

# Exploration and Practice on the “Symbiotic Integration of the Three Vitalities” Talent Cultivation Model

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**Abstract.** It is a vital necessity to explore high-quality talent cultivation models in vocational colleges in order to cultivate qualified and skilled talents. Based on the integration of "teachers and students & production & ecology," a "Symbiotic Integration of the Three Vitalities" (SITV) talent cultivation model is proposed in this paper. Years of practices have shown that this model is able to achieve significant effects and promote the development of vocational education.

**Keywords:** Integration of science and education, Collaborative innovation, Talent cultivation, SITV

## 1. Introduction

“Integration of science and education” and “the collaborative innovative development of vocational education, higher education and continuing education” are major strategic measures to deepen the construction of the vocational education system.[1] Vocational education plays an important role in China's national education system. Optimizing and reforming the talent training mode is not only the core connotation of professional construction in vocational colleges, but also the key content of teaching reform. In order to meet the needs of high-quality development of vocational education, a "Symbiotic Integration of the Three Vitalities" (SITV) talent cultivation model is proposed based on the fully utilization of existing resources and transformation of talent cultivation thinking. Although vocational colleges have achieved certain results in the cultivation of skilled talents, the proposal of "integration of science and education" and "collaborative innovation" has put forward higher requirements for the quality of talent cultivation in vocational colleges, and the cultivation of high skilled talents still faces many problems.[2]

## 2. Analysis of Practical Problems in Talent Cultivation

Although vocational colleges have achieved certain effects in the cultivation of skilled talents, the proposal of "integration of science and education" and "collaborative innovation" has put forward higher requirements for the quality of talent cultivation in vocational colleges, and there are still many problems.

### 2.1 Deficient Understanding of Concepts

There is still a lack of in-depth understanding and application of the concepts of "integration of science and education" as well as "collaborative innovation" in vocational colleges. This insufficient conceptual understanding has led to the same absence of the recognition of the fusion of scientific research, which in turn harms the enthusiasm of key participants such as enterprises, universities, research institutes, and governments in collaborative innovation. As a result, the effective integration of educational resources, as well as the depth and breadth of talent cultivation has been limited.

As a cradle for high-skilled talents cultivation, a sufficient understanding and application of "integration of science and education" and "collaborative innovation" has a close relationship with its result of talents cultivation. Teaching contents may fail to meet the practical needs, and teaching methods may be out of step with the times due to this lack of in-depth understanding. Therefore, the innovation ability and practical skills of students will be harmed accordingly. In addition, the lack

of enthusiasm may also lead to the loss of opportunities to cooperate with out-campus resources and restrain the development for colleges in talent cultivation, scientific research and innovation.

Therefore, vocational colleges need to strengthen their understanding and comprehension of these two concepts and integrate them into every teaching aspect. This requires not only internal self-renewal within the school, but also the establishment of closer cooperation with external collaborators to jointly promote the deep integration of education and scientific research, achieve optimized allocation of educational resources, and comprehensively improve the quality of talent cultivation. In this way can vocational colleges better adapt to the needs of social development can and cultivate more highly skilled talents with innovative spirit and practical capacity.

## **2.2 Insufficient Top-level Design and Guarantee Measures**

Currently, in the process of promoting the integration of science and education and collaborative innovation in vocational colleges, the lack of top-level design has become a bottleneck for further development. No confirmed planning and guarantee measures make it difficult to effectively promote and implement these concepts. At the same time, the unclear responsibilities of relevant management departments have further exacerbated the chaos in resource allocation, resulting in insufficient supply of human and material resources, making it difficult to meet the actual needs of “integration of science and education” and “collaborative innovation” .

This situation not only affects the implementation of educational concepts, but also restricts the potential of vocational colleges in talent cultivation, scientific research and innovation. The implementation of the concept is only in the initial exploration stage in some schools, lacking systematic and comprehensive promotion, which undoubtedly weakens the strength and effectiveness of education reform.

## **2.3 Low level of Collaboration and Participation**

Cooperation plays a crucial role in the development of vocational colleges, but currently its level is relatively low, and so is the enthusiasm of all participants. Enterprises often adopt a conservative attitude towards participating in collaborative innovation due to excessive focus on short-term economic benefits, which weakens their positive effects. Research institutes also face challenges as they find it difficult to break through existing collaboration models. Even if they do but still stay at a basic level and lack further motivation in innovation.

