single training form of the current talent training mode. This paper utilizes the principles and laws of industry university research (IUR) collaboration for reference to construct and optimize the talent training mode based on the analysis of the requirements of talent training and the role of each subject in talent training. Then, the ecological talent training environment can be realized. In the analysis of talent training mode under the cooperation of production and education, the correlation coefficients of network construction, environment construction, scientific research funds, scientific research level, and policy support were 0.618, 0.576, 0.493, 0.785, and 0.451, respectively. This showed that the scientific research level had the greatest impact on talent training in the talent training mode of IUR collaboration, while policy support had less impact on talent training compared with other factors. The combination of AI and 5G network technology with the talent training mode of IUR cooperation can effectively analyze the influencing factors and problems of the talent training mode. The hybrid method is of great significance to the talent training strategy and fitting degree.

Keywords: personal training; educational transformation; artificial intelligence; 5G network; fit degree of talent training

1. Introduction

The training of skilled talents in higher vocational colleges is a research hotspot. The importance of higher vocational colleges participating in skilled talent training activities is more prominent by introducing the science and education development strategy as well as talent training strategic plan. Meanwhile, the talent training research cooperation of industry university research (IUR) collaboration is considered. At the same time, the demand for talent training is more urgent due to the importance of talent training for scientific and technological competition. Higher vocational colleges, as the source of talent training, face higher expectations and higher requirements. How to improve the talent training environment and build a good talent training system to improve the efficiency of talent training has become

important issues today.

In the context of educational transformation, this paper makes a scientific and objective evaluation of the development of skilled talent cultivation in higher vocational colleges based on the theory of collaborative talent cultivation of IUR. This paper comprehensively evaluated the collaborative talent training mechanism and its influencing factors in higher vocational colleges by establishing a scientific and reasonable theoretical and empirical model. As a result, the research methods can be more rigorous and scientific. Meanwhile, research conclusions can be more reliable. The methods, models, and ideas adopted in this paper may deepened the relevant research on the theory of IUR collaborative talent training. In practical significance, this paper discusses the applicability of the theory of IUR collaborative talent training in the development of talent training to better understand the connotation, mechanism, talent training mode, and development path of IUR collaborative talent training. This paper constructs a matching strategy based on talent training to study the fitting of talent training through an analysis of the characteristics and development status of IUR subjects. It is of great practical significance to better apply the theory of IUR collaborative talent training to the development of skilled talent training in higher vocational colleges and improve the efficiency of talent training. IUR cooperation education, as a collaborative education model, integrates the forces of schools and society, providing an effective means for the transformation and development of higher vocational education.

In the context of the transformation and upgrading of education, the cultivation of talents is very important. In this regard, more and more scholars have studied the strategy of talent cultivation. Trukhachev (2019) introduced the limitations of agricultural talent training in the digital environment. The digital transformation of the economy aggravated the talent allocation in agriculture and other economic sectors. Shomirzayev (2021) elaborated on the essence of the formation of college students' professional quality. They explained the factors of competitive talent training. Liang et al. (2019) established effective innovative training teaching through research and discussion on talent training mode. Luo et al. (2018) reformed the "four in one" three-dimensional practical teaching system to cultivate students' engineering ability and quality management ability. The above studies have achieved good results. However, the methods used in these studies are too traditional and not convincing enough.

With the rapid development of AI and 5G network, the talent training mode has changed. Liu and Wang (2021) discussed the realization process and mechanism of data visualization of ice and snow mixed talent training. They discussed the mechanism from the two dimensions of timeliness and media form by building an AI teaching data visualization analysis framework. Bian et al. (2022) used the DEMATEL method to calculate the influence of factors. They studied the key influencing factors of the cultivation of Internet of Things AI multi-cloud scheduling application talents. In the context of the development of the Internet and big data, Mo (2022) formulated a marketing talent training strategy. They paid more attention to the cultivation of classroom creativity and cultivating students' personalities. Huang (2021) believed that it was very important to set appropriate AI courses in the basic education stage and cultivate students' key abilities through these courses.

Aluvala (2024) believed that as AI and 5G networks were increasingly integrated into the workplace, the ability to collaborate across disciplines and adapt to a rapidly changing environment was critical. Wu et al. (2024) discussed the application of 5G+ artificial intelligence (AI) in modern higher vocational education classroom teaching. They analyzed its potential impact on the quality, equity, and efficiency of vocational education. Moreover, how to build a more flexible and interactive learning environment was discussed. However, the above research is still in the theoretical stage and has no practicality due to the lack of data sources.

In summary, many scholars have explored the talent cultivation mechanism of the combination of industry, academia, and research. However, the effect is not ideal for the existing collaborative education and training mechanisms of industry, academia, and research. There are still many problems, such as outdated teaching models and ineffective cooperation mechanisms. Therefore, continuous innovation is needed to improve and enhance the talent cultivation mechanism of IUR cooperation to provide more powerful guarantees for cultivating more and better talents. The research focus is to build a new model of IUR collaborative talent training mechanism. Different from other models, this model emphasizes that universities play a leading role as the core in collaborative talent training. At present, the research on the collaborative talent cultivation of IUR focuses on the interaction and connection of different subjects, while ignoring the role of universities as the subject of talent cultivation. This paper focuses on the collaborative talent training and systematically explores the mechanism of IUR collaborative talent training in theory and practice. The related research on the theory of IUR collaboration talent cultivation is a beneficial improvement and expansion. This paper explains the problems of talent training through experimental analysis, providing reference for the proposal of talent training strategies. At the same time, this paper verifies the scientificity of data selection through experiments in the selection of survey data, making the research conclusion more reliable. The research innovation lies in integrating AI and 5G networks into education and constructing a new model of collaborative talent cultivation mechanism between industry, academia, and research. At the same time, empirical analysis is conducted using the new energy vehicle major as an example to explore the influencing factors of talent cultivation in the new energy vehicle profession, providing ideas for the cultivation of other high skilled talents.

