

Research on Cultivation of Innovative Students for Agricultural Equipment Industry

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Abstract: The innovation and development of agricultural equipment is imperative, however, there are some problems in the supply of talents for agricultural equipment industry, such as insufficient quantity, low quality, dislocation between the demand for talents in the industry and the cultivation of talents in colleges. It is imminent to explore innovative students training mode for agricultural equipment industry. Based on the investigation and analysis of the demand for talents in the agricultural equipment industry and the current situation of talent supply, this study actively explores the cultivation path of innovative talents from four aspects: setting up training plan based on industry demand; attaching importance to teaching quality construction; constructing an "open source and step-by-step" innovative practice system; setting up a comprehensive education platform by holding innovation competition for college students major in agricultural equipment. In this way students' comprehensive quality has been improved, their international horizons have been broadened and awareness of innovation and entrepreneurship has been enhanced.

Keywords: Cultivation of Students, Innovation, Industry Need

1. Introduction

Agricultural equipment is an important material basis for the development of modern agriculture. However, the development of agricultural machinery industry wasn't suitable for the new agricultural business entities any more in China. In the agricultural equipment manufacturing industry, also presents the common problems: large-scale in low-end, not high tech, at the bottom of the value chain, the core technology is subject to abroad. China has listed agricultural machinery and equipment in 10 major areas of "Made in China 2025" and put forward the direction and key tasks for the development of agricultural machinery and equipment, which showed government's high attention and determination to develop agricultural machinery and equipment. This is undoubtedly an important strategic opportunity for the development of the agricultural equipment industry. The innovation and development of agricultural equipment is imperative, and it is imminent to cultivate innovative students suited to it.

There are some problems in the cultivating mode at present: the curriculum system is lag behind the latest professional development direction [1]; the teaching method is unitary, which still adopts traditional inculcation teaching method, resulting in students' low enthusiasm and passive participation in the curriculum so the students are lack of the spirit of independent thinking and the consciousness of innovative exploration [2]; the cultivation of students' practical ability is divorced from the support of the industry, and there is a disconnection between students' theoretical learning and practical ability [3]; innovative design competition has become one of the main platforms to improve students' innovative practical ability, however, agricultural engineering students are still mainly taking part in innovative competitions of machinery, which are limited in number, low in participation and lack of professional pertinence. Therefore, it is of great practical significance to study the cultivating mode of innovative students for the agricultural equipment industry.

2. The Supply of College Graduates to Agricultural Equipment Industry at Present

2.1. The Supply of College Graduates Is Inadequate

China is in a critical period of transformation and upgrading from traditional agriculture to modern agriculture, and there is a huge demand for high-level agricultural talents. The agricultural machinery industry has entered a deep adjustment period due to the impact of product switching III, during which time enterprises need to strengthen their research ability with the help of talents. According to the forecast of talent demand in the "Guidelines for the Development of Talents in Manufacturing Industry", the gap in agricultural equipment industry will be as high as 169,000 by 2020. However, as an important source of talent supply, the number of students provided to enterprises is getting smaller, since the adjustment of agricultural equipment disciplines, and the connotation of agricultural equipment disciplines has been weakened, resulting in shrinkage of specialties, reduction of student resources, loss of teachers and so on. Because of prejudice against agriculture related enterprises, graduates' willingness to go to these enterprises is not strong. So, there is a big gap in personnel supply.

2.2. The Quality of Talents Is Not High

At present, there is a gap between the cultivation of students and the actual needs in agricultural equipment industry. On the one hand, the quality of applicants is not good. The attraction of agriculture-related disciplines is weak to students due to the influence of social concepts, so enrollment is facing greater difficulties. On the other hand, there is a lack of a systematic training system for talents in agricultural equipment industry. In the information age, technological development is changing rapidly. However, the content of textbooks in colleges update slowly, which cannot show the latest direction of professional

development, so students' professional knowledge is relatively backward. Currently, the problems in the practical courses stand out in two aspects: the content of practice is based on the needs of the curriculum of the general engineering colleges and universities, mainly on the practice of mechanical assembly and machining, ignoring the systematic training of experimental ability and the back of agricultural equipment which will lead to Disparities with the practical application of agricultural equipment industry; the teaching method is single, and the general proportion is only about 15% of the total credit, far below the reasonable proportion of about 30%.

