ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

Construction and Practice of the "Five-in-One" Innovative Talent Training Model for Remote Sensing Major under the Background of New Engineering

Yanzhen Yang, Bi He, Wenlong Yu

School of Transportation and Civil Engineering, Shandong Jiaotong University, Jinan 250357, China

Abstract

Based on the actual professional situation of the university, the thesis follows the school's school-running orientation of "cultivating engineers and managers with growth ability in the front line of transportation industry", takes the reform of talent training mode for remote sensing science and technology majors as an opportunity, aims at the problems existing in the previous professional talent training, and takes the needs of the industry as a guide. Aiming at cultivating students' ability to master professional knowledge, practice innovation ability, humanistic literacy ability and sustainable development ability, the University has carried out comprehensive reform and innovation in personnel training program setting, teaching mode, knowledge system construction, students' practice innovation and other aspects, solved a series of problems that emerged in the teaching process, and achieved good results. The reform achievement won the second prize of the school's teaching achievement.

Keywords

New Engineering; Remote Sensing; Five in One; Innovative Talent Training.

1. Research Backgrounds

In 2023, the Ministry of Education and five other departments mentioned in the notice on the issuance of the "Adjustment and Optimization Reform Plan for the Setting of Disciplines and Majors in General Higher Education" that higher education should actively adapt to the trend of industrial development, actively serve the strategy of building a strong manufacturing country, deepen the construction of new engineering disciplines around "new engineering majors, new requirements for engineering majors, cross integration and innovation", and require the transformation and upgrading of all elements of existing engineering majors, Integrate the cutting-edge achievements and latest requirements of relevant disciplines into talent training programs and teaching processes. At the same time, we will increase the construction of disciplines and specialties, promote cross disciplinary integration with other disciplines, form emerging interdisciplinary specialties, and cultivate new engineering fields. As an application-oriented undergraduate institution, we need to focus on solving the fundamental issue of "who to cultivate people for, what kind of people to cultivate, and how to cultivate people", which poses new requirements for the talent cultivation of undergraduate majors in application-oriented universities.

As an emerging interdisciplinary field that integrates multiple technologies and disciplines, remote sensing technology updates rapidly. The combination of remote sensing technology and industry applications has a huge industrial chain, providing important support for socio-economic development and government decision-making. It is one of the fastest developing and most promising disciplines in the spatial information industry of the 21st century, and has been

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

widely applied in various aspects such as economic construction, social development, national security, and people's lives.

Therefore, this also forces this major to focus on industry needs, innovate, closely follow the requirements of the times, take social needs as the guide, fully communicate and exchange with industry enterprises and institutions, as well as previous graduates, collect feedback, continuously optimize training plans, and update professional courses in a timely manner to meet the requirements of the industry for graduating students.

2. Current Problems

Over the years, there have been several main issues in the process of cultivating professional talents:

(1) In the traditional classroom teaching process, there is a "cramming" teaching model where teachers teach and students passively learn, which leads to a lack of interest in learning among students.

(2) The phenomenon of outdated and repetitive content in some professional courses.

(3) The lack of systematic and comprehensive knowledge modules in student learning, scattered knowledge points that cannot be comprehensively applied, or the lack of practical application despite mastering theory, resulting in poor practical skills and inability to correctly and reasonably apply them to solve practical problems.

(4) The lack of carriers for student innovation and entrepreneurship, inspiration for innovation, and creative realization, as well as the low interest, weak awareness, and ability of students in innovation and entrepreneurship.

(5) The professional level of the teaching staff is relatively low, and the industry and entrepreneurial practical experience of the teaching staff on campus are limited. The research level, theoretical and practical teaching level are relatively low, which cannot effectively guide students in innovation and entrepreneurship.

(6) The problem of low professional identity, low interest in employment, and low motivation among students.

3. Research Theoretical Foundations and Method

3.1. Main Theoretical Foundations

(1) The five in one training model of "politics, application, industry, education, and research";

(2) The cultivation of students' practical and entrepreneurial abilities is fully covered;

(3) Constructing a full chain of entrepreneurship and innovation practical education that includes "discovering problems, inspiring inspiration, enhancing abilities, and realizing creativity";

(4) Collaborative participation of off campus professional enterprises and institutions in the entire process of "setting training objectives, implementing teaching processes, and evaluating teaching quality".

3.2. Method

3.2.1. Refining Training Objectives and Strengthening Goal Guidance: Guided by Industry Needs and Student-centered

Based on the actual situation of the profession and in accordance with the school's positioning of "cultivating engineers and managers with growth potential in the transportation industry", the team is committed to adapting to industry needs, focusing on the cultivation of students'

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

professional knowledge mastery ability, practical innovation ability, humanistic literacy ability, and sustainable development ability, serving the field of spatial information industry.

