

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

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Abstract: *"New Technologies of Modern Satellite Communication Systems" is a new research course organised by the School of Electronics and Information Engineering at Harbin Institute of Technology for all undergraduate students of the university, and its goal is to foster the students' scientific research literacy. The main problem to be solved in the ideological and political education for the reform of teaching in professional courses is how to integrate professional knowledge and ideological and political education organically to achieve a unified combination of "knowledge imparting" and "value guidance". Based on the interpretation of the main national strategies, "China's Space Dream" and the "Belt and Road" Space Information Corridor, this paper examines the contents of ideological and political education in the course according to the characteristics of these strategies. It aims to extract ideological and political contents from the course materials, and based on close integration with the knowledge points of the course, it will revise teaching content, teaching design and assessment methods. This paper explores the teaching methods of ideological and political education in the reform of course teaching and ultimately achieves the joint 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 the Internet by low-orbit Internet constellation projects such as Starlink and OneWeb, new life has been breathed into the satellite communication industry. The construction of the space information infrastructure based on satellite Internet has become a new high ground for competition and conflict among major powers. By the end of 2025, the Starlink system will have released more than 10,000 satellites, established ground stations in 65 countries around the world, reached over 3.5 million users globally, and become the largest satellite constellation ever built by people. Although the OneWeb system had a downturn, it quickly recovered after bankruptcy and reorganization, and has completed the deployment of 618 satellites for the first generation of the constellation plan and officially put them into operation. Only two exploratory spacecraft have been sent out by the Kuiper Observatory.

With the development of low-orbit Internet constellations around the world, China has also put forward several such plans. Among them, the Swan Goose Constellation (with a planned scale of 300 satellites, one satellite launched, and it has been added to the GW Constellation) and the Rainbow Cloud Project (with a planned scale of 156 satellites, one satellite launched, and it has also been added to the GW Constellation) are the two earliest low-orbit Internet constellations put forward by China. GW Constellation, put forward by Xingwang Company, is the largest low-orbit constellation in China so far, and it is planned to have 12,992 satellites plus three experimental satellites. G60 Constellation is now the second-largest low-orbit large-scale constellation in China. Galaxy Constellation is a low-orbit Internet constellation put forward by Galaxy Space Company, and it is planned to have 650 satellites and seven launched. Geely Future Mobility Constellation has been independently developed and built by its parent company; it is a communication, navigation and remote sensing constellation of 72 satellites with 20 already launched. The Heavenly Enlightenment Constellation is an Internet of Things constellation that provides low-orbit satellite data communication services, and it has planned for 38 satellites with 21

already in operation. However, compared with developed countries in Europe and the United States, China's satellite Internet industry is still in the in-orbit verification stage and has not yet established a complete network solution.

In April 2020, satellite Internet was added to the list of essential information infrastructure in the main direction of the national policy support for the New Infrastructure Construction (hereinafter referred to as "New Infrastructure"). In the New Infrastructure, satellite Internet will be combined with 5G, the Internet of Things, and the industrial Internet at the core of the information infrastructure, namely the communication network infrastructure; therefore, satellite Internet will play a special role in the New Infrastructure. With the large-scale deployment and commercialisation of foreign systems, such as Starlink and OneWeb, and with the start of launches for 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 is China's first aerospace university and has consistently been in line with national strategies; it also has the special characteristic of being "rooted in aerospace and serving national defense". After launching "Experiment-1", the first satellite developed by a university as the leader in China in 2003, the institute has developed and launched 36 satellites so far and is now the university with the most satellites developed and launched in China. Over the past few decades, a large number of professionals in the field of satellite communication and aerospace have been nurtured by our country. "New Technologies of Modern Satellite Communication Systems" is an innovative research course organised by the School of Electronics and Information Engineering at Harbin Institute of Technology for all undergraduate students in the university, and its goal is to foster students' scientific research literacy. This course can help students learn the general working principles of satellite communication systems, as well as the latest trends in systems and technology, new research results, etc. Through practical teaching, students will write research reports on a particular topic and participate in defence assessments to learn some basic research ideas and methods; at the same time, they will also be able to develop innovative thinking and teamwork.