2.3. There Is a Dislocation Between the Demand for Talents and the Cultivating of Students

The dislocation between the demand for talents and the training of students leads to the situation that the employers in the agricultural equipment industry cannot find suitable professionals and graduates cannot find suitable post in enterprises. A questionnaire survey was conducted in the agricultural equipment enterprises on the newly recruited college students' professional knowledge, industry frontier knowledge, manual ability, innovation, communication ability, teamwork ability and craftsman spirit of the graduates. The results showed that the satisfaction degree is below 60% in industry frontier knowledge, innovation, and craftsman spirit (seen Figure 1). The reasons are as follows: First, the cultivation plan of schools does not invite the participation of relative industries and students, so the curriculum cannot meet the actual needs of the industry. Secondly, in the process of training, the collaborative training stays in a simple "cooperative" mode, and the role of collaborative education in the cultivation of students' innovation has not been fully played, leading to students' lack of in-depth understanding of the needs of the industry, and not in-depth grasp of the practical problems that the major should solve; the third , training mode is outdated, and college still pays major attention to theoretical knowledge, neglecting the cultivation of students' professional ability.

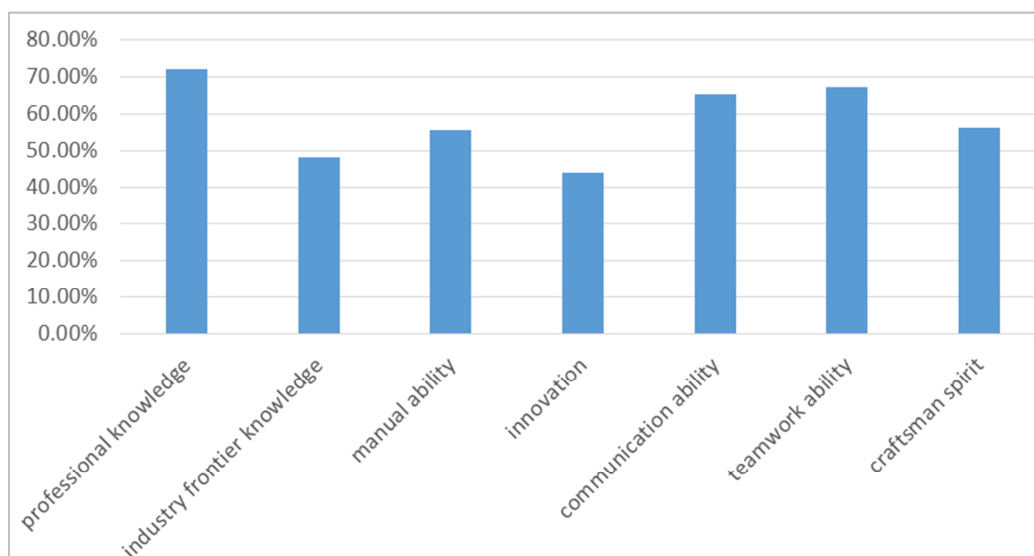


Figure 1. Employer's satisfaction statistics for graduating students.

3. Talents Requirement Standards for Agricultural Equipment Industry

3.1. Professional Quality

Professional knowledge is the basis for engaging in relevant work in agricultural equipment industry. The head of human resources of enterprises in the agricultural equipment industry put forward that university are the platform for teaching professional knowledge, and students must have solid professional knowledge, understand the forefront knowledge of the industry and the ability to transform knowledge into practical work. Graduates entering the agricultural equipment industry pointed out that mechanical design, hydraulic, engineering mechanics, agricultural equipment intelligent technology are very important, design software is also an essential skill needs to systematically master and integrate with professional knowledge, to be competent for the job requirements.

