Discussion on the Ideological and Political Education in the Course "New Technologies of Modern Satellite Communication Systems" under the Background of "New Infrastructure"

Mingchuan Yang[1*], Jia Lu[2], Lili Zhang[1]

[1]*School of Electronics and Information Engineering, Harbin Institute of Technology*
[2]*School of Astronautics, Harbin Institute of Technology*
[*]*Corresponding author: mcyang@hit.edu.cn*

Abstract: *"New Technologies of Modern Satellite Communication Systems" is an innovative research course offered by the School of Electronics and Information Engineering at Harbin Institute of Technology for all undergraduate students of the university, and it aims to cultivate the students' scientific research literacy. How to organically integrate professional knowledge with ideological and political elements to achieve the unified combination of "knowledge imparting" and "value guidance" is the primary issue to be addressed in the ideological and political education within the teaching reform of professional courses. Starting from the interpretation of major national strategies such as "China's Space Dream" and the "Belt and Road" Space Information Corridor, this paper analyzes the connotation of ideological and political education in the course based on its characteristics. It intends to extract ideological and political elements from the course content, and on the basis of close integration with the course knowledge points, it restructures the teaching content, teaching design, and assessment methods. This paper actively explores the teaching methods of ideological and political education in the course reform, and ultimately achieves the coordinated development of course teaching and ideological and political education.*

Keywords: *New Infrastructure, satellite communication, ideological and political education in courses*

1. Introduction

In recent years, with the integration of satellite communication services and Internet services by low-orbit Internet constellation projects such as Starlink and OneWeb, new vitality has been injected into the satellite communication industry. The construction of space information infrastructure represented by satellite Internet has become a strategic high ground for major powers to compete and game. As of December 2025, the Starlink system has launched more than 10,000 satellites, has achieved ground applications in 65 countries worldwide, and has more than 3.5 million global users, making it the largest satellite constellation in human history. Although the OneWeb system experienced a downturn, it quickly regained vitality after bankruptcy and reorganization, and has completed the deployment of 618 satellites of its first-generation constellation plan, officially putting them into operation. The Kuiper system has launched two experimental satellites so far.

Under the wave of the global low-orbit Internet constellation construction boom, China has also proposed multiple low-orbit Internet constellations. Among them, the Swan Goose Constellation (with a planned scale of 300 satellites, one satellite launched, and it has been incorporated into the GW Constellation) and the Rainbow Cloud Project (with a planned scale of 156 satellites, one satellite launched, and it has been incorporated into the GW Constellation) are the two earliest low-orbit Internet constellations proposed by China. The GW Constellation, proposed by the Xingwang Company, is the largest low-orbit constellation in China (with a planned scale of 12,992 satellites and three experimental satellites launched). The G60 Constellation is the second largest low-orbit large-scale constellation in China. The Galaxy Constellation is a low-orbit Internet constellation proposed by Galaxy Space Company (with a planned scale of 650 satellites and seven satellites launched). The Geely Future Mobility Constellation (20 satellites launched) is an integrated communication, navigation, and remote sensing constellation composed of 72 satellites, which was independently developed and constructed by its parent company. The Heavenly Enlightenment Constellation is an Internet of Things constellation that

provides low-orbit satellite data communication services (with a planned scale of 38 satellites and 21 satellites launched). However, compared with developed countries such as those in Europe and the United States, China's satellite Internet industry is still in the in-orbit verification stage and has not yet formed an overall networking solution.

In April 2020, satellite Internet was incorporated for the first time as an important information infrastructure into the key direction of the national policy support for the New Infrastructure Construction (hereinafter referred to as "New Infrastructure"). In the New Infrastructure, satellite Internet appears together with 5G, the Internet of Things, and the industrial Internet in the core part of information infrastructure, namely the communication network infrastructure, which means that satellite Internet will play a unique role in the New Infrastructure. In addition, with the large-scale deployment and commercial use of foreign systems such as Starlink and OneWeb, as well as the commencement of launches of domestic giant low-orbit Internet systems with a scale of tens of thousands of satellites, such as the GW Constellation and the Qianfan Constellation, China urgently needs a large number of innovative talents in the field of satellite communication.

