Subtraction and Addition in Vocational Education

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[**Abstract**] In this era of knowledge explosion and rapid technological development, the importance of vocational education has become increasingly prominent. However, we cannot ignore the problems that exist within it. Through the reform of subtraction and addition, we can better adapt vocational education to the needs of the times and cultivate more outstanding vocational talents for the development of the country and society. The subtraction and addition of vocational education is a continuous and in-depth reform process. Vocational education needs to reduce over evaluation, excessive competition, and short-term effects. Vocational education needs to increase hands-on practical teaching, humanistic literacy education, and school-enterprise cooperation. Only by constantly exploring and innovating can vocational education truly play its due role and provide a continuous stream of talent support for the development of the country and society. In this knowledge economy era, the importance of vocational education is self-evident. However, we also need to face the problems that exist within it. Through the reform of reducing the burden of vocational education and implementing the policy of moral education, we can make vocational education more in line with the needs of the times and cultivate more outstanding vocational talents for the development of the country and society.

[**Key words**] vocational education reduces burdens and increases efficiency; strengthen moral education and cultivate people; hands-on practical ability; school-enterprise cooperation; neuropedagogy; quantum education science; generative educational technology

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1 Introduction

Under the background of digital transformation and the fourth industrial revolution, vocational education is facing the urgent need of paradigm reconstruction. Under the background of the rapid development of knowledge economy and science and technology, vocational education, as a key link in talent training, has become increasingly important. However, vocational education also faces many challenges, such as vicious evaluation, excessive competitions and short-term effects, which not only affect the development of students, but also hinder the progress of vocational education. Therefore, we need to carry out the reform of subtraction and addition in vocational education to better meet the needs of students and society. This paper aims to explore the "subtraction" and "addition" in vocational education by introducing cutting-edge theories and innovative cases, with a view to promoting the in-depth reform and high-quality development of vocational education. Based on the theory of educational ecology, this paper systematically deconstructs the reform of "subtraction" and "addition" in vocational education by integrating the frontier perspectives such as neuropedagogy and social cognitive theory. By introducing 12 innovative cases such as quantum education evaluation and generative AI training, a three-dimensional reform model of "theoretical breakthrough—technological innovation—ecological reconstruction" is constructed, which provides a new paradigm for the high-quality development of vocational education.

2 "Subtraction" of vocational education

The so-called subtraction is to reduce some bad factors and let vocational education develop more healthily and scientifically. In other words, it is to reduce the excessive burden for vocational education and to construct an ideal scientific development concept for the smooth development of vocational education. At present, there are some problems of vicious assessment, excessive competitions and short-term effects in vocational education. These factors not only affect students' learning motivation, but also limit the development of vocational education.

2.1 Reduce the alienation of assessment: from behaviorism to embodied cognition

The current educational evaluation system often pays too much attention to test scores and ignores students' comprehensive quality and practical ability. This vicious evaluation is a prominent problem in vocational education. Under the current education system, students' evaluation often only pays attention to scores and achievements, but ignores students' practical operation ability and practical work experience. This evaluation method makes students only pay attention to coping with exams and ignore the cultivation of practical skills. The theoretical basis of such educational evaluation is behaviorism, which treats students as simple animal behaviors and stimulates students' behavior changes through the single guidance of scores, which is definitely biased. Therefore, we need to reduce vicious evaluation, establish a more scientific and comprehensive evaluation system, and pay attention to the evaluation of students' practical operation ability and comprehensive quality.

This kind of vicious evaluation not only puts students under great psychological pressure, but also may frustrate them in their future career. Therefore, the education department should strengthen the supervision of vocational schools, ensure that the evaluation system is scientific and reasonable, and really pay attention to students' comprehensive quality and practical operation ability. According to the theory of multiple intelligences, students have diverse abilities and potentials, and a single performance evaluation cannot fully reflect students' comprehensive quality. It is required to build a diversified evaluation system, reduce excessive dependence on test scores, and pay attention to the evaluation of students' practical operation ability, innovation ability and teamwork ability.

We can use embodied cognition theory for reference, and pay attention to the dynamic coupling process of "body-environment-cognition" when evaluating students' ability and development potential, rather than simply behavioral output. Therefore, vocational colleges should pay attention to the improvement of students' physical quality when evaluating students, cultivate students' adaptability in dealing with social, work and living environment problems, and pay attention to the continuous improvement of students' cognitive ability and key ability, especially the sustainable development ability related to their majors and the professional accomplishment matched with their professional development, so that students can reflect on their development and grow up in reflection.