3.2.2. Innovative Training Mode: "Five in One" Student Training Mode

(1) The Five in One Training Model of "Political Application, Industry, Education and Research"

The professional talent training mode is constantly improving, actively responding to the national and school talent training goals, specifically implementing from five aspects: curriculum ideology, practical application, industry integration, professional enhancement, and teaching research and teaching reform.

(2) Training of high-level innovation and entrepreneurship education faculty

Continuously building a high-level team of innovative and entrepreneurial education teachers. Team teachers constantly grow into "double qualified" teachers, who can not only attend classes but also complete projects, improving their professional skills. Encourage teachers to actively apply for projects at all levels, engage in ideological and political education, professional learning, practical exercises, etc., and continuously improve their own abilities.

(3) Promoting Education through Competition and Integrating Teaching and Competition

Establishing professional competition courses, with the teaching philosophy and method of "integrating teaching and competition", combined with relevant courses, using the content and requirements of various professional competition topics over the years as examples, integrating competitions or teacher research projects into the teaching process. Through the practical operation of actual competition projects, students become familiar with competition requirements, master competition content and problem-solving methods, etc., which improves their ability to use professional skills to solve comprehensive problems and enhances their innovative thinking ability. In the process of continuous integration, teaching and competition mutually promote and enhance each other.

(4) Integrated production and education

Strengthen cooperation with relevant industries and enterprises, establish high-quality and long-term stable off campus practice bases, organically integrate and link with relevant enterprises and units in talent cultivation, establish professional practice teaching bases, regularly deliver relevant students, deepen their mastery of theoretical knowledge, and enhance their practical skills.

(5) Project driven

Integrating theoretical courses with practical courses, achieving complete integration of theoretical and practical courses, scientific research nurturing teaching, and teaching promoting practice.

Students participate in teacher projects. Guided by the vertical and horizontal projects of relevant teachers, we guide students to actively participate in their projects and have also achieved certain results. Students have mainly published a certain number of teaching research and reform papers.

Students participate in projects in enterprises and institutions. Collaborating with professional enterprises and institutions, students have gained a deeper understanding of the entire process of project planning and implementation through their actual projects. On the other hand, they have improved their practical abilities, laying a solid foundation for faster and better integration into relevant project operations after graduation.

(6) Collaborative education

Conduct thorough research on enterprises and institutions. In response to the needs of today's industry, we will fully communicate and exchange ideas with external enterprises, institutions, and practical teaching bases through discussions, questionnaires, and other means, optimize

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

the development of training plans and teaching outlines, and cultivate high-quality graduates who meet the needs of the industry.

Conduct research on graduated students. Conduct research on students who have already graduated, listen to their suggestions on the training plan and mode during university through work practice, and further optimize the course configuration and training methods.

Encourage students to visit enterprises and institutions, understand the application fields, supplement their professional knowledge, and enhance their sense of professional identity.

(7) Establish a comprehensive laboratory

Establish a comprehensive laboratory that covers practical software for professional courses in talent training programs, such as aerial survey processing software, remote sensing image processing software, GIS software, etc., and improve the configuration of hardware related to field operations, such as aerial survey drones, total stations, etc., to cultivate students' hands-on practical abilities.

(8) Strengthening ideological and political education

Continuously improving students' humanistic literacy. Integrate industry leaders, experts and scholars with outstanding contributions, and national leading technologies such as Beidou and Qilu Satellite into the course content to enhance students' sense of national and professional pride. During the teaching process, relevant industry laws and regulations are supplemented to enhance students' professional ethics and respect for the law.

(9) Carry out classroom teaching reform

Actively carry out curriculum reform, stimulate students' interest in learning through flipped classrooms, group discussions, comprehensive question practice, and a combination of online and offline methods. At the same time, establish a long-term feedback mechanism, conduct periodic classroom teaching research, and continuously improve teaching methods. Optimize student assessment methods, increase the proportion of process assessment and feedback on learning stages, and continuously improve them.