Harbin Institute of Technology, as the top aerospace university in China, has always resonated with major national strategies and has developed the advantageous characteristics of being "rooted in aerospace and serving national defense". Since it launched "Experiment-1", the first satellite developed by a university as the lead in China in 2003, the institute has developed and launched 36 satellites to date, making it the university with the largest number of satellites developed and launched in China. Over the past decades, it has cultivated a large number of professionals in the field of satellite communication and aerospace for the country. "New Technologies of Modern Satellite Communication Systems" is an innovative research course offered by the School of Electronics and Information Engineering at Harbin Institute of Technology for all undergraduate students of the university, and it aims to cultivate the students' scientific research literacy. This course enables students to understand the basic working principles of satellite communication systems as well as the latest system and technology trends and the latest research developments. In addition, through the practical teaching sessions, which include writing research reports on specific topics and participating in defense assessments, this course enables students to master basic research ideas and methods, and it cultivates their innovative thinking ability and team spirit.

The new era requires us not only to impart knowledge to students but also to improve their ideological level and political awareness, and to cultivate talents who possess both moral integrity and professional competence. As professional course teachers, we have the responsibility to educate students. How to organically integrate professional knowledge with ideological and political elements to achieve the unified combination of "knowledge imparting" and "value guidance" is the primary issue to be addressed in the ideological and political education within the teaching reform of professional courses. Although "New Technologies of Modern Satellite Communication Systems" is a course with strong professionalism and practicality, a rich set of ideological and political education elements can still be extracted from it through in-depth exploration. Starting from the interpretation of major national strategies such as "China's Space Dream" and the "Belt and Road" Space Information Corridor, this paper analyzes the connotation of ideological and political education in the course based on its characteristics. It intends to extract ideological and political elements from the course content, and on the basis of close integration with the course knowledge points, it restructures the teaching content, teaching design, and assessment methods. This paper actively explores the teaching methods of ideological and political education in the course reform, and ultimately achieves the coordinated development of course teaching and ideological and political education.

2. Integrating Course Content to Thoroughly Explore and Refine the Ideological and Political Elements and Moral Education Functions within the Course

Exploring the ideological and political education elements embedded in the course content is the foundation and prerequisite for "ideological and political education in courses". In the development process of satellite communication, the experiences of the contributors to the "Two Bombs, One Satellite" project (such as Academician Qian Xuesen and Academician Sun Jiadong) are integrated with the "contemporary Chinese nation's nationwide unity and sincere solidarity as a cohesive force". The evolution of modern satellite communication transmission technologies contains the power of role models "learning from example and improving oneself" (such as Academician Zhang Naitong and the Lilac Micro-Nano Satellite Team of Harbin Institute of Technology). The evolutionary process and principles of satellite communication transmission technologies also embody the ancient Chinese

philosophical thought of "Yu Gong Moves the Mountain".

2.1 Combining Course Teaching with Patriotic Sentiment, the "Chinese Dream", and "China's Space Dream"

"Exploring the vast universe, developing the space industry, and building a strong space power is our unremitting space dream." "China's Space Dream" is an important part of the "Chinese Dream". For example, in the introduction of the course, the instructor can introduce aerospace technology as a country's hard power from the perspective of "national strength", thereby enhancing the students' sense of patriotism and mission. At the same time, in conjunction with "China Space Day", when explaining the development history of satellite communication technology in contemporary society, the course enables students to understand the research and development process of China's first satellite, the "East Red No. 1" satellite, as well as the past, present, and future of satellite communication technology. The course educates and guides university students to correctly understand the development trends of China and the world from an international perspective, cultivates the students' patriotic sentiment, guides them to deeply understand that technological development and progress cannot be achieved overnight, and inspires their confidence and determination to strive for the realization of the "Chinese Dream".