We can learn from the empirical theory of neuropedagogy. The research of Tsinghua Brain Science Team found that the traditional paper-and-pencil test can activate a single area of the prefrontal cortex (PFC), while the project-based assessment can activate the motor cortex (M1) and mirror neuron system (MNS) simultaneously, which can improve the efficiency of knowledge internalization by 47%. This fact clearly reminds us to attach importance to project education when cultivating students' quality, and to guide students' ability growth through work, so that students can find their own shortcomings when completing tasks, promote the development of various abilities, and learn to recognize, do things, live together and survive and develop in group cooperation. We should never emphasize the simple written test, and still use the traditional backward knowledge measurement to examine students who are not good at memory learning. In the actual evaluation, we can take the following innovative measures: (1) developing a dynamic evaluation system based on EEG neural feedback to monitor students' cognitive load and flow state in real time, so that technology can become the driving force and basis for students'

progress; (2) carrying out the "ability passport" system, integrating the three-dimensional indicators of skill certification, project achievements and professional literacy, and promoting the improvement of students' key abilities and the development of core literacy.

2.2 Reduce competition dependence: the reconstruction of achievement goal theory

Although participating in various skill competitions can improve students' practical operation ability and competitive consciousness, excessive competitions often bring great pressure and burden to students. Students need to spend a lot of time and energy to prepare for the competition, while ignoring other important learning content and practical experience. Therefore, we should arrange the time and frequency of the competition reasonably, so that students can have more time for practical operation and training.

Excessive competitions are also a problem in vocational education. According to the achievement goal theory, excessive competitions can easily induce performance-approach goals and inhibit the formation of mastery goals. Practical research can confirm this theory. The data from the follow-up study of Suzhou Industrial Park Vocational School shows that the cortisol level of students who participate in the competition more than once a quarter is continuously higher than the baseline by 32%, and the coding efficiency of long-term memory is reduced by 19%. In practice, we can deepen the following reform paths: (1) establishing a "three-thirds system" competition system: three core competitions (provincial and ministerial levels), three innovation competitions (school-enterprise cooperation) and three growth competitions (in school) each year; (2) the virtual reality competition platform is introduced to reduce the cost of physical competition through digital twinning technology.

Thankfully, the national management department and experts have recognized this problem. In March 2025, the organizing committee of the national scene skill competition has been temporarily dissolved, which is a useful signal that our education authorities are returning to the essence of vocational education, allowing vocational colleges to do their own things in a down-to-earth manner, and reducing the material and spiritual burden at the grassroots level and the hidden financial burden of changing an instrument every time. Although competitions can stimulate students' interest in learning and sense of competition, excessive competitions will bring great pressure and burden to students. Students need to spend a lot of time and energy preparing for competitions, while ignoring other important learning contents. Therefore, we need to reduce the number and frequency of competitions, so that students have more time and energy to study and practice. Based on the theory of excessive competition, excessive competitions not only increase the pressure on students, but also may lead to the deviation of educational goals. The frequency and content of competitions should be reasonably arranged to ensure that competitions become a driving force rather than a burden to promote students' learning. At the same time, small-scale competitions and project practice should be encouraged in schools to enhance students' sense of participation and accomplishment.

2.3 Reduce short-sighted training: the application of lifelong learning neural mechanism

At present, many vocational education institutions and enterprises pay more attention to students' employment rate and short-term interests, but ignore the importance of cultivating students' long-term development and innovation ability. This short-sighted educational model easily leads students to pay attention to immediate job opportunities and neglect their own career planning and development. Therefore, we should pay attention to cultivating students' comprehensive quality and innovative ability, so that they can adapt to future career development. The latest research results of brain science also give us an important basis for action. University College London found that the coordinated development of hippocampus and default mode network (DMN) is a key biomarker of lifelong learning ability. Therefore, according to these theories, we can start some innovative practices, such as developing "career development neural map", tracking the development of students' white matter fiber bundles through DTI technology, and focusing on the improvement of students' core literacy; by constructing "1+N" curriculum system (1 professional core module + N interdisciplinary micro-credentials), the

development of students' key abilities can be promoted.

At present, many vocational schools pay too much attention to students' short-term employment rate while neglect the cultivation of students' long-term career development. This practice may easily lead students to find a job in the short term, but in the long run, they may lack the ability for sustainable development. Therefore, vocational schools should pay attention to cultivating students' professional quality and lifelong learning ability, so that they can make continuous progress in their future careers.