2. Talent training mode

2.1. Talent cultivation under AI and 5G networks

The development of AI and 5G networks is inseparable from the cultivation of talents and knowledge innovation. It is necessary to have enough talents as support to meet the needs of AI and 5G network technology development to vigorously develop AI and 5G network industry, which brings new challenges to talent training (Lei et al., 2021). With the change of social characteristics, economic society has also put forward new requirements for talent training. The new requirements can be roughly divided into four types when combined with the AI and 5G networks, as shown in **Figure 1**.

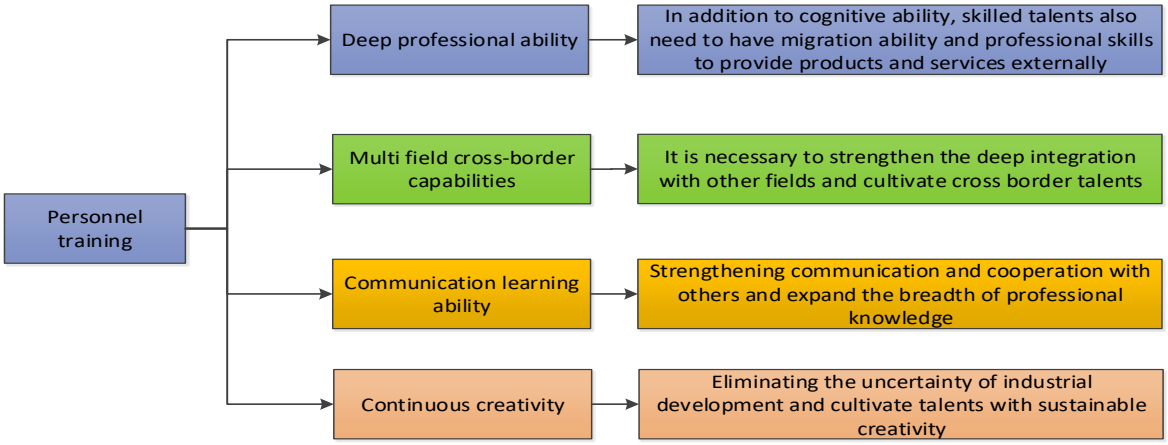

Figure 1. Types of demand for talent cultivation.

In the era of AI + 5G network, the generation and dissemination of knowledge are becoming more rapid, affecting the talent cultivation and evaluation system from multiple dimensions. The first and foremost requirement is for students to continuously improve their ability to obtain information and cultivate lifelong learning abilities. Vocational colleges should not only emphasize the mastery of knowledge, but also promote the improvement of cognitive and information acquisition abilities. Vocational colleges should focus on cultivating students' systematic thinking, independent judgment abilities, and the ability to collect, analyze, and transform information into output. It is necessary to equip students with a wider range of adaptability and a complete personality system. At the same time, it should cultivate the relationship between people and AI, and improve people's ability to utilize AI technology. The essence of school education is to adhere to a student-centered approach, continuously serving students through the design and development of various good courses. Therefore, in the current era, schools should adjust the goal system of student training and strive to create a profound interdisciplinary knowledge system. Meanwhile, schools can provide profound professional knowledge, computational programming knowledge, and mathematical and physical knowledge. At the same time, schools can achieve full integration of multiple disciplines and provide diverse practical platforms for students. As a result, students can learn more interdisciplinary knowledge, better solve practical problems, and achieve the unity of knowledge and action. It also needs to ensure the diversified development of talent training in addition to meeting the requirements of talent training to innovate the talent training mode (Haibin, 2018). Multi-aspect collaborative cooperation is required to achieve the collaborative training of talents through scientific and efficient methods (Wei et al., 2021). The main roles of different subjects in talent cultivation are shown in **Figure 2**.

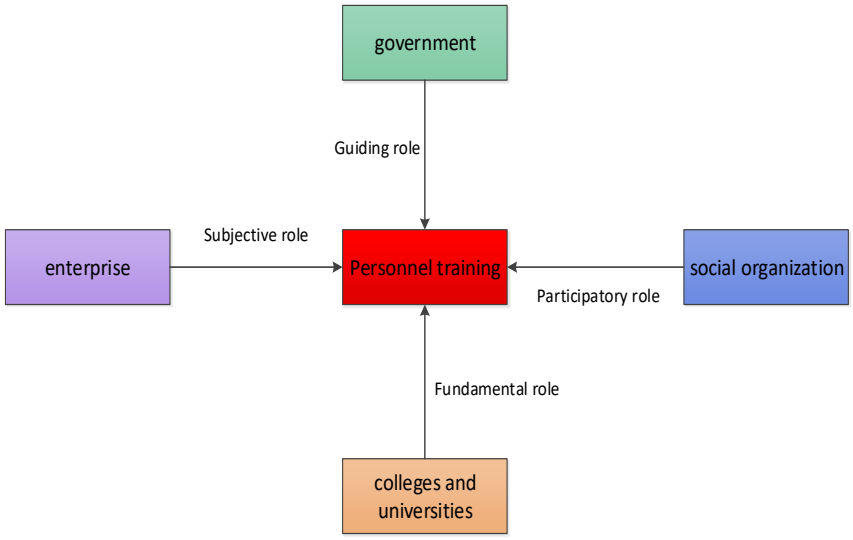

Figure 2. The role of different entities in talent cultivation.

In talent cultivation, the guidance of the government is not only to intervene in other subjects through power, but also to provide conditions and platforms for talent cultivation through functional advantages. At the same time, the government can guide other subjects to change their ideas and cultivate technical talents that meet the needs of the development of the times (Zhang et al., 2017). As the main places for talent cultivation, enterprises and universities play an irreplaceable role in talent cultivation. However, they are different. Enterprises mainly undertake the function of innovation, and their development status affects the talent cultivation of universities. Universities need to cultivate technical talents that meet the development needs according to the needs of social development. Social organizations mainly play a participatory role in the talent training process, which needs to cooperate with other subjects to complete the talent training (Chen, 2020; Gu et al., 2020).