3.2. Vocational Ability

Manual ability is the essential ability of manufacturing talents. In addition to a solid theoretical basis, students also need to integrate theory with practice, to transform the knowledge accepted in college into practical work. College students' innovation can be defined as their ability to generate innovative ideas, adopt innovative tools and means, and implement innovative ideas in scientific research and social practice. Students with strong innovation have good innovative thinking, which is the key to open the door to unknown areas of agricultural equipment industry. If the graduate is lack in innovation, which only through pre-job training to gradually improve the ability, the integration into the enterprise cycle will be longer, the cost of the enterprise will increase, and the pressure enterprises are facing will be increased.

3.3. Professionalism

High-quality talent in agricultural equipment industry need team cooperation consciousness, communication ability, and a good state of mind [4]. How to correctly adjust their mentality and face up to the frustrations in their work is also an ability that college students need to master. It is necessary for employees to have "the spirit of craftsman" to realize the transformation from a big manufacturing country to a powerful manufacturing country in China. "The spirit of craftsman" includes the contents of dedication, leanness, concentration, innovation and so on. Contemporary college students need to organically integrate "the spirit of craftsman" and innovation, and be responsible for realizing a strong manufacturing country in China.

4. The Path to Cultivate Innovative Students for Industry Demand

Jiangsu University has been actively exploring the cultivation mode of students for agricultural equipment industry. The demand for industry lies in the whole process of students' training.

4.1. Set up Training Plan Based on Industry Demand

The training objectives should meet the needs of the development of the industry [5]. The employers and graduates should be fully investigated on the knowledge and abilities needed by innovative talents during formulating the training program. The industry and employers should be invited to participate in the formulation of the training objectives. The curriculum system not only considers the inheritance of mechanical engineering discipline, but also has obvious characteristics of agricultural mechanization specialty. It establishes interdisciplinary curriculum system based on integration of professional foundation and industry demand, coordination between specialties, to make the curriculum system more subject-oriented [6]. The curriculum system is constructed according to the structure of general education course, discipline and specialty basis course, specialty course, practice link course and self-study course. Academic curriculum, innovation curriculum and practical application curriculum are offered to provide students with a variety of curriculum system support. The curriculum system embodies professional ability, practical ability, innovation and comprehensive quality (Seen Table1). The time of Year One, the main courses are general education, matching professional cognition training, basic engineering training and teaching factory practice, focusing on the cultivation of students' basic ability, professional interest and innovative consciousness; The time of Year Two, subject basic courses are the main, matching experience-based primary agricultural equipment innovation comprehensive training, focusing on the cultivation of students' professional accomplishment and practical ability; the time of year three, in-depth study of basic courses and professional direction courses, matching farm agricultural equipment production practice, intermediate agricultural equipment innovation comprehensive training, participation in agricultural equipment innovation competition, focusing on quality development, cultivating students' innovative ability and communication ability, and other comprehensive qualities; the time of year four, professional orientation courses, matching advanced agricultural equipment innovation comprehensive training, enterprise agricultural equipment production practice, to enhance students' comprehensive ability.

Table 1. Elements of curriculum system.

school year	Main course	Course stage	Corresponds to capability
First year	General education course Cognitive practice	Construction of basic knowledge	Learning ability and innovation consciousness
Second Year	Basic course Experiential practice	Preliminary professional knowledge building	Professionalism and practical ability
Third Year	Professional course Participatory practice	In-depth knowledge building	Professionalism and creativity
Fourth Year	Professional direction course Innovative practice	Comprehensive knowledge building	Professional ability

