



Cultivating Innovative and Entrepreneurial Talent in the Higher Vocational Automotive Major with the “On-board Educational Factory” Model

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Received 1 December 2016 • Revised 1 January 2017 • Accepted 1 March 2017

ABSTRACT

In this paper, we investigate the steps necessary to initiate reform in professional education. First, we analyze the advantages and disadvantages of the unified theory and practice model of education currently adopted in mainland China. Next, we suggest a talent cultivation strategy that prioritizes students and views industrial (factory) vocational ability as the guiding measure of the “factory” model in the higher vocational automotive major. Lastly, we propose a method for carrying out this strategy that involves boosting the innovative and entrepreneurial abilities of students, optimizing the goals of educational models, and establishing “on-board educational factories” and other pedagogical models.


Keywords: higher vocational automotive major, on-board educational factory, pedagogical reform, innovative and entrepreneurial education

INTRODUCTION

Higher vocational schools are training centers for technological skills. In the traditional unified theory and practice model of training, the training process works as follows: teachers design specific “tasks” based on a certain technical skill (e.g., servicing a generator in the automobile inspection and repair industry, or pushing a new vehicle in the car sales and service industry), which are completed in isolation from other tasks and “refitted” from existing course materials based on the scientific method. Before attempting to perform tasks, students complete the theoretical portion of their coursework, which features the traditional lecture-based pedagogical model. As students complete tasks, they focus only on the surface aspect of the task itself and do not work holistically with the entire vehicle. Additionally, due to limitations imposed by pedagogical theory, training centers are unrealistic in terms of their professional training positions, hindering students’ ability to form realistic impressions of professional positions within their major. The traditional unified theory and practice model also easily creates situations in which theoretical content is repeated, causing some students to only

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State of the literature

- Before attempting to perform vehicle service tasks, students complete the theoretical portion of their coursework, which features the traditional lecture-based pedagogical model. As students complete tasks, they focus only on the surface aspect of the task itself and do not work holistically with the entire vehicle.
- Due to limitations imposed by pedagogical theory, training centers are unrealistic in terms of their professional training positions, hindering students' ability to form realistic impressions of professional positions within their major.
- These faults with the traditional model affect the cultivation of both logical reasoning and innovative awareness among students, diminishing their ability to innovatively launch their careers and compete in the workplace after graduation.

Contribution of this paper to the literature

- In this paper, we investigate the steps necessary to initiate reform in professional education
- We analyze the advantages and disadvantages of the unified theory and practice model of education currently adopted in mainland China. We also suggest a talent cultivation strategy that prioritizes students and views industrial (factory) vocational ability as the guiding measure of the "factory" model in the higher vocational automotive major
- Finally, we propose a method for carrying out this strategy that involves boosting the innovative and entrepreneurial abilities of students, optimizing the goals of educational models, and establishing "on-board educational factories" and other pedagogical models.

recognize automobile structures in isolation, and not on actual automobiles. Moreover, it can cause others to lack the wherewithal to distinguish the differences between structures on different brands of automobiles. These faults with the traditional model affect the cultivation of both logical reasoning and innovative awareness among students, diminishing their ability to innovatively launch their careers and compete in the workplace after graduation.

In light of recent technological developments, industrial adjustments, and economic improvements, the large-scale cultivation of the "craftsmanship of a great nation" – in which innovative and entrepreneurial skills are paramount – has already become both a trend and a necessity in the efforts to reform higher vocational education and pedagogy in mainland China. In addition to reforming traditional pedagogical methods in the classroom, professional teachers at higher vocational schools must, more importantly, introduce the concepts of innovation and entrepreneurialism into every aspect of their educational curriculum. Moreover, they need to search for innovative talent training methods better suited to mainland China's current situation. In recent years, some higher vocational schools, in an effort to expand employment options for students, have established cross-vocational elective courses. Yet, the curriculum and teaching methods for these courses have seen little innovation; most courses still follow pedagogical models based on the "scientific method," and practical education in these courses takes place only in classrooms and lecture halls. This mode of talent cultivation still emphasizes theory over practice and prioritizes faculty

guidance over student autonomy. As for implementing itemized instruction, seminar discussion, and other innovative pedagogical methods, very few operate on the level of working with actual automobiles, instead only teaching the completion of tasks. This serious lack of holistic and logical thinking has severely stunted the growth of students in the higher vocational automotive major in terms of their overall personal character as well as their innovative and entrepreneurial abilities.