At a macro level, the fundamental notion of professional competence is the culmination of several fundamental skills that enable an individual to choose to pursue a specific technical career. The requirements for the vocational ability training of majors in new energy vehicle-related fields can be summed up as follows when developing new energy and automobile-related professionals. These requirements are designed to fully meet the needs of the various skills of the new energy vehicle profession. The professional needs of energy vehicle industry companies, the intellectual and physical growth of the educated individual, and contemporary society's ethical standards must be carefully considered when directing scholars to train professionals in new energy vehicles. The professional knowledge and abilities of an educated person cannot be merely dismissed as "skillization". People cannot simply focus on the growth and acquisition of an educated person's vocational skills while ignoring their own professional quality training. People cannot simply short-circuit the development trend of the energy vehicle industry by considering current market demand. In addition, people cannot simply train professionals who only need to possess the necessary skills to fully utilize new energy and automobiles.

2.2. Talent cultivation mode of IUR collaboration

The talent training mode of IUR collaboration can regard the talent training as a socialized interaction of mutual cooperation between subjects from the overall level. In this complex dynamic process, this training mode generates unique talent training methods in different fields and industries by focusing on the relationship between subjects and their impact on talent training (Zuo et al., 2021). The talent training mode of IUR collaboration is a process in which the IUR subjects participating in talent training cooperate according to certain rules. In this process, the government, universities, enterprises, and social organizations jointly maintain the healthy operation of the entire IUR collaboration system. As a result, society can obtain technical and innovative talents constantly (Zheng, 2018).

In the collaborative system of IUR, the knowledge-based theory understands talent training as a process of re-combining the old knowledge as well as producing and applying new knowledge, that is, talent training is a process of creating knowledge (Li and Xue, 2021). This paper analyzes the talent training process of universities participating in IUR collaboration from the perspective of knowledge talent cultivation to better understand the concept of talent training mode based on IUR collaboration, as illustrated in **Figure 3**.

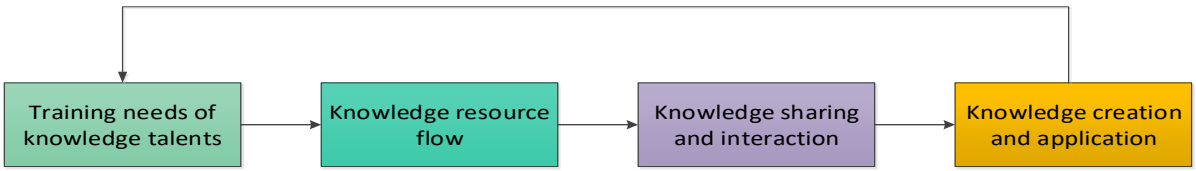

Figure 3. Talent cultivation process of IUR collaboration.

In the talent cultivation of IUR collaboration, the first stage needs to understand the training needs of knowledge talents. Each talent training subject participating in the IUR collaboration can find the training needs from the macro national economic development with the support of a good talent training environment. Talent training opportunities are identified from the micro market and customer needs. Therefore, the feasibility of achieving talent training results after resource input is analyzed. Finally, the corresponding collaborative talent training method is formulated. The second stage needs to complete the flow and integration of knowledge resources, aiming at the talent training needs identified by the cooperative talent training subject of IUR. Universities should achieve talent training through the flow and integration of knowledge resources after deciding to participate in the talent training activities of IUR collaboration. This step mainly includes the selection of talent training subjects and the creation of a talent training environment. This stage represents the formation of talent cultivation in colleges and universities based on the cooperation of IUR. The interest relationship between talent cultivation subjects drives the development of talent cultivation activities. The third stage is knowledge sharing and interaction. It is mainly the skilled talents of universities and enterprises who participate in the cultivation of the cooperative talents of IUR. Knowledge can be transferred from a single subject to multiple subjects through the sharing and learning of core knowledge. Then, the compound knowledge formed can be

internalized. The sharing and interaction of knowledge talent cultivation based on IUR collaboration is completed in the continuous learning and internalization of knowledge. The last stage is knowledge creation and application. Relevant task allocation is carried out in combination with the objectives of individual talent training subjects to achieve this round of knowledge talent training process. At the same time, the results of this round also become the basis for the next round of talent training needs (Zhou and Zhou, 2019).

2.3. Knowledge acquisition in the cultivation of IUR collaborative talents

Data mining can use machine learning algorithms to derive new knowledge from massive amounts of data and uncover potentially valuable information (Alasadi and Bhaya, 2017). Data mining has developed rapidly in recent years and is widely used in many fields. The definition of data mining indicates a process of extracting knowledge, which is also defined as knowledge mining. The relevant subjects of talent training can get more simple and efficient talent training methods through the application of data mining. The data mining process is depicted in **Figure 4**.

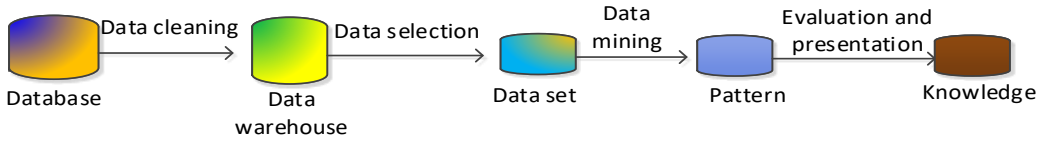

Figure 4. Implementation process of data mining.

In the data mining, the quality of knowledge mining depends on the quality of the algorithm used. Among them, machine learning algorithm is one of the most practical algorithms (Nguyen et al., 2019). Because knowledge data needs to be classified in the process of knowledge mining, the perceptron algorithm in machine learning algorithm is introduced. The perceptron algorithm is often used in linear classification problems. The perceptron algorithm is shown in **Figure 5**.