4.2. Attach Importance to Teaching Quality Construction

Students' innovation can be cultivated, exercised and acquired in the process of scientific research [7]. The use of high-quality scientific research resources, scientific research to nurture teaching will continuously improve the quality of teaching. CBL (Case-Based Learning) teaching method was adopted in "3D Design and Virtual Simulation", "Facility Agricultural Engineering and Planning and Design", "Agricultural Robot". Teachers took the latest research progress as a case to teach. Research progress is integrated into classroom teaching, abandoning the knowledge inculcation and outdated content of traditional teaching, to enhance the effectiveness of teaching. When students participate in scientific research, they experience the hypothesis, making plans, conducting experiments, collecting evidence, drawing conclusions, reflection, all of which will help exercise students' innovation. Strengthen the application of PBL ("Problem-Based Learning") [2], and introduced observational teaching and small class discussion teaching in the teaching process. Experiment and practice teaching hours were added, designed some experiments closely related to the actual engineering teaching interlaced with the classroom teaching course according to the characteristics of the course and teaching requirements, so as to solve the questions theoretical study is not closely related to practical problems in the existing curriculum system, which is not conducive to the cultivation of students' innovation. Regularly invite experts from collaborative universities, research institutes, enterprises to make reports for undergraduates, bringing the new knowledge, new methods, new concepts of agricultural machinery, so that the students can face the profession development, the present and future situation of industries directly; Seen the examination as an important link with the students' ability trains. Methods Innovating transitional simple test paper examination method, it introduces role play and theory examine methods combinative way. The assessment for the course involves written assignments, practical tests, case discussion, book report and et.al.

4.3. Constructing an "Open Source and Step-by-Step" Innovative Practice System

Focusing on the training objectives of improving students' manual, practical and innovative abilities, actively taking serving the state "China made 2025" and "Internet +" as the goal, we have integrated agricultural mechanization

engineering specialty and electrical automation specialty, explored practice teaching mode of intelligent agricultural equipment, and established agriculture equipment virtual simulation teaching center, agricultural robot innovation experimental platform; Set up an open practice platform called "school-farm-agricultural equipment enterprise" practice platform by establishing practice bases on farms and in agricultural equipment enterprises, to enhance the professional applicability and industry pertinence of students.

Based on the different mastery degree of knowledge in different learning stages of undergraduates, different comprehensive practice links are set up to step-by-step improve practical ability and comprehensive innovation ability of students. The time of Year One, leading students to the leading agricultural equipment enterprises to visit the advanced manufacturing technology, let students observe the production of enterprises in the actual visit, witness the combination of theory and practice, understand the enterprise's employment standards. Organize freshmen to visit the innovation laboratory, show the existing research results to the students, and let the freshmen understand the new trends of science and technology more intuitively. The time of Year two, we set up the professional practice which mainly focus on the training of basic practical ability; and require students to participate in the competition of agricultural equipment innovation as members; and from the time of year three, we set up the comprehensive practice ability with the help of exercises "surveying, mapping, imitation and partial modification" on the base of lower professional knowledge, so as to improving the training of practical ability and innovative ability; participate in agricultural equipment production practice; participate in agricultural equipment innovation competition as the core; in the fourth year, we set up a "comprehensive innovation ability training based on transformation design", innovative design of comprehensive practical links, such as: agricultural equipment innovation and production curriculum design; innovative design of agricultural robots; participate in agriculture equipment production practice. The practical teaching platform, which combine experimental platform, enterprise platform and the innovation contest; the practice curriculum system which compromises the basic theory, the experimental teaching and the engineering practice as one, makes the students' professional knowledge, practical ability, innovation and the comprehensive quality develop in an all-round way, and fully realizes the seamless match between the students training and the industry demand [8]. (Seen Figure 2)

