ISSN: 2688-8653

Research on the Training Mode of Top-notch Innovative Talents in Navigation Facing the Requirements of the 14th Five Year Plan

Yanghe Wu, Tao Ge

Guangzhou Maritime University, Guangzhou 510000, China

Abstract

In view of the current situation of marine undergraduate talent training, this paper constructs a Top-notch and innovative talent training mode for navigation, and designs, selects, trains and evaluates the effectiveness. The practice in our university has proved that it has achieved initial results, plays a positive role in promoting the development of marine transportation industry, and the trained students have initially possessed scientific research ability and comprehensive practical ability, they will continue to further study and improve in their professional fields and contribute to the realization of the national marine power strategy.

Keywords

The 14th Five Year Plan; Top Innovative Talents in Navigation; Talent Training Mode List.

1. Introduction

At present, the whole country is implementing and studying the 14th five year plan for national economic and social development of the people's Republic of China and the outline of long-term objectives for 2035. In Chapter 43, "building a high-quality education system" [1], the "14th five year plan" proposes to fully implement the party's education policy, give priority to the development of education, adhere to building morality and cultivating people, enhance students' civilization, awareness of social responsibility and practical skills, and cultivate socialist builders and successors with all-round development of morality, intelligence, physique, art and labor. The 14th five year plan also mentioned increasing human capital investment, enhancing the adaptability of Vocational and technical education, deepening the integration of Vocational and general education, industry and education, school enterprise cooperation, exploring the apprenticeship system with Chinese characteristics, and vigorously cultivating technical and skilled talents [2]. Build high-quality undergraduate education, promote the transformation of some ordinary undergraduate colleges and universities to application-oriented, promote the reform of high-level talent training mode in basic disciplines, and accelerate the training of scarce talents in science, engineering, agriculture and medicine [3].

Since entering the new century, with the continuous development and innovation of science and technology, more and more information technology has been applied to ship manufacturing, management and operation, and this situation is getting worse and worse. For a time, many new terms such as "intelligent ship", "unmanned ship" and "new energy ship" were heard. Today's world is undergoing profound scientific and technological revolution and industrial transformation, and the navigation industry is facing unprecedented development opportunities. Navigation education can no longer be limited to the previous single application-oriented talent training mode, but should gradually change to the high-quality, compound and Top-notch innovative talent training mode. Combined with a series of major strategic initiatives such as the national "transportation power" and "maritime power", it is not difficult to find that Top-notch and innovative maritime talents are also urgently needed by the country. National energy transportation, trade and Maritime Silk Road are inseparable from the participation and

ISSN: 2688-8653

contribution of maritime talents. Many ship core technologies are still under the technical blockade and monopoly of European and American countries, especially the current "neck" policy on key technologies implemented by the U.S. government, which inevitably makes people feel on pins and needles and nervous. Therefore, it is of great significance to accelerate the reform of the training mode of navigation majors and improve the scientific literacy and innovation ability of navigation talents in terms of national strategy.

2. The Necessity of Cultivating Top-notch Innovative Talents in Navigation

On the one hand, maritime colleges and universities should cultivate a sufficient number of high-quality crew to meet the needs of China's maritime industry. On the other hand, under the background of the incandescent competition in the world economy and science and technology, the navigation industry is also in urgent need of Top-notch innovative talents with scientific research ability. The former is undergraduate vocational education and the latter is undergraduate scientific research education. Although their emphases are different, their ultimate purpose is to support China's navigation industry and impact the world-class level. They are the cornerstone of building a high-quality navigation education system. The two are interrelated organic whole and indispensable. According to the national college enrollment statistics, even if the same navigation undergraduate college, its student enrollment standards are uneven. Some students' scores have just passed the undergraduate file adjustment line, and some students' scores have passed the key line. The traditional practice of the school is to put all freshmen at the same level and implement an undifferentiated education and training model, resulting in the disappearance of many students with scientific research potential.