2.2 Combining Course Teaching with "Firming Up the Original Aspiration and Mission, and Strengthening the Sense of Responsibility"

While learning professional knowledge, students also need to cultivate their sense of social responsibility, so that they can establish an awareness of social responsibility in addition to theoretical learning. For example, through the deeds of the contributors to the "Two Bombs, One Satellite" project, represented by Qian Xuesen, the course introduces China's world-class advanced achievements in the field of satellite communication and typical examples of influential figures in the world, thereby guiding students to firm up their original aspiration of acquiring cultural knowledge, to bear in mind the mission of contributing their own strength to social development and national progress, to strengthen the responsibility of revitalizing the motherland, and to repay the country, society, and family after entering society, thus becoming a person who truly loves the country and the family and dares to take responsibility. The 1950s and 1960s were highly unusual periods, when China faced a severe international situation and needed to resist the military threat and nuclear blackmail of imperialism. A large number of outstanding scientific and technological workers, including many scientists who had already achieved remarkable success abroad, devoted themselves to the country, harboring deep love for the new China. Answering the call of the Party and the state, they resolutely threw themselves into this sacred and great cause. Together with the vast number of cadres, workers, and officers and soldiers of the People's Liberation Army who participated in the development of the "Two Bombs, One Satellite" project, they relied on their own efforts and the assistance of the Soviet Union under the circumstances of a weak national economic and technological foundation and very difficult working conditions at that time. They worked hard to achieve self-reliance, made the country strong through hard work, broke through cutting-edge technologies such as nuclear bombs, missiles, and artificial satellites, and achieved brilliant accomplishments that attracted worldwide attention, all with relatively small investment and in a relatively short period of time.

2.3 Combining Course Teaching with "the Power of Role Models and the Spirit of Craftsmanship"

Through the introduction of academic masters in the field of satellite communication at home and abroad, the course guides students to learn from their professional qualities of dedication, meticulousness, and innovation, as well as their spirit of obscurity and willingness to contribute. In particular, the course introduces the typical deeds of the founder of this discipline, Academician Zhang Naitong, and the Lilac Satellite Team of our university to the students, so that they can understand the development history of the discipline and learn from Academician Zhang Naitong's scientific research spirit of confronting difficulties and continuous innovation, as well as his excellent qualities of selfless dedication, self-restraint, and devotion to public duty. By integrating the knowledge points of the course, the course introduces China's internationally advanced scientific research achievements in related fields, guides students to understand the spirit of craftsmanship, and deepens the spiritual concept of meticulous carving, continuous improvement, and the pursuit of perfection. Under the guidance of "the power of role models and the spirit of craftsmanship", the course teaching becomes socially relevant, inspiring students to develop the professional qualities of loving their work, being willing to contribute, and daring to innovate while learning professional knowledge, and encouraging them to create extraordinary brilliance in

ordinary positions.

3. Restructuring the Teaching Content, Teaching Design, and Assessment Methods Based on the Ideological and Political Elements Refined from the Course

In terms of teaching content, the instructor can add the refined ideological and political knowledge points to classroom teaching as a beneficial supplement to the teaching content. For example, the collated and analyzed development statuses of China, the United States, the European Union, Japan and other countries and regions in this field, the current domestic innovative breakthroughs in relevant satellite communication technologies, and China's world-class achievements in the field of space communication can all serve as reasonable supplements to the teaching content and can be added to the teaching syllabus.

In terms of teaching content, the course optimizes its system structure and supplements the latest domestic and international developments in satellite communication systems and technologies. Therefore, in terms of teaching content, the course needs to optimize its system structure and supplement the latest domestic and international developments in satellite communication systems and technologies, such as the latest technologies like low-orbit satellite Internet, ultra-dense constellations, and direct satellite-to-mobile-phone connections, so that students can understand the latest technological developments in the field of satellite communication. Satellite communication systems and technologies are evolving rapidly. This course has always used "Satellite Communications" written by Dennis Roddy in 2006 as its textbook. During the research period of this project, the project team published a Chinese version of the course textbook "Satellite Communication" and the reference book "Analysis and Modeling of Propagation Characteristics for Satellite Mobile Channels", which supplement the latest developments in satellite communication systems and technologies in the world and in China. In terms of teaching content, the instructor adds the refined ideological and political knowledge points to classroom teaching as a beneficial supplement to the teaching content. For example, the collated and analyzed development statuses of China, the United States, the European Union, Japan and other countries and regions in this field, the current domestic innovative breakthroughs in relevant satellite communication technologies, and China's world-class achievements in the field of space communication have all been added to the teaching syllabus as reasonable supplements to the teaching content.