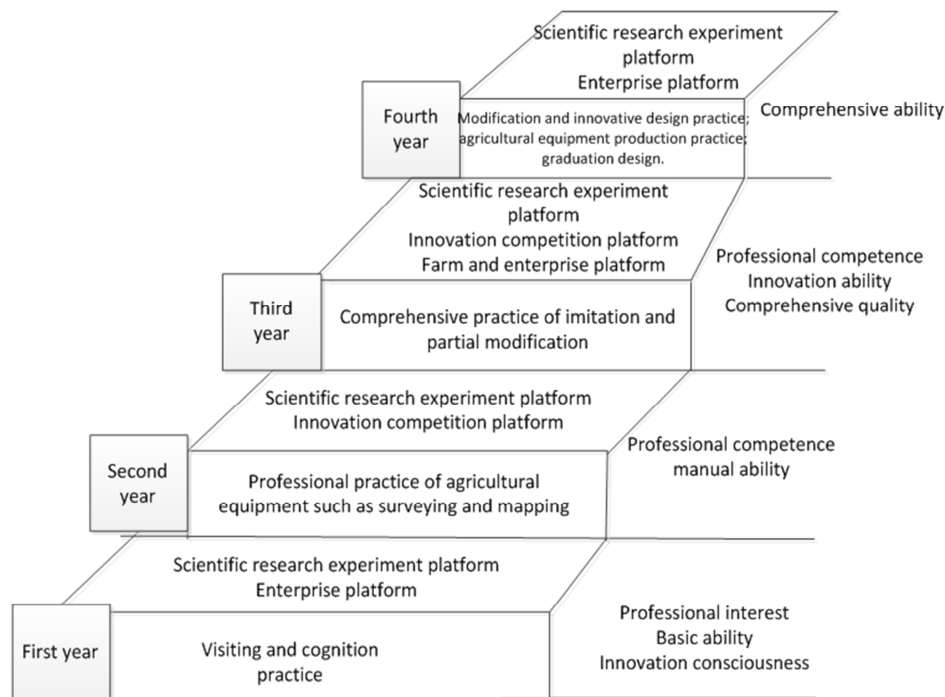


Figure 2. "Open source and step-by-step" innovative practice system.

4.4. Setting Up a Comprehensive Education Platform by Holding Innovation Competition for College Students Major in Agricultural Equipment

Aimed at the lack of an effective platform to improve the practical ability of students majoring in agricultural equipment, Jiangsu University launched and held the National College Students' Intelligent Agricultural Equipment Innovation Competition. With the help of the platform, more than 80% of the students major in agricultural equipment are mobilized to participate in scientific research and innovation training every year, and the coverage of the competition is constantly improved to strengthen the students' practical ability, Innovation and professionalism. The process of participating in the intelligent agricultural equipment innovation competition is the process of the students' mutual integration of theoretical knowledge, innovative ideas and practical ability [9]. In practice, students' theoretical knowledge can be firmly grasped, innovative ideas can be realized, practical ability can be trained, and innovation ability has been cultivated [10]. To better complete the work of the competition, some students give up their holidays and spend the whole day in the laboratory. The spirit of craftsmen can be sublimated in the process of students' conscientious completion of the work. Students' communication skills have been improved in the whole process from the germination of ideas, to parts purchasing, parts grinding, to the introduction of works in the competition. At the same time, the completion of the work poured into the labor and wisdom of each member in the team, students have a profound understanding of how to work well with others. Therefore, the innovation competition will become the core carrier of innovation practice in the second classroom, and play an important role in the cultivation

of innovative talents for the industry.

The competition explores multi-form competition methods through the proposition way of openness, propositional, enterprise-oriented and to further deepen the industry to participate in the contest, so that the industry needs and student's innovation closely linked. Invite enterprises to observe the competition on the spot, excavate talents and recruit talents. The competition will become a collaborative education platform for all colleges and universities, enterprises, and industry associations, which integrates innovation, entrepreneurship, achievement transformation, enterprise selection and student employment.

5. Conclusion

Through actively exploring the cultivation path of innovative talents, reforming and designing the cultivation mode of undergraduate students major in agricultural equipment, strengthening the construction of teaching quality, constructing the innovative practice curriculum system, building the comprehensive education platform competition for students major in agricultural equipment

and constantly promoting the school discipline advantages in scientific research shifted to the cultivation of talents, actively practicing the unity of discipline construction and students cultivation, students' comprehensive quality will be improved, their international horizons will be broadened and awareness of innovation and entrepreneurship will be enhanced.

By directly facing the enterprises, the students' professional recognition has been enhanced, and their interest in learning and innovation have been aroused.