LITERATURES REVIEWING

In 1991, the Tokyo International Summit for Innovative Education broadly defined “innovative and entrepreneurial education as the training of individuals who possess the most innovative personalities, which features cultivating the spirit of originality, risk taking, and entrepreneurship, as well as developing independence in the workplace, and professional, social, and managerial skills.” The piece “On Greatly Increasing Innovative Education in Higher Vocational Schools, and Fostering Autonomy and Entrepreneurship in the Workplace for Students,” published by China’s Bureau of Education, points out that “in launching innovative and entrepreneurial education in higher vocational schools, actively encouraging higher vocational students to be autonomous and entrepreneurial stands as a ‘Scientific Outlook on Development,’ which serves as an important strategic step in constructing an innovative nation; it serves as an important channel through which to intensify pedagogical reform in higher education, and cultivate the spirit of innovation in and practical abilities of students; it stands as an important measure to implementing a system in which innovation drives employment, and graduates of higher vocational schools are fully prepared for employment.

Presently, in a society inundated with slogans such as “encourage the people to create and innovate,” as well as a new prevailing attitude of “promoting the development of new methods for economic development, and reworking the economic structure,” it is imperative for higher vocational education to implement pedagogy that is oriented toward personal cultivation on two levels. First, teachers should convey the theoretical knowledge and operational skills and standards relevant to students’ respective occupational positions, along with teaching the principles of interpersonal conduct and concepts of innovation and entrepreneurship. In the present pedagogical system, students occupy a conspicuously passive position. Second, students must convert their knowledge into functional skills by way of practically connecting them. Regarding the question of whether students can yield innovative and entrepreneurial concepts and abilities from this conversion, it depends on the process. Currently, higher vocational education mostly only focuses on the first of these processes. It neglects to convert the knowledge absorbed by students into functional skills and innovative, entrepreneurial abilities, and it fails to cultivate students’ capacity for logical reasoning, as well as their ability to discover and solve practical problems.

RESEARCH DESIGN

Generally, the traditional educational model in the higher vocational auto major prioritizes the transmission of knowledge at the expense of cultivating ability. Such is the case with the model's emphasis on explaining specialized theoretical knowledge while neglecting practical and operational training. Likewise, it prioritizes the diagnosis of automotive structures over conducting systematic analysis on a holistic level. In terms of evaluating students under this system, most evaluations focus on students' retention of knowledge and operational procedures, while insufficiently evaluating aspects such as logical reasoning, innovation, and entrepreneurship. The effect of these disadvantages is that students build a solid theoretical foundation on which they excel at gaining knowledge but lack realistic operational training in their industrial posts, as well as the capacity to think independently and systematically. Hence, to reform educational and pedagogical models in the higher vocational auto major, a comprehensive increase in students' holistic standards is imperative.

The objectives of the pedagogical reform movement, based on the "on-board educational factory" educational model, in the higher vocational auto major are as follows. In terms of talent cultivation, the former "transmission-based" model must be replaced with a pedagogical model based on the on-board educational factory. The on-board educational factory is essentially a place for students to gain practical experience, which provides the most realistic simulacrum of their industrial positions (e.g., sales reception, sales information, repair reception, basic maintenance, accident diagnosis, replacement and administration, insurance and compensation, used vehicle exchange, and vehicle financing). This model of education also uses core, specialized curricula (e.g., auto sales, vehicle inspection and diagnosis, used vehicle appraisal and assessment, and vehicle insurance and compensation). The industrial simulacrum positions and core curriculum used in the factory both employ pedagogy operating at a holistic level inside a realistic, industrial environment. After taking an academic course that corresponds to their industrial posts, students may choose their next course that corresponds to their posts. Such a course enrolment model would serve to increase levels of student autonomy and bolster their capacity for innovative and entrepreneurial thinking.