Both the honor education program of foreign universities and the domestic "Top-notch program" are individualized programs for gifted students, which have commonality in design. By combing the literature, it is found that these two types of educational projects have three prominent common characteristics: paying attention to setting challenging courses, supporting undergraduates to participate in scientific research and establishing learning community. Relevant studies at home and abroad show that these three kinds of educational practices have a positive impact on students' learning and development.

2.1. Impact of Highly Challenging Courses on Students' Development

The research shows that highly challenging courses and research-based teaching mode will have a positive impact on students' academic development, academic interest and learning satisfaction. Huang Lan, a domestic scholar, conducted an in-depth interview and questionnaire survey on 86 outstanding alumni of n University working in the field of aviation and aerospace, and found that teacher guidance, practical experience and curriculum system are the most important factors affecting the quality of high-tech Top-notch talents in university education [4]. Li Xiongying and others conducted a questionnaire survey on College Students' learning input and learning harvest with 2000 students from 7 colleges and universities implementing the "Top-notch plan". The results show that "high academic challenge" and "sufficient support" have a significant impact on the growth of Top-notch students, challenging courses and good interaction between teachers and students, often cooperate with peers to learn, so that they can master knowledge more deeply, understand themselves better, and form higher learning satisfaction [5]. Lu Yi et al. Conducted a questionnaire survey on 290 students majoring in life sciences of Tsinghua University and found that the appropriate curriculum challenge was significantly correlated with the academic interest of first-year students, while for all grades, the academic interest was significantly positively correlated with the perceived relevance and systematicness of the curriculum [6].

ISSN: 2688-8653

2.2. Impact of Undergraduate Scientific Research on Students' Development

The top talent training program can provide more scientific research training opportunities for undergraduates, improve students' scientific research ability and innovation quality, enhance students' academic identity, and promote students' willingness to further study empirical studies have revealed the socialization development process of students in undergraduate scientific research. Through the case analysis of undergraduate scientific research in American research universities, from the perspective of Situational Cognition Theory, Liu Junyi puts forward that undergraduate scientific research is to build a personalized learning experience on the basis of giving full play to students' subjectivity, so as to cultivate students' innovative ability in the real research situation, obtain membership through participating in the practice community and enhance students' interest in scientific research [7] Russel et al. Found that undergraduate scientific research training can stimulate students' interest in scientific exploration and urge them to choose further education the research also shows that scientific research self-efficacy is an important intermediary variable between undergraduate scientific research training, innovation ability development, scholar identity and other results. Through a questionnaire survey of more than 300 undergraduates, Robnett et al. Revealed the mechanism between undergraduate scientific research participation, scientific research self-efficacy and scholar identity, as well as the intermediary role of self-efficacy in scientific research participation and Student Scholar identity Hunter et al. Found that the higher the Undergraduates' confidence in their own scientific research ability, the more they can inspire their belief in becoming scientists .[8]

2.3. Impact of Learning Community on Students' Development

As a learning community for teachers and students, top talent training project can enhance students' sense of belonging and identity, and affect students' interests and career choices. Kathy et al. Found that Meyerhoff's identity formation, sense of belonging to Meyerhoff, social networks, summer exchange programs and financial support have played a positive role in their development through the survey of students and alumni of Meyerhoff scholar program [9] Lee found that the better the relationship between students and peers with common academic pursuit, the more they can see themselves as scientists and are more willing to participate in scientific research activities the sense of scholar identity is also an intermediary variable for honor projects to affect students' attitude [10], which can affect students' interest in science and their willingness to continue their further study and engage in academic career.

Overall, the top talent training program promotes students' academic and social development through highly challenging courses, scientific research opportunities and building a learning community. So far, the domestic research on the top talent training project on the development of students' socialization and the internal mechanism is still relatively scarce.