By innovating the content of the course system, including its

hierarchy, specialty and combining with the actual characteristics of the agricultural equipment industry, the students' practical ability and the ability of flexible use of knowledge are cultivated, and the students' enthusiasm and initiative in learning are stimulated. The increased proportion of comprehensive, design-oriented and innovative experiments, meeting the needs of students' personality development; Respecting the interests of students and their position as the subject of study in the experiment, and optimizing the experimental environment will stimulate students' innovative spirit and entrepreneurial consciousness.

Collaborative education mode avoids the divorced among school teaching from social industry and international frontier. On the one hand, students fully integrated into the innovation chain and industrial chain, enhancing their level of innovation in the field of science and technology. On the other hand, from the perspective of supply-side reform, we can solve the dislocation of talent cultivation in colleges and the needs of social talents, so as to synchronize the content of talent cultivation in colleges with the needs of the industry.

By mobilizing students to participate in the innovation competition, students' practical ability and competitive consciousness are strengthened, and students' innovative ability and team spirit are cultivated. Innovation competition will become the core carrier of innovation practice in the second classroom, and play an important role in cultivating innovative talents of agricultural equipment with strong innovation ability and broad international vision.

Foundation Projects

presiding over the key project of postgraduate education and teaching reform in Jiangsu Province (JGZZ17_054): research on innovative postgraduate cooperative training mode of agricultural engineering discipline;

presiding over the project of Jiangsu higher education reform project (2017JSJG158): research on innovative undergraduate training mode of agricultural equipment under the background.

presiding over the project of research and innovation program of academic degree postgraduates in Jiangsu province (KYZZ_0285): The formation mechanism of new generation employees' innovative behavior.

References

- [1] Li Beiqun, Hua Yuzhu (2018). Reform of collaborative talents training mode in industry featured Universities: transformation and path. *Jiangsu Higher Education*: 4: 22-25.
- [2] Berns, R G; Erickson, P M (2001). Contextual Teaching and Learning, Preparing Students for the New Economy *The Highlight Zone*, 12(2): 89- 92.
- [3] Liu Yahui, Tian Tian Xi, Tian Yan Mei (2016). Research on the path of improving the employment quality of mechanical undergraduates in Local Universities. *Journal of Shanxi University of Finance and Economics*, 4(38): 41-44.
- [4] Hao, Yu (2017). The innovation and Entrepreneurship Education Model of College Students Based on the Comprehensive Participation of the Society. *AGRO FOOD INDUSTRY HI-TECH*, 28(1): 357-361.
- [5] Huang, X. H. (2015). Research on the teaching mechanism of education practice of innovation and entrepreneurship in colleges and universities. *Heilongjiang Researches on Higher Education*, 6(11), 122-124.
- [6] Li, S. X. (2017). Study on the integration strategy of knowledge resources in education college students. *Computer simulation*, 34(7), 162-165.
- [7] Ferrari, A; Cachia, R; Punie, Y (2009). Innovation and creativity in education and training in the EU member states, fostering creative learning and supporting innovative teaching. *JRC Technical Note*, 8: 78-82.
- [8] Bao, ZB; Jin, DC (2017). The Role, Problems and Countermeasures in the Construction of Experimental Practice Base in the Cultivation of Innovative Talents. *PROCEEDINGS OF THE 2017 7TH INTERNATIONAL CONFERENCE ON MECHATRONICS, COMPUTER AND EDUCATION INFORMATIONIZATION (MCEI 2017)*, 75: 229-232.
- [9] Jiang, Quansheng; Cao, Ziyang; Wang, Bangfu (2017). Cultivation of the Innovative Ability Students in Mechanical Engineering with Subject Competition and outcome-based Education. *7th International Conference on Education, Management, Information and Mechanical Engineering (EMIM)*, 76: 768-772.
- [10] WAN, Min (2011). Constructing College Student Ability Training Mode Based on Academic Competitions. *Journal of Xichang College*, 25(1): 145-147.