In terms of educational content, by "itemizing" the functional skills relevant to real positions into practical and operational questions utilized in on-board education, students would holistically learn functional skills while also refining their ability to operate in their positions. This in turn would cultivate entrepreneurial ability as well as a spirit of innovation among students. In terms of pedagogical methods, several reforms are necessary. First, the "force feed" pedagogical model must be transformed into one based on "stimulation, questioning, and discussion." Next, students inside the "factories" should be allowed to design projects proposals and freely participate in completing various types of projects. Lastly, as students analyze the completion of their projects, they should be allowed to compare the strengths and weaknesses of their classmates' proposals. This will push students to study actively rather than passively and become the center of educational activity. As for reforming pedagogical evaluation systems, members of the Society of Automotive Engineering (SAE), as

well as management professionals, should be invited to participate in the comprehensive evaluation of student character. Emphasis should be placed on evaluating students' ability to solve practical problems in their professional positions and to use functional skills to develop innovative designs. In terms of reforming pedagogical management, these changes will create a free and relaxed environment for discussion among students. This will allow students to take their studies into their own hands as well as create an atmosphere conducive to developing students' personalities and discovering their hidden talents.

EVALUATED MEASUREMENTS

The institution where the authors of this paper work is the chairman institution of the city-level SAE. This institution is also a vice chairman institution of the provincial-level SAE. In working to implement innovative and entrepreneurial models of talent cultivation in the higher vocational automotive major, we have relied on both prefectural- and provincial-level associations as platforms. We have organized many expert-directed conferences, featuring speakers from different business groups (e.g., the Automotive Repair and Licensing Association, ARLA), enterprises (e.g., name-brand 4S dealerships, used car markets, insurance companies, part and component manufacturers), campuses (junior high, high school, and undergraduate campuses), government labor departments (the Bureau of Labor), and traffic and transportation administrative departments (Bureau of Transportation Administration). Such variety has guaranteed that an approach involving multiple perspectives has been adopted to address the issue of developing methods for talent cultivation. This ensures that the skills students obtain will be the most desirable as well as the most current. The environment in which students receive practical education will also be arranged based on realistic industry positions, such that when students tackle their core curriculum by working on "projects" in the on-board educational factories, it will be as if they are actual employees. Such a model not only clarifies individual tasks and responsibilities within the entire factory but also allows students to see the operations of individuals working in positions above and below them in the factory. Furthermore, inside the educational factories, students will still have reasonable freedom to select the timing (e.g., different semesters), space (e.g., different auto models), credits (e.g., different study programs), and order (e.g., different sequences) of educational projects in their core coursework. Allowing students to autonomously rotate positions in the factory will not only help them internalize industrial training requirements, gain passion for their studies, and heighten the urgency of their initial functional training but also give them a direct perspective on development trends in the industry. This in turn will help instill the concepts of systematic study and lifelong learning, which will also increase students' capacity for innovative thinking.

Characteristics of the on-board educational factories are described below. This pedagogical model is an integrated training model that cultivates students' professional skills, innovation and entrepreneurialism, communication and social interaction, and professional ethics and manners. It puts students at the helm of their training while situating faculty in supportive roles. Moreover, it designs educational projects based on the conceptual

framework of strengthening students' functional skills and innovative and entrepreneurial abilities, reforms pedagogical content and academic coursework, and utilizes key pedagogical concepts to incorporate innovative awareness and entrepreneurial ability into the entire training program.

1) Accumulating Functional Skills along with Cultivating Character

The rapid development of scientific technology has diversified human relationships. Therefore, higher vocational education must not only teach students how to do things (i.e., use functional skills to solve practical problems in the workplace) but, more importantly, also teach them how to function as human beings (e.g., dealing diplomatically with coworkers or clients). Inside the on-board educational factory, students must take the initiative to communicate with their teachers about choosing projects and with their "colleagues" in positions above or below them about the status of these projects. Students must understand that for a factory to operate seamlessly – and to keep the entire factory from stalling due to the neglect of a single position – everyone must work effectively in their respective posts. This way, students' ability to manage themselves and get along with others – and to act professionally and ethically in the workplace – will attain the same level of importance as the accumulation of functional skills. Such emphasis will not only refine students' skills and abilities but also influence the cultivation of "character," which will help inculcate responsibility and professionalism, along with cultivating talent with an overall higher character.