2.4. Current Situation of Navigation Education

Shao Guoyu [11] and others put forward a training mode of maritime talents according to many deficiencies in China's maritime education at the present stage, that is "Maritime undergraduate colleges and universities should do a good job in classified development, optimize the discipline and specialty structure, and divide the training of maritime undergraduate education talents into two levels, namely, the training mode of research talents in maritime undergraduate education and the training mode of professional talents in maritime undergraduate education" This coincides with the author's point of view, but it is harmonious but different. The author believes that, in addition to the gap in scientific research strength between different maritime undergraduate colleges, there are also differences in strength among students in the same maritime undergraduate college. In our student training work, we should do classified education for students, teach students according to their talents and teach

ISSN: 2688-8653

students according to their aptitude. The traditional maritime teaching pays more attention to applied education The content and discipline setting are relatively single, and the discipline knowledge structure covers a wide range but is not profound, which is not suitable for the cultivation of Top-notch innovative maritime talents. The cultivation of Top-notch innovative talents needs to increase the integrated learning of basic disciplines and expand the teaching concept of "focusing on students' growth and development".

3. Construction of Training Mode of "Top Innovative Talents in Navigation"

Not all students are suitable for scientific research, and not all students must engage in specific navigation work. Instead, they should teach students according to their aptitude according to their own conditions. To construct the training mode of "top innovative talents in navigation", the focus is to grasp the three key links of selection, training and effectiveness. For the three key links, the corresponding standards and schemes are designed to complete the construction of talent training mode.

3.1. Selection Mechanism of "Interdisciplinary Integration"

As mentioned above, the entry criteria for navigation students are uneven, and a certain selection mechanism needs to be adopted to select students with scientific research potential and train them according to the mode of "top innovative talents in navigation". Real systems are often complex. It is often difficult to solve problems by relying on a single discipline, and sometimes interdisciplinary cooperation is needed. At this time, students with multi-disciplinary comprehensive knowledge have obvious advantages. Therefore, the cross-border integration of disciplines is an excellent standard for the selection of students.

First of all, in view of the rigid examination-oriented assessment, the selection should be both moral and intellectual. The traditional navigation education curriculum itself is interdisciplinary, but it is slightly insufficient to learn basic knowledge and cultivate innovation ability. In the learning stage of freshman general courses and basic courses, students' interest in scientific research should be stimulated by means of guidance, communication and lectures. After freshman guidance and learning, students have a basic understanding of their major and have a preliminary plan for their own development. At this time, students can be selected. The main indicators considered in selecting students include ideological situation, scholar identity, general course foundation, mental health, etc., and their proportion is shown in Table 1.

Table 1. Main Indicators of student selection

Results	Numbers
Ideological Situation	30%
Scholar Identity	10%
Fundamentals of General Courses	50%
Mental Health	10%

Convene students who initially meet the training mode of "top innovation in navigation", judge students' scores through interviews, speeches, questionnaires and written tests, and select the best students according to the principle of "prefer shortage to abuse".

Secondly, focus on the cross-border development of disciplines and be good at exploring cross-border innovative talents. Relying on the established engineering center and experimental center of the college, arrange students to participate in specific scientific research projects and stimulate their innovation ability. For students with strong innovation ability, they can be

ISSN: 2688-8653

encouraged to form teams to participate in innovation and entrepreneurship competitions of various colleges and universities inside and outside the province. At the same time, they are encouraged to apply for school projects and exercise their scientific research ability.

3.2. The Cultivation Mechanism of "Mutual Progress between Teachers and Students"

3.2.1. Establish a System of "Mutual Progress between Teachers and Students"

Establish a systematic concept and organically combine teachers, students, teaching and scientific research as systematic elements to become a "mutual progress between teachers and students" system. In the traditional training mode, teachers are generally the leaders in the teaching process, and students often accept it passively. In the training system of "mutual progress between teachers and students", teachers and students are the main body of the teaching and research process, which can be transformed from each other. In order to meet the requirements of system operation, the college starts from two aspects to lay a solid foundation for the training mode. First, teachers with profound scientific research ability participating in the training mode shall be given certain preferential policies in terms of performance appraisal, and they shall be selected in turn to participate in academic exchanges in professional fields at home and abroad to expand their scientific research vision. Second, strengthen the management of students' selection and entrance, and clarify the high standards and graduation requirements.