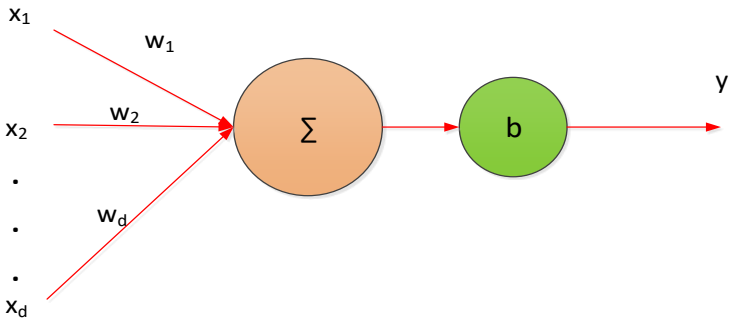

Figure 5. The perceptron algorithm.

In the perceptron algorithm, x_i is usually used to represent the value of the input sample in the i dimension. w_i denotes the weight connecting the perceptron and the input $i = \{1, 2, \ldots, d\}$. The linear perceptron algorithm is:

$$y = f(x, y|w, b) = \text{sgn}(wx + b) \quad (1)$$

The perceptron algorithm enables all knowledge categories to find a plane

through training to find suitable parameters. All samples are closest to this plane. It is assumed that the composition of training samples is:

$$(X, Y) = \{(x^1, y^1), (x^2, y^2), (x^i, y^i), \ldots, (x^n, y^n)\} \tag{2}$$

It is assumed that the problem to be solved by the algorithm is a binary classification problem to simplify the process of the algorithm. The positive class is represented by +1, and the negative class is represented by −1. Then, there is $y^i \in \{+1, -1\}$. The correct classification can be expressed as:

$$z^i, y^i = 1 \tag{3}$$

Similarly, errors are classified as:

$$z^{i\prime}, y^{i\prime} = -1 \tag{4}$$

The error is obtained by calculating the error function from all misclassified points in the perceptron algorithm:

$$L(w, b) = -\sum_{i=1}^{m} Y^i (w \times X^i + b) \tag{5}$$

The gradients are:

$$\frac{\partial l}{\partial w} = -\sum_{i=1}^{m} X^i Y^i \tag{6}$$

$$\frac{\partial l}{\partial b} = -\sum_{i=1}^{m} Y^i \tag{7}$$

Next, the weights and thresholds of the perceptron algorithm are updated.

Training set $(X, Y) = \{(x^1, y^1), (x^2, y^2), (x^i, y^i), \ldots, (x^n, y^n)\}$ is entered.

Classification decision function $y = f(x, y|w, b) = \text{sgn}(wx + b)$ is output. Wrong classification points are used for parameter updates. The above process is repeated until all samples in the training set are correctly classified.

The function iterates to generate different values through the gradient descent algorithm. Finally, the local optimal value is generated. It is assumed that the cost function is:

$$J(x, y|b) = \frac{1}{2}\sum_{i=1}^{n} ((X_i|b) - y_i)^2 \tag{8}$$

Among them, (x, y) represents a sample data in the training set, then:

$$\frac{\partial J}{\partial b} = -\frac{\partial f}{\partial b}\sum_{i=1}^{n} ((fX_i|b) - y_i) \tag{9}$$

Then, the update of threshold b is:

$$b = b - \alpha \frac{\partial J}{\partial b} \tag{10}$$

Among them, α represents the learning rate. Since the process of selecting samples is full of uncertainty, it is necessary to randomly select a sample for learning to ensure the smooth progress of the algorithm, namely:

$$b = b - \alpha \frac{\partial J(x_i, y_i|b)}{\partial b} \tag{11}$$

The speed of each knowledge classification is improved due to the randomness of the selected samples, which enhances the convergence of the algorithm.

2.4. Research on the fitting degree of the new energy vehicle professional talent training

New energy vehicles have consistently developed and enlarged the business along with majors like electrochemistry, information technology, and electrical engineering. This can be achieved by applying a variety of cutting-edge and modern technologies. As a result, teachers should take the initiative to develop the teaching skills, accurately predict the new energy vehicle industry's future development direction, and offer a positive reference for students' employment. At the same time, teachers should broaden students' professional horizons and make the most of the school's limited resources. Furthermore, teachers should update their professional knowledge on a regular basis, enhance their own knowledge system, and meet the needs of new energy professionals for the growth of the industry market. Second, professional teachers of these vehicles must also conduct extensive practical research at the grassroots of the enterprise to lay a strong foundation for developing high-caliber new energy vehicle talent. Teachers should comprehend the new energy vehicles' production and operation steps, master contemporary organizational production methods, and comprehend the real job competency standards of the enterprise. Meanwhile, they should boldly introduce new knowledge and new skills in the daily curriculum teaching practice. Outside of the classroom, teachers should also continue to reflect on their teaching, promptly identify any problems they may have encountered, and enhance the content they teach.

The match between the professional setting of new energy vehicles in vocational colleges and the demand for industrial trained talents are needed to be assessed. It is important to take into account the education lag and the government's release of statistics on industry practitioners from the previous year to achieve this goal. A complicated and significant area of study is the applicability of professional training for new energy vehicle operators. It can offer helpful references and recommendations for colleges and technical education facilities. This can be achieved through a thorough examination of market demand, education system docking, curriculum setting, practical teaching, teacher strength, school-enterprise cooperation, graduate tracking survey, and training effect evaluation. The talent training model needs to be continuously optimized and improved if people are to produce more new energy vehicle professionals that are up to par with market demands.