2) Simultaneously Implementing Innovative and Professional Education

In reforming traditional academic curricula, we seek to shift the focus of traditional coursework away from emphasizing the transmission of knowledge toward an understanding of the ways different courses relate to each other. We also seek to study the effect of unified coursework planning on the process of cultivating innovative talent and discover the factors that contribute to cultivating innovative ability in each academic course. Inside on-board educational factories, students can freely choose educational projects; freely rotate between professional posts; and utilize homework, problem sets, discussions, presentations, and other assignments to assess the benefit, or lack thereof, of completing various projects. In this way, this system will cultivate innovative awareness and entrepreneurial ability among students, and thereby develop innovative thinking and awareness, and entrepreneurial ability in step with specialized education. During the allotted learning time for each core academic course, faculty will do their best to teach projects efficiently, placing particular emphasis on cultivating ability to the point of sufficient mastery.

3) Evaluating Student Skills while Cultivating Student Expertise

As for evaluating students in the on-board educational factory, we have collaborated with various traditional industries within prefectural and provincial SAE to select standard industrial positions that correspond to a core curriculum. This curriculum features highly utilitarian positions, widely employable tracks, and strongly adaptable skills in accordance

with the practical, operational demands of industry. Further, students will be comprehensively evaluated from various perspectives, including professional competence, business etiquette, adaptability to changing circumstances, and strength of personality. Evaluations will not only identify areas in which students are deficient but also distinguish those in which they excel, thereby helping students to objectively analyze their strengths and weaknesses, optimizing their selection of a professional identity. In terms of evaluating study habits, integration with industry can mobilize self-initiative and curiosity among students and help them discover and channel their strong points, thereby creating a “win-win” situation for education and learning.

4) Combining Classroom Teaching with Practical Innovation

The road by which educational factories have entered innovative and entrepreneurial education is paved with the many teachers within these factories. Some have years of practical teaching experience under their belts, come from industry themselves, or continue to work on industrial projects as they teach. We encourage students to assimilate entrepreneurial planning into their educational projects as they study in these factories. Such assimilation will allow students to add their own entrepreneurial elements to the projects teachers design for them. Alternatively, students may choose projects that fall more closely in line with their own entrepreneurial plans. In this way, pedagogical models focused only on transmitting knowledge by way of “lecturing” will shift toward a model focused on student “entrepreneurial” education, thus bringing together classroom teaching and practical student innovation. This will not only increase the efficacy of professional education but also increase students’ capacity for innovation. Bringing together the skills and strengths of students, displayed in their various “occupations” inside the educational factories, will also serve to better define the advisor–advisee relationship between teachers and students when students select externships or arrange their graduation plans. This will also push students to bring together their graduation plans, practical industrial experience, and entrepreneurial activities. Lastly, this will further stimulate the entrepreneurial passion of students and increase the likelihood of converting creative thinking into innovative success.

CONCLUSION AND RECOMMENDATION

In today’s information age, the automobile has entered the everyday lives and households of the Chinese people. Thus, how should the automotive major in higher professional education react? Every teacher in the higher vocational auto major needs to consider this question. Training innovative and entrepreneurial talent is an educational goal that not only promotes the need for innovative personalities but also serves to expand reform to educational models, holistically advance the inevitable need for character-centric education, and respond to the information age’s call for innovative and entrepreneurial talent. Developing training methods for innovation and entrepreneurship in the higher vocational auto major based on on-board educational factories is more than just a method for reforming professional education in this field or updating educational content. On a larger scale, it is also

a way to functionally reposition higher vocational auto education, structurally renovate educational models, and achieve ideological breakthroughs in models for talent cultivation.

ACKNOWLEDGEMENTS

This work was financially supported by the Higher Education Pedagogical Reform Project of Zhejiang Province, China, 2016 (Grant No. jg20160348).

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