The new era requires us to pass on knowledge to the students and improve their ideological and political literacy; at the same time, we need to nurture talent with strong moral character and excellent professional ability. As professional course teachers, we have the responsibility to educate the students. How to integrate professional knowledge with ideological and political education organically to achieve the joint goal of "knowledge transmission" and "value leading" is the main problem that needs to be solved in the ideological and political education of professional courses under teaching reform. Although "New Technologies of Modern Satellite Communication Systems" is a course with strong professionalism and practicality, a large number of ideological and political education materials can still be obtained by studying it in detail. Based on the interpretation of the main national strategies, "China's Space Dream" and the "Belt and Road" Space Information Corridor, this paper examines the connotations of ideological and political education in the course in light of its features. It plans to extract the ideological and political components of the course materials, and based on close integration with the knowledge points of the course, it will restructure the teaching content, teaching design and assessment. This paper explores the teaching methods of ideological and political education in course reform and achieves the coordinated development of course teaching and ideological and political education.

2. Integrate course content to explore and improve the ideological and political qualities and moral education functions of the course in depth

Research on the content of ideological and political education in the course provides the foundation for "ideological and political education in courses". In the course of the development of satellite communication, the experience of the contributors to the "Two Bombs, One Satellite" project (such as Academician Qian Xuesen and Academician Sun Jiadong) will be integrated into the spirit of unity and common prosperity for the Chinese nation. The development of modern satellite communication transmission technology is also a good case of "learning from examples and improving oneself", such as Academician Zhang Naitong and the Lilac Micro-Nano Satellite Team at Harbin Institute of Technology. The development and ideas of satellite communication transmission technology are also in line with the old Chinese philosophical idea of "Yu Gong Moves the Mountain".

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

Explore the vast universe, develop the space industry, build a powerful space-age, and realize our dream of space exploration tirelessly. "China's Space Dream" is an important part of the "Chinese Dream". For example, in the introduction to the course, the teacher can present aerospace technology as a country's hard power from the perspective of "national strength" to enhance students' patriotism and sense of social responsibility. At the same time, in conjunction with "China Space Day", when explaining the development history of satellite communication technology in contemporary society, the course can help students learn about 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, fosters their patriotic sentiment, helps them feel that technological development and progress do not happen overnight, and inspires them to have the confidence and will to strive for the achievement of the "Chinese Dream".

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

In learning professional knowledge, students should also be able to develop a sense of social responsibility and form an awareness of social responsibility in addition to theoretical study. For example, through the deeds of the contributors to the "Two Bombs, One Satellite" project, represented by Qian Xuesen, this course introduces China's world-class advanced achievements in the field of satellite communication and typical examples of influential figures around the world, thus motivating students to strengthen their original aspiration for cultural learning, be aware of the mission of using their own strengths to contribute to the development of society and the nation, enhance the sense of responsibility for the rejuvenation of the Chinese nation, feel gratitude to our country, society and family after entering society, and become a person with a strong sense of patriotism and social responsibility. The 1950s and 1960s were a very difficult time for China, and it had to face serious problems abroad and resist the military threat and nuclear blackmail from imperialist countries. A large number of outstanding scientific and technological workers, many of whom were scientists who had achieved great success abroad, dedicated themselves to the country out of deep love for the new China. In response to the call of the Party and the country, they bravely took up the cause of the people. Along with a large number of cadres, workers, officers and soldiers of the People's Liberation Army who took part 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, built a powerful country through hard work, developed leading-edge technologies such as nuclear bombs, missiles and artificial satellites, achieved excellent results that attracted the attention of the world, 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"

By having academic masters in the field of satellite communication from home and abroad teach this course, students will be exposed to various professional qualities such as dedication, meticulousness and innovation, as well as a spirit of obscurity and a desire to contribute. In particular, the course will introduce 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 learn about the development history of the discipline and be inspired by Academician Zhang Naitong's scientific spirit of facing difficulties and continuously innovating, as well as his excellent qualities of selflessness, self-restraint and devotion to public duty. Integrate the knowledge points of the course to introduce China's outstanding scientific research achievements in the relevant field, lead students to grasp the spirit of craftsmanship, and deepen their spiritual conception 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 has been made more socially relevant to inspire students to develop professional qualities, learn to love their work, be willing to contribute, dare to innovate in their studies of professional knowledge, and create extraordinary brilliance in ordinary circumstances.

3. Restructuring the Teaching Content, Teaching Design and Assessment Methods According to the Ideological and Political Elements Refined in the Course

In terms of teaching content, the teacher can add the refined points of ideological and political knowledge to the class as a good supplement to the teaching content. For example, the collated and analysed development status 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 technology, and China's world-class achievements in the field of space communication can all serve as reasonable additions to the teaching content and be added to the teaching syllabus.