There is a significant gap between product research and technological innovation in vocational colleges and the actual demands of enterprises, which leads to an urgent need to improve the depth and breadth of school-enterprise cooperation. Closer connection with enterprises, more acknowledgement of market demands and infusion with the enterprise practices need to be implemented by vocational colleges to nurture high-skilled talents who are capable to better meet market demands.

In addition, the lack of supporting policies restrains the utmost effects of all participants in collaborative innovation. Related policies play a crucial role in supporting and stimulating all parties, otherwise it will be difficult to form a strong joint force and achieve expected results.

## **2.4 Poor Resources of Double-position Teachers**

Vocational colleges generally face the problem of a shortage of double-position teachers in their teaching staff. On the one hand, its number was so small that double-position teachers only accounted for 22.8% of the total in 2020. [3] Obviously, it would be far from satisfaction. On the other hand, the level of existing double-position teaching staff needs to be strengthened in the depth and breadth of theoretical knowledge and practical operation skills. There is a common problem in vocational colleges where "double-certified" teachers replace double-position teachers. [4] Moreover, poor double-position teaching staff will also limit the innovation of teaching methods and make it more difficult to effectively connect teaching with the actual needs of enterprises.

These problems not only affect the quality of teaching, but also restrict the ability of vocational colleges to cultivate high skilled talents who can adapt to social and market demands.

## 2.5 Inadequate Practical Training Resources

Vocational colleges generally face a series of challenges in practical teaching. Teaching methods lack diversity and directed focus. Meanwhile, the deficiency, low utilization rate and poor adaptability of practical training resources also do great harm to the cultivation of high skilled talents. [5] [6] Firstly, poor teaching methods lack flexibility and innovation, which in turns cannot adapt to needs of different students and different majors. The absence of targeted teaching content fails to effectively stimulate students' interest and creativity in learning. Secondly, insufficient practical training equipment and venues, or the low utilization rate of existing resources result in less opportunities for students to access to practical operations. In addition, this lack of accessibility not only harms their skill mastery but also exacerbates the unfair distribution of educational resources.

These problems depart students' training in school from practical job requirements in enterprises. This gap makes it difficult for them to adapt to the career and quickly meet the expectations of the company after graduation.

## 2.6 Unsatisfactory Evaluation of Talent Cultivation

At present, the evaluation system of talent cultivation of vocational education in China confronts further improvement. Overall, this system exhibits clear characteristics of summarization, formalization, and traditionality. [7] Specifically, existing evaluation indicators often do not focus on being vocational, namely the skills and qualities closely related to actual work. Moreover, the composition of reviewers has not been diversified without different voices and perspectives, which affects the comprehensiveness and objectivity of the evaluation. What' s more, related figures are not so scientific enough to guarantee the accuracy and effectiveness of the evaluation results. [8]

These problems not only affect the effectiveness of educational evaluation, but also hinders the transformation of vocational education from "emphasizing scale development" to "emphasizing quality improvement"

# 3. "Symbiotic Integration of the Three Vitalities" Talent Cultivation Model

## 3.1 Conception of SITV

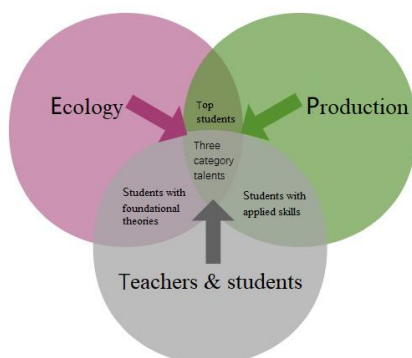


Fig. 1 Conceptual diagram of SITV

The concept of "Symbiotic Integration of the Three Vitalities" (SITV) model refers to integrate teachers, students, production and ecology in the talent cultivation to achieve effectiveness and innovation, which exhibits in the diagram of figure 1. Teachers and students function as the main body of talent cultivation which exhibits from the leading position of teachers and the active role of students in the process of talent cultivation. Production is the carrier and means of talent cultivation,

which requires the close integration of theoretical teaching, scientific research, social practices, and practical production to maximize the utilization of related resources. Ecology is the environment for talent cultivation. Sustainable development theories should be rooted in the entire cultivating process to create beneficial environment for students' gradual and layered development.

The SITV model is based on the concepts of "integration of science and education" and "collaborative innovation". It is a new talent cultivation mode of vocational education oriented towards the integration of science and education, emphasized on the integration of industry and education and supported by the integration of vocational education and academic education. It features in student-centered, practices and innovation as well as result-oriented. By embedding scientific research, projects, and cooperation into the entire cultivating process, through the collaboration of vocational colleges, universities, research institutions and enterprises, the integration and innovation of teachers, students, production, and ecology is able to be achieved, and the utilization of related resources can be maximized, and accordingly, high-quality skilled talents who are adaptable to the new era with innovative, entrepreneurial and green concepts may be nurtured.