In terms of teaching design, first, the instructor can organically integrate the refined ideological and political knowledge points with the course knowledge points. During the teaching process, the instructor can reasonably incorporate national sentiment based on the knowledge points, tell the Chinese stories well, and demonstrate Chinese wisdom, so that the teaching of professional courses presents a Chinese style and Chinese manner. Second, the instructor can take the academic masters, academic leaders, and research backbone of this discipline as role models, and tell the stories of their technological breakthroughs, achievements, and contributions in relevant technical fields. This approach not only strengthens the students' understanding and mastery of the knowledge points but also enhances their professional pride. The cultivation of value guidance elements and thinking methods is subtly integrated into the teaching, and moral education is reflected in the entire process of teaching behavior. Third, the instructor can connect the imparting of knowledge points with the cultural background of the course content. This background can be either excellent traditional culture or real life. It can be famous enterprises and well-known figures in the development process of this discipline, or it can be historical events that everyone knows.

In terms of assessment methods, the course attempts to introduce an ideological and political content assessment mechanism while assessing professional abilities, and it focuses on process assessment. For example, the course may adopt a combination of 10% for regular performance, 20% for discussion, 10% for practice, and 60% for examination to determine the final course grade. The assessment of the ideological and political content of the course is incorporated into the regular performance and practice components.

4. Exploration of Diversified Teaching Methods for Ideological and Political Education in the Reform of Professional Courses

(a) The course uses the WeChat platform to create a course learning group to enhance teaching effectiveness. The instructor posts the course content in the WeChat group in advance, allowing students to preview the course, understand the content, and put forward their own opinions. The teacher then makes targeted adjustments and guidance to the teaching content in a timely manner, answering questions

and providing knowledge guidance for students. The teacher also publishes the latest research results in the field through the WeChat group, enabling students to understand the development dynamics of the industry, broaden their horizons, and expand their thinking. This approach not only improves the teaching effect of the course but also enhances the students' deep sense of identification and honor towards China and their own value.

(b) Through case-based teaching, problem-based teaching, and seminar-based teaching, the course strengthens the interaction between teachers and students, and complements knowledge teaching and ability improvement. Through animations, videos, audio recordings, and other audio-visual materials, the course increases the students' perceptual understanding and interest in abstruse professional knowledge, improves classroom teaching effects, and achieves a dual improvement in students' scientific literacy and humanistic literacy.

(c) The course pays attention to industry development, understands domestic and foreign technology development trends, and keeps teaching content up to date. The teacher uses a few minutes in each class to introduce recent industry news and hot issues, providing a useful supplement to the course content. For example, through various channels such as the annual satellite communication international conferences, domestic and foreign academic conferences, and literature, the teacher introduces to students the well-known enterprises in the industry, as well as new systems and new technologies that have emerged. In this way, students can understand the current development status of the satellite communication field, the current system status, and the level of technological development. This helps students with their own career planning, enhances their professional identity, and stimulates their self-confidence.

5. Conclusion

Taking the course "New Technologies of Modern Satellite Communication Systems" as an example, this paper starts from the explanation of "China's Space Dream" and, in light of the course's characteristics, refines ideological and political elements such as patriotic sentiment, responsibility and accountability, the power of role models and the spirit of craftsmanship. This paper restructures the teaching content, teaching design, and assessment methods, and explores and practices the teaching methods of ideological and political education in the reform of professional courses. It achieves the aligned and coordinated development of course teaching and ideological and political education, and it subtly and quietly enhances students' recognition of Chinese culture and their in-depth understanding and comprehension of the core socialist values. This paper also gives full play to the role of professional courses in the ideological and political education of college students, thereby achieving the goal of cultivating well-rounded talents.

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