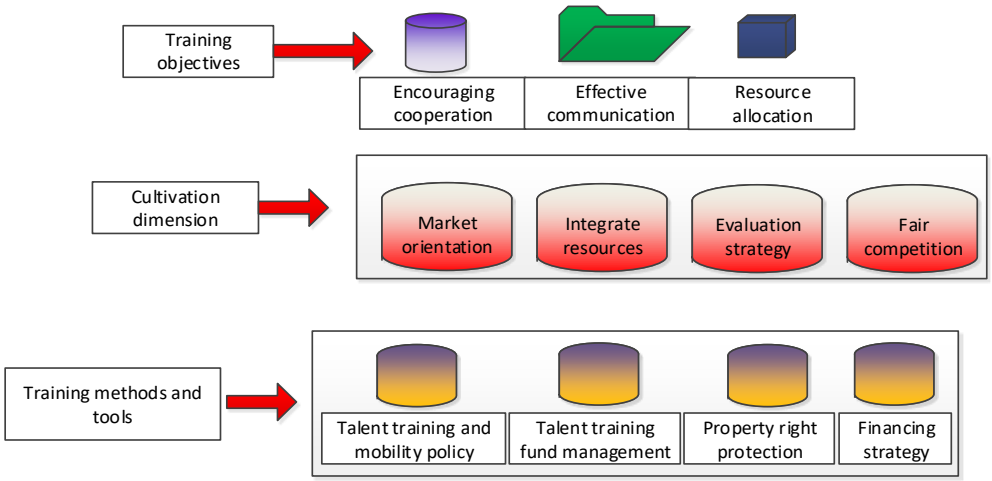

Figure 6. A talent cultivation framework based on industry university research cooperation.

The talent training model of IUR collaboration can be improved through machine learning algorithms. Based on this, this paper constructs a fit framework for talent cultivation, as shown in **Figure 6**.

First, it is necessary to make clear the training objectives of skilled talents in the matching strategy of talent training. Under the guidance of this goal, the selection of training strategy dimensions is carried out. The role dimensions of training strategies are analyzed respectively for different talent training objects. As a result, which angle to choose the applicable methods and tools can be determined, thus achieving the goal of talent training. The logical idea is to build a talent training strategy framework of IUR collaboration and build a strategy tool pool from the perspective of use methods. Among them, there is a certain flexibility between training strategies and tools. The purpose is to comprehensively include the connotation of the talent training strategy system of IUR collaboration, rather than to construct an ideal strategy system standard.

3. Talent training model experiment

AI and 5G network connectivity are being employed in education more and more due to the rapid advancement of science and technology. How effectively these cutting-edge technologies fit the training of skilled talents in higher vocational colleges is a topic worthy of in-depth research in the context of the transformation and upgrading of education, particularly in the particular field of new energy vehicle majors. Firstly, the training of qualified people at higher vocational institutions has benefited greatly from the deployment of AI and 5G technologies. AI can create precise images of the learning styles and proficiency levels of students and serve as a foundation for individualized instruction by using technological tools like intelligent analysis and data mining. 5G networks' high speed, low latency, and enormous capacity can guarantee the seamless development of teaching modalities including remote learning and real-time interaction, overcoming the space-time limitations of conventional classrooms. There is a trend toward specialization and diversification in the demand for skills in this subject by using the major in new energy vehicles as an

example. Students can have a deeper understanding and proficiency with the primary technologies of new energy cars, like intelligent driving and battery management, by utilizing AI and 5G technology. In the meantime, students can hone their practical skills in a controlled and secure setting by using remote experiments, simulation, and other methods.

3.1. Influential factors of talent cultivation

It is necessary to conduct a quantitative analysis of its influencing factors to further analyze the impact of IUR cooperation on the training of new energy vehicle professionals. In this regard, this paper summarizes the various factors affecting the training of new energy vehicle professionals through empirical research. Meanwhile, this paper analyzes the proportion of the influencing factors to describe the degree of correlation between the influencing factors. These factors are the cornerstone of students' good growth, including network construction, environmental construction, research funding, scientific research level, policy support. At the same time, these factors include the five dimensions of thinking, knowledge, ability, habits, and personality of talent comprehensive literacy. Among them, improving network construction can help students better adapt to the needs of society and enhance competitiveness. A good development environment is conducive to the growth of students. Students can engage in more scientific practice with sufficient funds, thereby cultivating talents with innovative abilities. Scientific research is the driving force for improving the quality of talent cultivation, which is beneficial for students to develop a taste of valuable academia. Policy support can promote the improvement and upgrading of the education system, promote the comprehensive development of students, and cultivate innovative spirit and event abilities. Comprehensive literacy refers to cultivating students' abilities in various aspects such as subject knowledge and skills, critical thinking, innovation ability, social skills, and moral conscience (Lin, 2023). **Tables 1** and **2** show the results for the proportion of factors influencing talent development of the IUR collaboration.

Table 1. The IUR cooperation affects the horizontal proportion of the factors for the training of new energy vehicle professionals.

	Thinking	**Knowledge**	**Ability**	**Habit**	**Personality**
Network construction	60%	10%	10%	10%	10%
Environmental construction	20%	40%	10%	20%	10%
Research funds	30%	30%	15%	15%	10%
Scientific research level	10%	20%	40%	20%	10%
Policy support	15%	35%	10%	5%	35%

The data in **Tables 1** and **2** are analyzed by correlation degree to obtain the relationship between different influencing factors. The correlation coefficient is the correlation value obtained through comparison at different time points, and its specific value is not unique. When the relationship between the relevant factors is too scattered, it is not conducive to the overall analysis of each influencing factor. Therefore, the correlation can be expressed by the average value of the correlation

coefficient. At the same time, the calculation results can show the influence ability of each influencing factor. A ~ E represent the network construction, environmental construction, scientific research funds, scientific research level, and policy support, respectively. The correlation coefficient of each influencing factor is obtained as shown in **Figure 7**.

Table 2. The vertical proportion of the factors affecting the training of new energy vehicle professionals in the IUR cooperation.