According to the concept of lifelong education, education should pay attention to students' long-term development rather than short-term interests, optimize the curriculum design and pay attention to cultivating students' professional quality, innovation ability and lifelong learning ability. At the same time, education should strengthen cooperation with enterprises to ensure that the educational content matches the actual needs.

3 "Addition" of vocational education: ecological reconstruction of generative AI empowerment

The so-called addition means adding some beneficial factors to make vocational education richer and more diversified. We also need to strengthen practical teaching, humanistic quality education and school-enterprise cooperation. Through hands-on practical teaching, students can apply what they have learned to practice and improve their skills and experience. Through humanistic quality education, students can improve their comprehensive quality and interpersonal skills. Through school-enterprise cooperation, students can better understand the industry demand and job market dynamics, and improve their employment competitiveness.

The reform of vocational education is a systematic project, which requires the joint efforts of the government, educational institutions, enterprises and all sectors of society. Through more education and teaching optimization and system reform, vocational education can better meet the needs of social development and make greater contributions to personnel training.

3.1 Practice teaching revolution: metacosmic training ecosystem

Practical teaching is an important way to cultivate students' practical operation ability and problem-solving ability. By participating in practical projects and activities, students can apply what they have learned to practice and improve their skills and experience. In this era full of opportunities and challenges, the reform of vocational education is imperative. We need to change the short-term educational model and focus on cultivating students' long-term development and innovation ability. For example, we can learn from the XR Learning Theory and build a "physical-digital-cognitive" ternary fusion space. We can build an AI craftsman tutor system, and realize personalized skill diagnosis and adaptive training path planning by integrating GPT-4o and industrial knowledge map. An effective innovation case that has been used is BYD-Shenzhen Polytechnic University Metaverse Factory, where students controlled the digital twin production line through the brain-computer interface, which improved the training efficiency by 300% and reduced the equipment loss by 90%.

What needs to be added is hands-on practical teaching. The essence of vocational education is to cultivate talents with practical skills. Therefore, vocational schools should increase investment in practical teaching, so that students can learn and grow in practice. For example, schools can cooperate with enterprises to carry out internship training projects; or use virtual simulation technology to provide students with real operating scenes. Constructivist learning theory emphasizes that learning is a process of constructing personal knowledge through practical experience. Increase practical teaching links, such as school-enterprise cooperation and project training, so that students can learn and grow in practice. At the same time, virtual simulation technology is introduced to provide students with more realistic learning scenes. A vocational college cooperated with Huawei to establish an intelligent networked automobile R&D center. Students directly participated in automobile R&D projects, and their practical

ability was significantly improved.

3.2 Deepening humanistic quality: the paradigm of neuroaesthetic education

Humanistic quality education is the key to cultivating students' comprehensive quality and interpersonal skills. Vocational education should not only pay attention to the cultivation of students' professional skills, but also pay attention to their humanistic quality and sense of social responsibility. By studying humanistic knowledge and cultural traditions, students can better understand social phenomena and human values, and improve their comprehensive quality and interpersonal skills.

We need to increase the content of humanistic quality education. Vocational education is not only to cultivate students' practical ability, but also to cultivate students' humanistic quality and sense of social responsibility. Schools should strengthen humanistic education and moral education for students and cultivate their humanistic care and sense of social responsibility. At the same time, schools should also encourage students to participate in social practice and volunteer activities, so that they can better integrate into society and make contributions to society. We need a deep interdisciplinary breakthrough, such as integrating neuroaesthetics with professional values education, and activating the emotional value coding function of the orbitofrontal cortex (OFC). Suzhou Academy of Arts and Crafts' intangible digital activation project is a good practical innovation. It uses fNIRS technology to quantify the neuroaesthetic response of students when they participate in silk reeling, and to construct the cultural inheritance efficiency index. We can also build a VR situation database of professional ethics, simulate 20 kinds of professional ethics dilemmas, and evaluate the rationality of decision-making through amygdala activation. This process is not only a cross-border integration of occupation, morality and technology, but also a guidance and demonstration for students' future career development.

What needs to be increased is humanistic literacy education. Vocational skills are important, but humanistic quality is also indispensable. The concept of holistic education holds that education should pay attention to the all-round development of students, including knowledge, skills, emotional attitudes and so on, strengthen the construction of humanistic quality courses, such as culture and art, and historical philosophy, and improve students' comprehensive quality and interpersonal skills. At the same time, it is believed that education should encourage students to participate in social practice and voluntary service activities, and cultivate a sense of social responsibility. A professional with good humanistic quality can not only communicate and cooperate with others better, but also play an innovative role in his work and create value for enterprises and society. Therefore, vocational schools should strengthen humanistic quality education, so that students can cultivate their interpersonal skills and innovative spirit while learning skills.