Add the latest developments in satellite communication systems and technologies around China and abroad to expand the content of teaching in this course. Therefore, in terms of teaching content, the system structure of the course needs to be optimised, and new domestic and foreign developments in satellite communication systems and technologies should be added, such as the latest technologies of low-orbit satellite Internet, ultra-dense constellations, direct satellite-to-mobile-phone connections, etc., so that students can learn about the latest technological progress in this field. Satellite Communications and Satellite Technology are evolving rapidly. The course has always used "Satellite Communications" by Dennis Roddy in 2006 as its textbook. During the research period of this project, the project team has published a Chinese edition of the course textbook "Satellite Communication" and the reference book "Analysis and Modeling of Propagation Characteristics for Satellite Mobile Channels", both of which cover the latest developments in satellite communication systems and technologies around the world and in China. For the teaching content, the teacher can add well-organized points of ideological and political knowledge to the in-class teaching as an effective supplement to the main content. For example, the collated and analysed development status 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 technology, 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.

First, the teacher should integrate the improved contents of ideological and political education with the knowledge content of the course in the teaching plan. During the course of teaching, the teacher can reasonably incorporate national sentiment based on the knowledge points, tell Chinese stories well, show Chinese wisdom, and thus present the teaching of professional courses in a Chinese style and manner. Second, teachers can take the initiative to learn about the academic leadership and research foundation of this subject and share their stories of technological breakthroughs, achievements and contributions to related technical fields. This way can help the students learn and remember the material better, and also make them feel more competent. The cultivation of value guidance elements and thinking methods is gradually integrated into the teaching, and moral education is shown in all aspects of teaching behaviour. Third, the teacher can connect the teaching of knowledge points with the cultural background of the course content. The background can be excellent traditional culture or real life. It can be well-known enterprises and famous people in the development of this field, or it can be historical events that everyone knows.

For the purpose of assessment, elements of ideological and political education will be added to the evaluation of professional ability at the process stage. For example, the proportion of each part in the final grade of the course may be 10% for regular performance, 20% for discussion, 10% for practice, and 60% for examination. Assessment of the ideological and political content of the course will be included in the regular performance and practice sections.

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

(a) A WeChat group for the course learning group will be set up to enhance the teaching effect. The teacher will post the course materials in the WeChat group in advance for the students to read, learn about the course content, and share their thoughts. At this time, the teacher will modify or lead the teaching content according to the needs of the students, answer questions from the students, and provide some knowledge. The teacher will also post the latest research results in this field in the WeChat group so that the students can learn about the development of the industry, gain some knowledge, and expand their horizons. In this way, it will improve the teaching efficiency of the course and help students develop a stronger sense of belonging and pride in China and their own values.

(b) Case-based teaching, problem-based teaching and seminar-based teaching will be used to enhance the interaction between teachers and students, expand the scope of knowledge teaching, and improve abilities. Animations, videos, audio recordings and other audio-visual materials can be used in class to increase students' interest and learning ability, help them better grasp difficult professional knowledge, improve teaching efficiency, and foster the development of their scientific literacy and humanistic literacy at the same time.

(c) Keep abreast of the development of the industry, learn about the trends in domestic and foreign technology development, and regularly update teaching materials. At the beginning of each class, the teacher will briefly introduce some current events and popular topics in society to provide students with some knowledge. Through all sorts of channels, such as the annual satellite communication international conference, domestic and foreign academic conferences and literature, teachers introduce well-known enterprises in the industry and new systems and new technologies that have recently emerged to the students. Therefore, students will be able to learn about the current development stage of the satellite communication industry, its system structure and all kinds of technological progress. It can help students plan their own lives, feel more responsible for them, and build up self-confidence.

5. Conclusion

For example, the course "New Technologies of Modern Satellite Communication Systems" will be used in this paper, and in line with the nature of this course, ideological and political content such as patriotism, responsibility and accountability, the power of role models, and the spirit of craftsmanship will be integrated. Restructuring the teaching content, teaching design and assessment in this paper, we explore and practise teaching methods for ideological and political education in the reform of professional courses. It can promote the joint development of course teaching and ideological and political education, and at the same time strengthen students' awareness of Chinese culture and their deep understanding and assimilation of core socialist values. This paper also carries out the function of professional courses in the ideological and political education of college students to achieve the goal of nurturing all-round talents.

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