3.2.3. "Three Stage Cross Fusion" Training Process

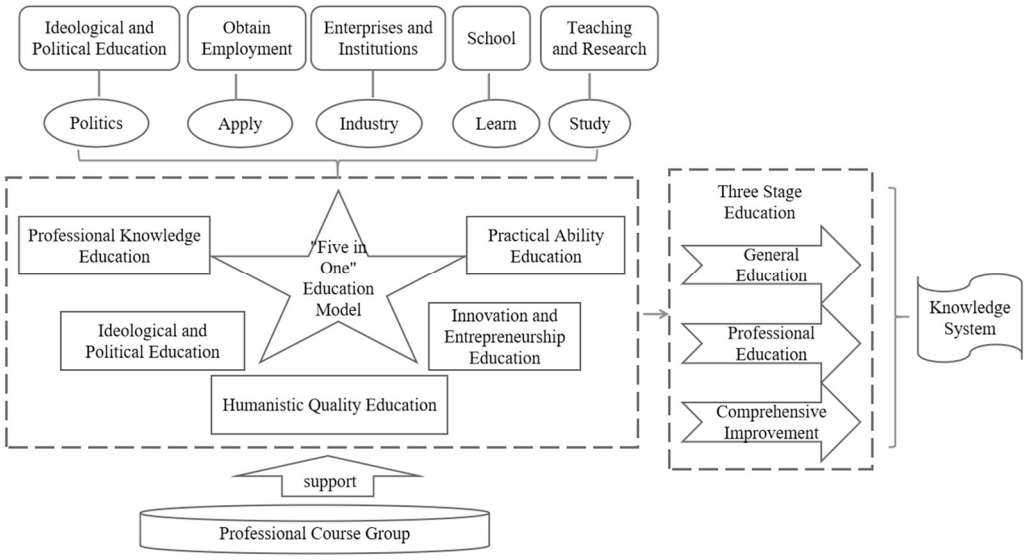

Figure 1. Talent Training Mode

In line with the concept of new engineering and new interdisciplinary disciplines, a three-stage cross integration training process is adopted, namely "general education - professional education - comprehensive improvement".

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

General education stage: Increase the breadth and depth of students' knowledge, expand their horizons, enable them to possess both humanistic and scientific literacy, and cultivate them into well-rounded individuals.

Professional education stage: Focusing on professional knowledge education, cultivating students' professional abilities and enhancing their professional literacy.

Comprehensive improvement stage: Through comprehensive practice and internships on campus, collaborating with relevant teachers on projects, and combining with comprehensive internships outside of school, students will become familiar with the comprehensive business process, comprehensively apply the knowledge they have learned, complete relevant projects, and enhance their professional comprehensive ability and teamwork ability.

3.2.4. Building Talent Training Platform

The Remote Sensing Science and Technology major of our school was established in 2014 and enrolled simultaneously. So far, there have been 6 graduates serving the society. Since its establishment nearly 10 years ago, the major has adhered to the teaching philosophy of "focusing on comprehensive literacy cultivation, enhancing innovation and entrepreneurship practical ability, and serving the industry and society", focusing on the cultivation of professional talents, laying a solid foundation for the construction and practice of the innovative talent cultivation model in this major.

Continuous school enterprise cooperation and off campus internship and training bases provide a good platform for expanding employment channels and improving students' practical skills.

The launch of various levels of college student innovation and entrepreneurship competitions and professional competition series activities provides a way to enhance professional thinking and cultivate innovative talents.

The establishment of professional laboratories on campus provides a good platform for improving students' hands-on abilities.

Online teaching platforms and MOOCs provide a good way for students to learn in the second classroom.

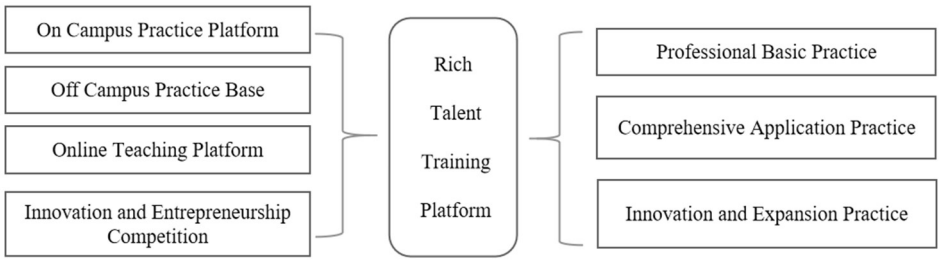

Figure 2. Rich Talent Training Platforms

4. Reform Effect

In the continuous reform and practice of talent training mode, certain results have been achieved. Since the practice, undergraduates have benefited nearly 700 people, accumulated hundreds of various achievements at all levels, and served dozens of enterprises and institutions. At the same time, the teachers also received relevant training and study, and improved their teaching and teaching research level. The reform achievements won the second prize of school-level teaching achievements.