	Thinking	Knowledge	Ability	Habit	Personality
Network construction	30%	15%	40%	15%	5%
Environmental construction	15%	30%	10%	25%	40%
Research funds	10%	20%	10%	10%	10%
Scientific research level	15%	5%	20%	20%	5%
Policy support	30%	30%	20%	30%	40%

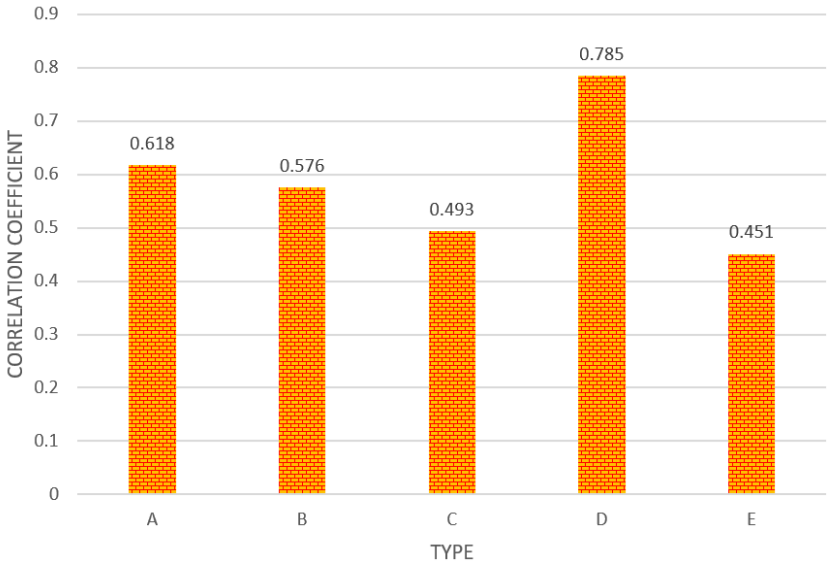

Figure 7. Correlation coefficient of each influencing factor.

From **Figure 7**, the correlation coefficients of network construction, environmental construction, scientific research funds, scientific research level, and policy support are 0.618, 0.576, 0.493, 0.785, and 0.451, respectively. This also shows that the scientific research level has the greatest impact on talent training in the talent training mode of IUR collaboration, followed by network construction and environment construction. Policy support has less influence on talent cultivation compared with other factors. This is because although policy support provides corresponding guidance and resources for talent cultivation, it does not directly participate in talent cultivation, so its impact is relatively small. However, this does not mean that policy support is not important. On the contrary, its impact is indirect and easily influenced by other external conditions in practical applications.

3.2. Questionnaire survey and data collection

In this paper, the samples are selected mainly based on the purpose and object

of the study. In terms of the professional talent training mode of new energy vehicles, the cross-border coordination of talent training mainly refers to the coordination between universities, enterprises, governments, and social organizations. Therefore, this paper initially determines the sample objects as universities, enterprises, governments, and social organizations. The survey subjects of this article are personnel related to the training of new energy vehicle professionals in the first quarter of 2024 released by a certain city's statistics bureau on the basis of the above analysis. The survey subjects mainly include college teachers who participate in talent training in colleges and universities. At the same time, the survey subjects include some college students, enterprises, governments and relevant managers in social organizations who are responsible for talent training, and other personnel who participate in talent training. The reason why such people are selected as the survey objects is that they have more or less participated in the cross-border collaborative process of talent training. These people can accurately grasp and answer the contents of the questionnaire, which is conducive to improving the effectiveness of the questionnaire data (Thongoum and Channuwong, 2024). The results of the survey are shown in **Figure 8**.

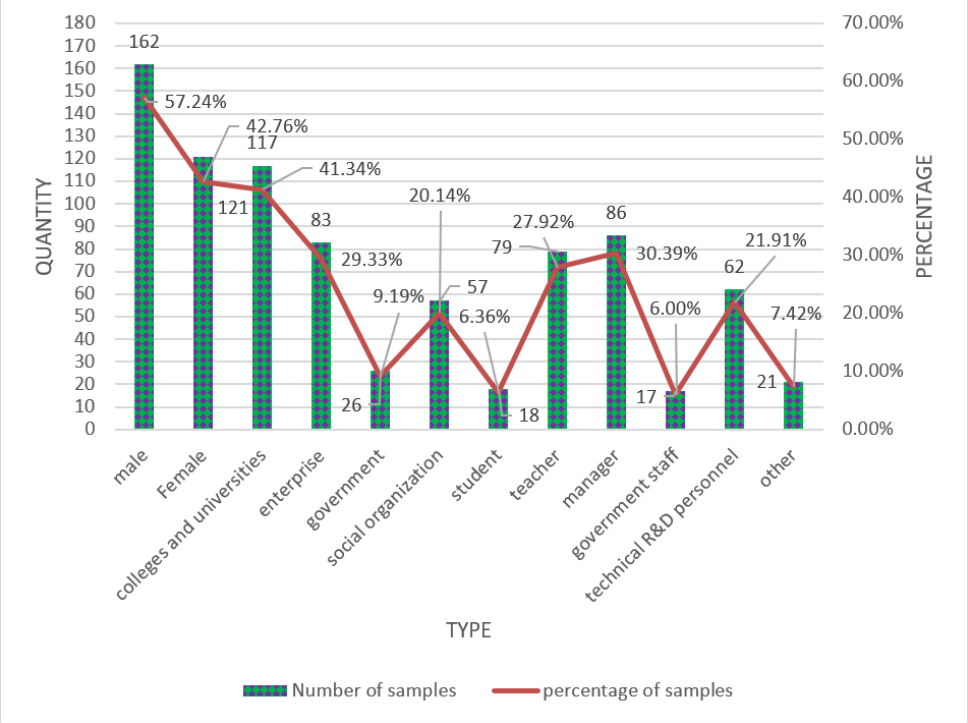

Figure 8. Information chart of survey results.