3.2.2. Pay Attention to the Transformation of Scientific Research Achievements

It advocates the transformation of teachers' knowledge, scientific research achievements and students' basic theoretical knowledge to students' knowledge and comprehensive scientific research ability, forming a transmission chain of teachers' scientific research achievements and a growth chain of students' comprehensive scientific research ability. The two are interrelated and form an effective closed loop, as shown in figure 1.

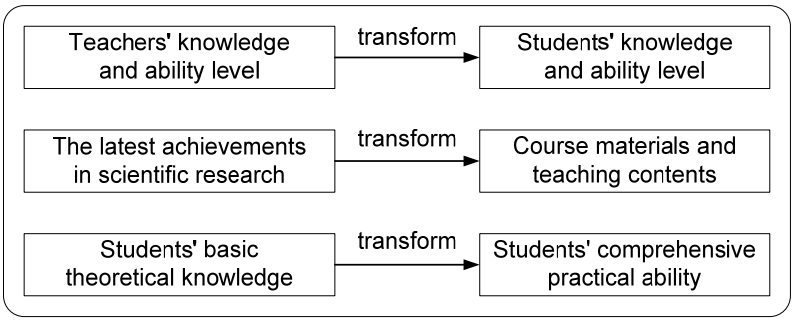

Figure 1. Knowledge transformation

Teachers integrate national strategic needs, industry cutting-edge scientific research trends and their own scientific research achievements into teaching documents, and complete the renewal of old knowledge system in teaching activities; Based on different types of courses and teaching materials, students form their own knowledge through teachers' teaching and students' independent learning. In scientific research practice and engineering technology practice, students use, learn and create knowledge, cultivate and shape students to achieve various abilities and meet the development needs of the country and industry. Thus, a two-dimensional knowledge transfer chain is formed, as shown in Figure 2.

ISSN: 2688-8653

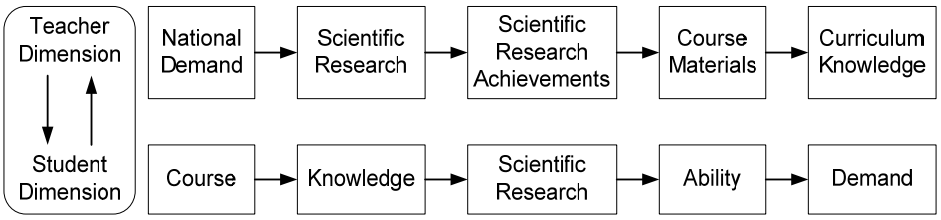

Figure 2. Knowledge transfer chain

3.2.3. Core Meaning

The core meaning of constructing the system of "mutual progress between teachers and students" is to highlight the three "new". "One new" is the latest achievement into the curriculum, that is, the latest research achievements in the field of navigation and transportation are timely integrated into the students' curriculum teaching; "Two new" is to pay attention to interdisciplinary, so as to meet the high requirements of modern navigation complex system for multi-disciplinary compound innovative talents; "Three new" is to cultivate Top-notch research talents and technological innovation and application talents by relying on the frontier scientific research projects and practical engineering application projects undertaken by the Institute aiming at the major needs of maritime traffic development.

3.3. Training Path of "Top Innovative Talents in Navigation"

3.3.1. Cognitive Apprenticeship Model

Cognitive apprenticeship [6] is a learning theory, learning environment design thought and teaching model born under the background of the late 1980s and early 1990s when the teaching paradigm has just changed from "teaching" to "learning", the research on learning is gradually changing from cognition to situation, and the idea of learning environment design is emerging, It is not only a way to realize the new educational paradigm and a form of existence, but also one of the theoretical foundations of the emerging learning science. It plays a significant role in overcoming the disadvantages of traditional school education.

The cognitive apprenticeship model is introduced to form the undergraduate scientific research mechanism, as shown in Figure 3.