Vocational colleges can play a leading role and utilize their own advantages through SITV model. The human and practical training resources of other universities, institutions, and enterprises can be made use of to solve the problem of insufficient double-position teachers in vocational education. Theoretical and practical teaching can take advantage of scientific results and the insufficiency and low utilization of related resources may be eased. As two driving forces, scientific research and popular science can help to enhance their abilities and skills for them of different levels. Top talents can further strengthen their abilities by participating in skill competitions and innovation matches.

### 3.2 Construction of SITV Model

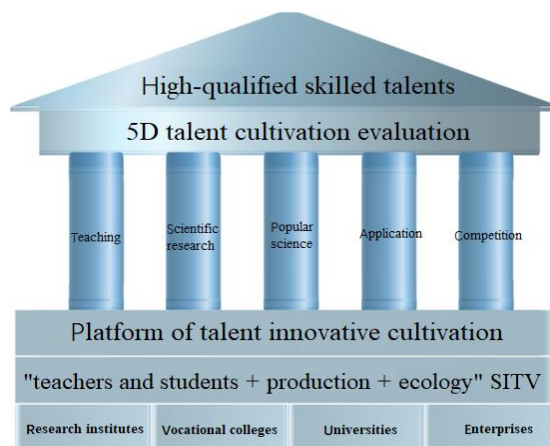


Fig. 2 Talent Cultivation Model of SITV

Because the cultivation of skilled talents is a systematic project, it is fundamental to establish a model to provide a clear development path and plan. The talent cultivation model of SITV is shown in Figure 2.

Firstly, to realize the integration of science and education, industry and education, vocational and academic education by introducing scientific research, projects, and cooperations into the entire cultivating process under the joint efforts from vocational colleges, ordinary universities, research institutions and enterprises. Secondly, to implement the innovative path as the core of SITV model and in this way to maximize utilization of related resources and construct environment for students' improvement. Thirdly, to establish a platform and build a team to ensure students' sustainable development. Fourthly, to classify students and enhance their corresponding knowledge and skills based on different situations and training objectives through different ways, such as teaching, scientific research, popular science, application and competitions. Fifth, to assess knowledge and

skills comprehensively by establishing an evaluation system in five dimensions, namely teaching, scientific research, science popularization, application and competitions. Finally, to output high-quality skilled talents through cultivation.

#### 4. Current Achievements of SITV Model

Since its implementation in 2020, the SITV Model has effectively solved problems such as poor double-position teaching staff, lack of practical training resources, and disconnection between textbook knowledge and vocational skills, etc. It has also promoted the effective integration of resources in school, research institutions and enterprises, achieved the maximum resource utilization and optimized the growth environment for students.

As a key foundational course of environmental engineering technology major, various methods such as flipped classroom, project-based and mobile teaching are adopted in the class of college chemistry. Two modules of course video and intelligent homework in "123" model are developed to strengthen students' theoretical knowledge, operational skills and personal qualities.

On this basis, according to the characteristics of students in this major, practical training resources and textbook development have been carried out by connecting with technological development, market demands and environmental monitoring technology. The self-developed scientific research facilities such as "artificial wetland system" and "ecological floating bed" have been transformed as practical training resources and applied to classroom teaching. We won the second prize in the 2023 Sichuan Teaching Ability Competition through this transformation.

Many textbooks such as Environmental Monitoring Technology (Second Edition) have been published based on deep cooperations with enterprises. It has been selected as a national vocational education planning textbook by the Ministry of Education and used by more than 50 unities.

At the same time, our research has been rated as excellent for many consecutive years. Our students have achieved fruitful results in various competitions, completed multiple scientific research projects, obtained several patent authorizations and published over 30 academic papers.

The SITV Model has demonstrated effectiveness and innovation in practice, provided valuable experience for the field of environmental protection education and set an example of talent cultivation for other sectors.

Continuous improvement and innovation are still needed in spite of significant achievements. The future education should pay more attention to nurturing high-quality talents, meeting personalized needs of students, providing diversified and personalized learning paths and adapting to social and environmental changes. Meanwhile, it is necessary to expand cooperation between schools, enterprises, and research institutions, enhance academic exchanges, broaden international views for in-depth development of vocational education and more cultivation of high-quality skilled talents.

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