(1) Significant educational practice results

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

A number of professional courses have been awarded excellent cases of school education reform, high quality classrooms, etc. Many teachers have won the first and second prizes in the national GIS Young Teachers Teaching Competition. A number of courses have been awarded "Superior Supervision - Quality Demonstration Classroom" and selected into the excellent case database of school education reform. Many teachers have won the honorary titles of "Excellent Teacher", "Excellent Teacher Ethics", "Excellent Teacher of Online Teaching", "Third Prize of Teacher Teaching Innovation Competition", Excellent instructor of student academic science and technology activities, Excellent instructor of student social practice activities, etc. Many students received quality class notes, quality homework, etc.

(2) Iconic research and educational achievements

Many teachers have successfully applied for national, provincial and ministerial level, school level and other scientific research and teaching reform projects.

He has published many high-level scientific research papers, teaching reform papers, and applied for a number of soft books and patents.

A teacher won the excellent case of classroom teaching reform; Many teachers have won the first and second prizes of quality classroom in the course reform.

(3) Guide students to publish academic papers

Many teachers have guided students to publish nearly 20 academic papers and more than 10 teaching research and reform papers.

(4) Guide students to win awards in innovation, professional competitions, etc

Instructed students to participate in the "Internet plus", national and provincial innovation and entrepreneurship, China Undergraduate GIS Software Development Competition, SuperMap Cup College GIS Competition, etc. and won a number of awards at various levels, including the national third prize, provincial second prize, etc.

(6) Course informatization construction

Multiple teachers participated in the construction of school curriculum informatization and online courses. Actively carry out course evaluation, classroom teaching reform, etc., and integrate new technologies and methods into classroom teaching.

(7) Establishing off campus internship and training bases, expanding employment channels

Collaborating with off campus enterprises and institutions to jointly build multiple off campus internship and training bases has provided a good platform for student internship and training. Utilize resource advantages, actively and successfully recommend students for employment.

(8) Self improvement of teacher's professional skills

Many teachers keep up with the development of technology, learn new professional technologies for professional upgrading, have registered surveying and mapping, drone driver license and other kinds of professional qualification certificates, participate in the national young teachers professional technical seminar, improve their professional skills, and better integrate into the teaching and practice of professional courses.

(9) Improvement of Teacher's Professional Ideological Education

Teachers use all kinds of holidays to carry out thinking and learning training, and constantly improve their own political literacy, such as the theme activities of teacher ethics concentrated learning education, the teacher training of the national general undergraduate education course ideological and political demonstration course, the theme education of "Condensing the heart and casting the soul to strengthen the foundation, unity and forge a new journey", so as to better integrate into the classroom ideological and political education.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202409_7(9).0022

5. Conclusion

With years of teaching experience and classroom teaching reform as an opportunity, the major of Remote sensing Science and Technology of the University has established a "five-in-one" innovative talent training model with the goal of training innovative professionals to meet the needs of the industry, and has been put into practice and applied, and has achieved certain results. A large number of innovative talents serving the national strategy and social needs have been trained to help the development of the industry. From the perspective of employment units and the reputation of graduates, it has played a good effect. There may still be some shortcomings in this process, and it will be continuously improved and perfected in the future.

Acknowledgments

This work is supported by the education reform fund of Shandong Jiaotong University(Grant No. 2022YB15).

References

[1] Jin Chao,Chao Yuanqing,Fei Yingheng etc.Exploration of the training mode of excellent applied talents for the development of scientific and technological innovation[J].Journal of Higher Education, 2023,9(35):43-46+50.

[2] CHEN Jie,DENG Min,HOU Dongyang.Reform and exploration of the practical teaching mode of remote sensing course in the era of big data and artificial intelligence[J].Bulletin of Surveying and Mapping, 2023(06):176-179.

[3] WANG Zhiyong,ZHAN Lili,XIE Feifei etc.Reform of cultivating innovative talents of remote sensing major under the background of new engineering[J].Engineering of Surveying and Mapping,2023,32 (03):76-80.

[4] Li Deren,Gong Jianya,Qin Kun etc.Innovation and Practice of World-class Remote Sensing Talent Training System for National Needs[J].Research on Higher Engineering Education,2023(02):1-5+177.

[5] Dong Mengchen,Liu Jiaxin,Meng Qingqiang etc.Exploration and Practice of the Collaborative Education Model of Industry Education Integration under the Background of New Engineering[J]. Inner Mongolia Science Technology & Economy,2022(21):50-51+161.

[6] Zhang Guangyun, Zhang Rongting.Exploration on the reform of teaching methods for remote sensing majors supported by the new generation of Artificial Intelligence technology[J]. SHANXI ARCHITECTURE, 2023,49(21):183-187.