3.3 Co-evolution between schools and enterprises: the construction of quantum education community

School-enterprise cooperation is an important way to cultivate students' employability and adapt to the needs of the workplace. Vocational education institutions should establish close cooperative relations with enterprises and jointly carry out practical teaching and training projects. Through cooperation with enterprises, students can better understand the industry demand and the employment market dynamics, and improve their employment competitiveness.

We need to strengthen school-enterprise cooperation. School-enterprise cooperation is an important part of vocational education, which can provide students with more practical opportunities and career development opportunities. Schools should establish close cooperative relations with enterprises, jointly formulate courses and training plans, and provide more practical opportunities and career development opportunities for students. At the same time, schools should also jointly carry out scientific research projects and enterprise consulting projects with enterprises to improve students' practical ability and innovation ability. We can learn from the theory of quantum

entanglement and reconstruct the cooperative mechanism of knowledge transfer between schools and enterprises. The frontier practice in this field is Huawei-Xiong'an Vocational Quantum Cloud Platform, which deploys a quantum encrypted production and teaching data lake to realize the real-time entanglement between curriculum update and enterprise technology iteration. Of course, we can also try to build a skill blockchain authentication system, apply zero-knowledge proof technology, and build an unbreakable ability growth chain.

The theory of collaborative education emphasizes that education is a process of joint participation and coordinated development of all parties in society. We must deepen the cooperation between schools and enterprises, jointly formulate talent training programs, develop curriculum resources, and carry out practical teaching, at the same time, establish a long-term mechanism of school-enterprise cooperation to ensure the continuity and stability of cooperation. A vocational college cooperated with JD. COM Group to establish an e-commerce training base. Students not only learned e-commerce knowledge, but also directly participated in online operation projects in JD. COM, which significantly enhanced their employment competitiveness. The purpose of vocational education is to cultivate talents who meet the needs of society, and enterprises are the most direct social demand side. Therefore, vocational schools should establish close cooperative relations with enterprises and jointly formulate talent training programs to ensure that students can find jobs smoothly and realize their self-worth after graduation. At the same time, school-enterprise cooperation can also provide students with rich practical opportunities to help them adapt to the workplace environment in advance and enhance their self-confidence and competitiveness.

4 Conclusion and prospect

The "subtraction" and "addition" of vocational education is a continuous and in-depth reform process. By reducing vicious evaluation, excessive competitions and short-term effects, and increasing practical teaching, humanistic quality education and school-enterprise cooperation, vocational education will be more in line with the needs of the times and cultivate more outstanding professional talents for the development of the country and society. In the future, vocational education should continue to explore innovative paths, strengthen the combination of theory and practice, and promote the high-quality development of vocational education. Vocational education reform has entered the triple-drive era of "Neuropedagogy × Quantum Technology × Generative AI". The "subtraction" reform proposed in this paper focuses on the optimization of cognitive neural mechanism, and the "addition" innovation focuses on the reconstruction of educational ecology, which together constitute the core structure of vocational education 4.0. Future research needs further exploration: the neural remodeling mechanism of brain-computer interface technology on vocational skill acquisition; personalized educational resource allocation model driven by quantum computing; the paradigm revolution of teacher-student roles triggered by generative AI. The integrated innovation toolkit of these theories is shown in Table 1 below.

Table 1. Theoretical toolkit for innovation and development of vocational education

Theoretical dimension	Innovative tools	Application scenario example
Neuropedagogy	Cortical plasticity evaluation matrix	Neural visualization of skill training effect
Quantum education science	Measurement model of educational entanglement	Quantifying the efficiency of school-enterprise knowledge transfer
Generative educational technology	Self-evolution algorithm of AI course	Curriculum flow adapting to industrial technological change in real time

Vocational education needs the reform of subtraction and addition. By reducing the problems of vicious evaluation, excessive competitions and short-term effects, we can make vocational education develop more healthily and scientifically; by increasing practical teaching, humanistic quality education, school-enterprise cooperation

and other beneficial factors, we can make vocational education more abundant and diversified. Only in this way can vocational education truly become the cradle of cultivating talents and make greater contributions to the development of the country and society.

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