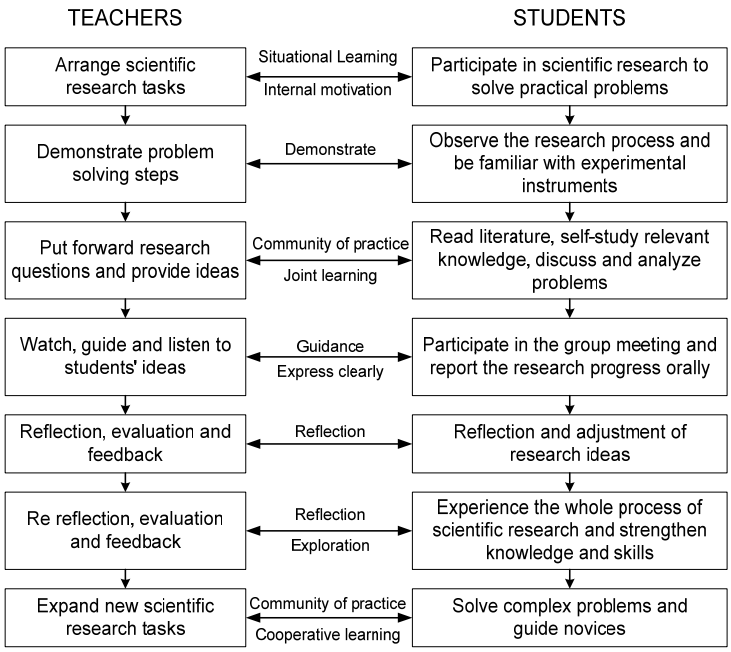

Figure 3. Principle of cognitive apprenticeship

ISSN: 2688-8653

The process of students' participation in scientific research is as follows: first, teachers create real problem situations, demonstrate the basic logic and Strategies of problem-solving, and students, as "novices", observe, imitate and learn the methods of teachers' problem-solving. Then, teachers set up scaffolding to provide students with research ideas and framework. Under the guidance of teachers and peers, students gradually experience the whole process of scientific research, such as literature reading, self-study knowledge according to problems, experimental operation, data analysis and so on. Students show their thinking by asking questions, discussing problems and reporting research progress. Teachers and peers reflect and evaluate, and then feedback to students. Students correct their thinking in reflection, experience many times of joint reflection between teachers and students, and gradually improve their advanced thinking skills and knowledge transfer ability. Finally, teachers further expand new situations, dismantle scaffolds and provide more complex research tasks. Due to the increasing self-confidence and independence of students, they can clearly express their knowledge and thinking, improve their ability to solve complex problems, and even help other "novices".

3.3.2. Training Path Model

The reason why Top-notch talents are "Top-notch" lies not only in mastering profound professional knowledge, but also in having firm academic ambition and strong academic interest, as well as daring to break the Convention and take an unusual road. Influenced by Chinese traditional culture and education mode, Chinese students are relatively introverted and conservative. They are used to passively accepting knowledge rather than actively thinking and asking questions, are used to "brushing questions" rather than personal experience, and are used to what they are arranged to do without knowing what they want to do. In the face of Chinese Top-notch students with the same characteristics, while paying attention to laying the foundation, the Top-notch talent training project focuses on enabling students to awaken their curiosity and stimulate their learning initiative through practical activities and interactive communication. In view of this, the training path model of "top innovative talents in navigation" is proposed, as shown in Figure 4.

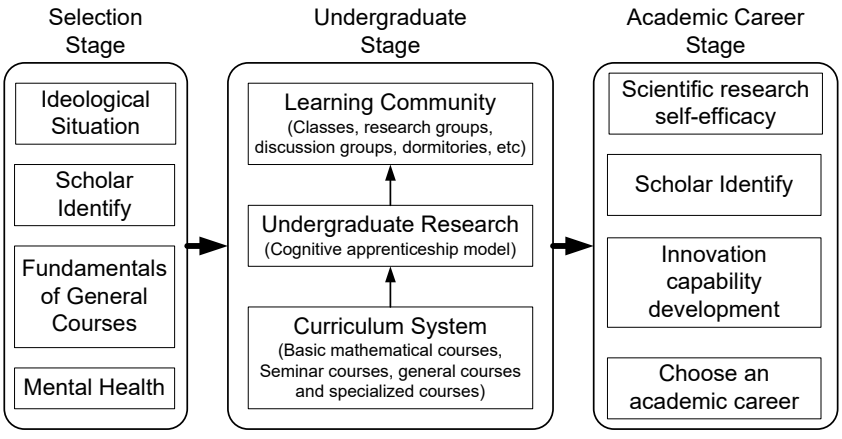

Figure 4. Training path model

3.4. Practical Results

Since the implementation of this training mode in 2016, more than 20 students have been selected from our college to carry out differentiated education according to their aptitude, in order to cultivate them into innovative Top-notch talents suitable for modern navigation industry. Initial results have been achieved, as shown in Table 2.