In **Figure 8**, 41.34% of the surveyed people are from universities. The proportion of employees in enterprises is 29.33%. The proportion of government personnel is 9.19%. The proportion of personnel in social organizations is 20.14%. From the units of the investigated personnel, the proportion of colleges and universities is higher than that of other subjects. This shows that the training of colleges and universities is the main focus in talent training. Enterprises, governments, and relevant social organizations mainly train talents in the way of cooperation with colleges and universities, which plays an auxiliary role in the

process of talent training. At the same time, students account for 6.36% of the respondents. The proportion of teachers accounts for 27.92%. The proportion of managers is 30.39%. The proportion of government workers is 6.00%. The proportion of technical R&D personnel is 21.91%. The proportion of other personnel is 7.42%. From the basic information of the survey of the subjects, this questionnaire is more in line with the requirements of the questionnaire design, and the survey data have high validity. In short, only when schools, enterprises, governments, and society work closely together to cultivate outstanding talents can they adapt to the development of society and make contributions to economic and social development.

The questionnaire data needs to be analyzed to test the reliability and validity of the questionnaire and variables after the questionnaire is completed. The variables studied in this paper are analyzed by descriptive statistics through data processing software. The results are shown in **Table 3**.

From **Table 3**, Cronbach's α values of other variables are greater than 0.7, except that Cronbach's α value of the research funds is close to 0.7. Generally, when Cronbach's α value is less than 0.6, the reliability of the variable is insufficient. When Cronbach's α value is between 0.7 and 0.8, the scale of each variable has certain reliability. The variables of this questionnaire have good reliability. The validity of the scale is generally tested by content and structure. Because the variables selected in this paper are based on relevant research, the validity of its content does not need to be tested. The construct validity is reflected by the value of factor load. In **Table 3**, the factor load results of each variable are 0.721, 0.637, 0.658, 0.715, and 0.731, respectively. The results are all greater than 0.6, indicating that the explanatory power of each variable is good and the construct validity is good.

Table 3. Reliability and validity of the scale.

Variable	Factor load	Cronbach's α
Network construction	0.721	0.754
Environmental construction	0.637	0.721
Research funds	0.658	0.697
Scientific research level	0.715	0.744
Policy support	0.731	0.712

3.3. Problems existing in the training of new energy vehicle professionals

People put forward new requirements for talent cultivation under the background of educational transformation. Therefore, the construction of teaching staff for talent training must be changed accordingly. This paper makes a statistical analysis of the shortcomings of the current teaching staff to optimize the construction of the teaching staff. The results (multiple choices are allowed) are shown in **Figure 9**.

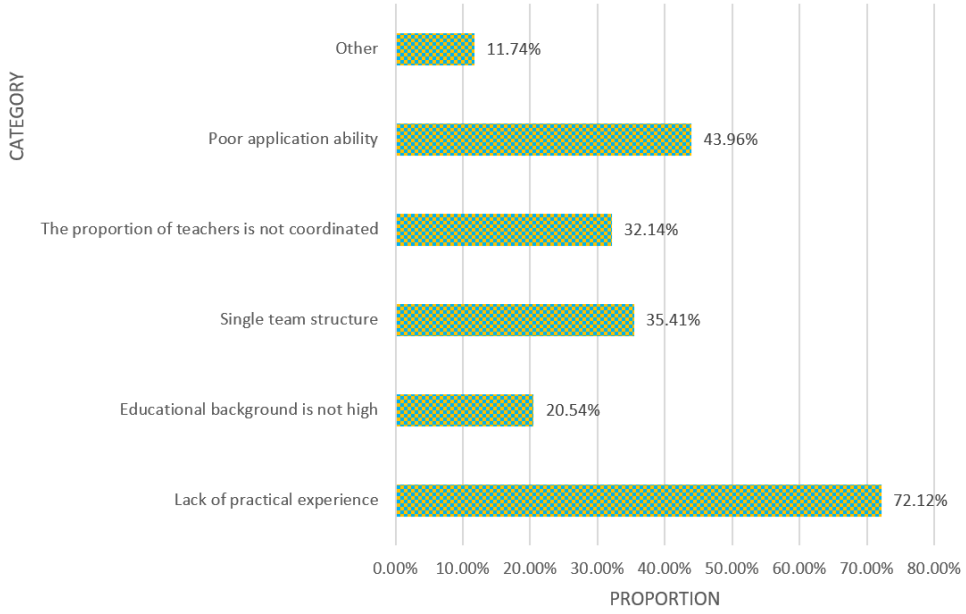

Figure 9. Deficiencies of the teaching staff.

This survey divides the problems existing in the current talent training faculty into “lack of practical experience”, “low education background”, “single team structure”, “uncoordinated proportion of teachers”, “poor application ability”, and others. From **Figure 9**, 72.12% of the respondents believe that the teaching staff of talent training lacks practical experience. 43.96% of respondents believe that the current talent cultivation faculty has poor application ability. 35.41% of respondents believe that the structure of talent cultivation and teaching staff is single. 32.14% of respondents believe that the proportion of talent cultivation and teaching staff is not coordinated. 20.54% of respondents believe that the educational level of the talent cultivation faculty is low. It still needs to fundamentally solve the problem of teachers’ lack of practical experience to optimize the talent training mode.

4. Conclusion

This paper combs the requirements of IUR collaboration for talent training, the role of different subjects in talent training, knowledge foundation theory and talent training theory on the basis of summarizing relevant research. The talent training system and its operation are studied, and the suitability of the training of new energy vehicle professionals is studied on the basis of the IUR collaboration. The key factors affecting the operation of the talent training model are extracted by analyzing the composition of the IUR collaborative talent training system. This is achieved from the aspects of network construction, environmental construction, scientific research funding, scientific research level, and policy support. Among them, the level of scientific research has the greatest impact on talent training, while policy support has less impact on talent training than other factors. This shows that the prerequisite for talent training at this stage is to improve the level of scientific research. The higher the level of scientific research, the better the effect of training new energy vehicle professionals, and the better the performance of the university talent training system. However, this research still has some shortcomings. It is not

practical enough. Follow-up research can conduct more in-depth research on the various elements of talent training from the perspective of individuals due to personal level, research conditions, and time constraints. At the same time, the study uses the perceptron algorithm for knowledge mining. However, this algorithm can only perform binary classification and cannot directly handle multi classification problems. It is necessary to expand or combine multiple perceptrons to handle multi classification tasks. Therefore, future work will explore the application of more advanced machine learning algorithms in knowledge mining to improve the adaptability of the methods.

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References

Alasadi, S. A., & Bhaya, W. S. (2017). Review of data preprocessing techniques in data mining. Journal of Engineering and Applied Sciences 12(167), 4102–4107.

Aluvala, R. (2024). Monumental Transition From 5G To 6G: Skill Development Needs and Workforce Evolution Imperative. Educational Administration: Theory and Practice, 13699–13706. https://doi.org/10.53555/kuey.v30i5.5986

Bian, Y., Xie, L., & Li, J. (2022). Research on influencing factors of artificial intelligence multi-cloud scheduling applied talent training based on DEMATEL-TAISM. Journal of Cloud Computing, 11(1). https://doi.org/10.1186/s13677-022-00315-4

Chen, J. (2020). Analysis on the Willingness of Enterprises in Wenzhou to Carry out Apprenticeship Talent Training and Its Influencing Factor. International Journal of Social Science and Education Research, 3(7), 148–154.

Gu, J., Ye, T., &, Gao, G. (2020). 5G e-commerce model and talent training strategy. IETI Transactions on Engineering Research and Practice, 4(1), 34–38.

Haibin, D. (2018). Interdisciplinary Talents Cultivation of Animation Education in Universities Based on University-Enterprise Cooperation Mode. International Journal of E-Education, e-Business, e-Management and e-Learning, 8(3), 165–172. https://doi.org/10.17706/ijeeee.2018.8.3.165-172

Huang, X. (2021). Aims for cultivating students' key competencies based on artificial intelligence education in China. Education and Information Technologies, 26(5), 5127–5147. https://doi.org/10.1007/s10639-021-10530-2

Lei, J., Hock, O. Y., & Karim, A. M. (2021). Exploration of Entrepreneurship Education and Innovative Talent Training Model: New Economic Perspective. International Journal of Academic Research in Business and Social Sciences, 11(11). https://doi.org/10.6007/ijarbss/v11-i11/11319

Li, J., & Xue, E. (2021). How talent cultivation contributes to creating world-class universities in China: A policy discourse analysis. Educational Philosophy and Theory, 54(12), 2008–2017. https://doi.org/10.1080/00131857.2021.1965876

Liang, S., Yue, H., Yang, F., et al. (2019). Study on Innovation Personnel Training Mode in Automation Specialty. International Journal of Information and Education Technology, 9(4), 310–313. https://doi.org/10.18178/ijiet.2019.9.4.1218

Lin, C. L. (2023). Enhancing competency development and sustainable talent cultivation strategies for the service industry based on the IAA-NRM approach. Soft Computing, 28(6), 5071–5096. https://doi.org/10.1007/s00500-023-09140-6

Liu, S., & Wang, J. (2021). Ice and snow talent training based on construction and analysis of artificial intelligence education informatization teaching model. Journal of Intelligent & Fuzzy Systems, 40(2), 3421–3431. https://doi.org/10.3233/jifs-189380

Luo, X., Song, G., Deng, W., et al. (2018). Reform of Four-in-One Practical Education System to Promote the Personnel Training in Chinese Pharmaceutical Engineering Major. Creative Education, 09(04), 625–632. https://doi.org/10.4236/ce.2018.94044

Mo, F. (2022). Strategies to Cultivate Generation Z Talent in Marketing under the Big Data Era. OALib, 09(01), 1–11. https://doi.org/10.4236/oalib.1108157

Nguyen, G., Dlugolinsky, S., Bobák, M., et al. (2019). Machine Learning and Deep Learning frameworks and libraries for large-scale data mining: a survey. Artificial Intelligence Review, 52(1), 77–124. https://doi.org/10.1007/s10462-018-09679-z

Shomirzayev, M. K. (2021). Young People from "Technology" to Profession Training as a Factor of Competitive Personnel Training. International Journal of Multicultural and Multireligious Understanding, 8(4), 580. https://doi.org/10.18415/ijmmu.v8i4.2638

Thongoum, A., & Channuwong, S. (2024). Management strategies for retaining talented and good personnel in the organization. Journal of Research Administration, 6(1), 5107–5118.

Trukhachev, V. (2019). Personnel training for the agricultural sector in terms of digital transformation of the economy: Trends, prospects and limitations. International Journal of Civil Engineering and Technology, 10(19), 2145–2155.

Wei, W., Yan, J., & Zhang, X. (2021). Exploration and analysis of the talent training model of research tutors in the modern apprenticeship concept from the perspective of educational psychology. Psychiatria Danubina, 33(8), 177–178.

Wu, Z., Lv, C., & Tan, Y. (2024). Research on the Innovation of Classroom Teaching Mode in the Era of "5G+ Artificial Intelligence. Contemporary Education and Teaching Research, 5(6), 229–234.

Zhang, R., Liu, H., & Zhang, J. (2017). A Brief Study on the Problems and Development Countermeasures of China's International Trade Talents Training. Modern Economy, 08(12), 1575–1579. https://doi.org/10.4236/me.2017.812104

Zheng, J. (2018). Research on the Training of Innovative Talents in Applied Colleges and Universities. Advances in Educational Technology and Psychology, 2(1). https://doi.org/10.23977/aetp.2018.21009

Zhou, J., & Zhou, Y. (2019). Research on Innovation and Entrepreneurship Talent Training Model for Application-Oriented University under Perspective of Collaborative Innovation. International Journal of Information and Education Technology, 9(8), 575–579. https://doi.org/10.18178/ijiet.2019.9.8.1269

Zuo, J., Lu, W., & Jia, C. (2021). Relationship Between the Cultivation and Incentive Mechanism of Senior Educational Talents. International Journal of Emerging Technologies in Learning (IJET), 16(22), 99–112. https://doi.org/10.3991/ijet.v16i22.26879