ISSN: 2688-8653

Table 2. Main practical results

Results	Numbers
Preside over or participate in municipal projects	5
Provincial College Students' innovation and strength award-winning project	12
Scientific research learning team	3
Graduate study at 985 or 211 university	10

While the students have improved their scientific research ability, the overall scientific research entity of the college has also increased steadily. The marine engineering major of the college has been selected as a provincial key discipline, the college has built a provincial key laboratory and obtained more than 10 provincial major topics, which has well verified the feasibility and effectiveness of the "mutual progress between teachers and students" system.

4. Conclusions and Recommendations

Through the practice of the training mode of Top-notch innovative talents in navigation in recent years, the college has achieved preliminary results, which has played a positive role in promoting the development of navigation transportation industry. The trained students have initially possessed scientific research ability and comprehensive practical ability, and will continue to study and improve in their professional fields, to contribute to the realization of the strategy of national maritime power. In view of this talent training mode, we also need to further strengthen the transformation of scientific research achievements, continue to strengthen the participation of teachers and students, increase its coverage, and select and train more Top-notch innovative talents in navigation.

Acknowledgments

This work was sponsored by the Online and offline mixed first-class course cultivation project of Guangzhou Maritime University (No: C2106001230).

References

[1] Rong Changhai, Li mo. theoretical innovation of Vocational Education in the national 14th five year plan [n]. Tianjin daily, 2021-04-30 (009).

[2] The 14th five year plan and the long-term goal outline of 2035 propose to build a high-quality education system [J]. China Electric Power Education, 2021 (03): 6-7.

[3] Wu Qijian. Planning the blueprint of the 14th five year plan and building high-quality education [J]. Fujian Education, 2021 (04): 24.

[4] Huang Lan, Jiang Yanlong, Kong Chui Qian. Quality characteristics of top scientific and technological talents and ecological optimization of University Education -- analytic hierarchy process based on the survey data of outstanding alumni of n University [J]. Higher education research, 2017, 38 (1): 55-61.

[5] Li Xiongying, Qin Xiaoqing. Research on the relationship between students' learning input and learning harvest in the "Top-notch program" -- Also on the promotion of College Students' deep learning [J]. Jiangsu higher education, 2019 (12): 102-108.

[6] Lu Yi, Shi Jinghuan. Analysis of educational factors affecting academic interest in the cultivation of Top-notch innovative talents -- Taking undergraduates majoring in life sciences of Tsinghua University as an example [J]. Educational research, 2015 (5): 38-47.

[7] KARDASH C A M. Evaluation of undergraduate research experience: perceptions of undergraduate interns and their faculty mentors [J]. Journal of Educational Psychology, 2000,92(1):191-201.

ISSN: 2688-8653

[8] MEROLLA D M, SERPE R T. STEM enrichment programs and graduate school matriculation: the role of science identity salience[J]Social Psychology of Education,2013,16(4):575-597.

[9] TSUI L. Effective strategies to increase diversity in STEM fields: a review of the research literature [J]. The Journal of Negro Education,2007,76(4):555-581.

[10] Liu Junyi. Value pursuit of undergraduate scientific research in American Research Universities -- from the perspective of Situational Cognition and learning theory [J]. Fudan Education Forum, 2010 (2): 84-87.

[11] Shao Guoyu, Zhao Lei. Research on talent training mode of undergraduate Navigation Education under the 14th five year plan [J]. China water transportation (second half of the month), 2021,21 (07): 23-25.