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The Value Implications and Innovative Pathways of Integrating the Aerospace Spirit into Higher Education Ideological and Political Education

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Abstract: The spirit of space exploration encompasses the "Two Bombs, One Satellite" ethos, the manned spaceflight ethos, the lunar exploration ethos, and the new-era BeiDou ethos. Its core tenets align profoundly with the developmental objectives of ideological and political education in higher education. This paper examines the integration of the spirit of space exploration into university ideological and political education, exploring its value implications and practical pathways within the context of the new era. Through literature analysis and case studies, this research systematically outlines the defining characteristics of the aerospace spirit and thoroughly examines its significant value in areas such as fortifying ideals and convictions, cultivating new generations for the era, enhancing innovative capabilities, and deepening patriotic sentiments. The study proposes multi-dimensional integration pathways, including curriculum-teaching fusion, practice-based education expansion, campus cultural immersion, and communication matrix construction. These approaches play a unique role in enabling universities to fulfil the fundamental task of fostering virtue through education, while the innovation of these practical pathways offers important insights for enhancing the effectiveness of ideological and political education.

Keywords: aerospace spirit; ideological and political education; value connotations; innovative pathways

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1. Introduction

Over the six-decade evolution of China's aerospace endeavors—from the self-reliant achievement of the "Two Bombs, One Satellite" programmed to the pioneering feats of manned spaceflight; from the lunar exploration mission's "orbit, land, return" objectives to the global deployment of the BeiDou navigation system—the history of China's aerospace progress has been an enduring testament to the spirit of aerospace. Amidst intensifying global technological competition and the increasingly diverse value systems among contemporary university students, higher education institutions face fresh challenges in ideological and political education. In-depth research into the value implications and practical pathways for integrating the spirit of space exploration into ideological and political education in higher education institutions not only broadens the theoretical research perspective on ideological and political education but also provides new approaches and methodologies for enhancing its effectiveness.

2. The Core Essence of the Space Spirit

The spirit of space exploration encompasses the "Two Bombs, One Satellite" spirit, the manned spaceflight spirit, the lunar exploration spirit, and the new-era BeiDou spirit. These unique spiritual qualities have gradually crystallized throughout the development of China's space endeavors, vividly embodying "the national spirit centered on patriotism and the spirit of the times centered on reform and innovation" [1].

2.1. The "Two Bombs, One Satellite" Spirit: The Foundational Cornerstone of the Space Spirit

The "Two Bombs, One Satellite" spirit embodies the extraordinary determination, collective wisdom, and patriotic devotion demonstrated by China's aerospace pioneers during the nation's early efforts to develop the atomic bomb, hydrogen bomb, and its first artificial satellite. It stands as a monumental testament to the indomitable will of a generation that overcame immense scientific, technological, and geopolitical challenges in pursuit of national security and technological sovereignty.

In 1956, the establishment of the *Fifth Academy of the Ministry of National Defense* officially inaugurated China's missile, rocket, and satellite development programs, marking the symbolic beginning of the nation's strategic advancement toward the "Two Bombs, One Satellite" objective [2]. Despite severe material shortages and international blockades, countless scientists and engineers devoted themselves wholeheartedly to the cause, often working in isolation under extreme conditions. Through perseverance and collective innovation, they laid the cornerstone for China's emergence as a major space power.

Out of this arduous journey emerged a distinctive national ethos—the "Two Bombs, One Satellite" spirit—summarized by the core values of *"love for the motherland, selfless dedication, self-reliance, arduous struggle, vigorous collaboration, and the courage to scale new heights"* [3]. This spirit not only reflects the moral strength and scientific ingenuity of that pioneering generation but also serves as an enduring source of inspiration for contemporary China. Today, it continues to guide the nation's scientific community in advancing independent innovation and technological excellence, while offering rich ideological and moral resources for the cultivation of patriotism and perseverance in university education.

2.2 The Spirit of Manned Spaceflight: An Evolution of the Space Spirit

The Spirit of Manned Spaceflight represents the vivid continuation and contemporary manifestation of the "Two Bombs, One Satellite" ethos by a new generation of Chinese aerospace professionals. It emerged from the preliminary research on key manned spaceflight technologies initiated by Chinese scientists and engineers in 1986, marking the nation's strategic entry into the era of human space exploration. This endeavor carried forward the core values of self-reliance, perseverance, and innovation established by earlier pioneers, while integrating new dimensions of technological sophistication, teamwork, and national pride.

From the historic moment in 2003, when Yang Liwei became the first Chinese astronaut to enter space aboard *Shenzhou 5*, to the successful completion and commissioning of China's space station in 2021, the journey of nearly two decades has epitomized the unyielding determination and collective excellence of China's aerospace community. Throughout this period, thousands of engineers, scientists, and astronauts have embodied the Spirit of Manned Spaceflight, characterized by *"exceptional endurance, exceptional combat readiness, exceptional problem-solving capability, and exceptional dedication"* [4].

This spirit not only signifies China's growing capacity for independent innovation in cutting-edge aerospace technology but also reflects a deeper moral commitment—to serve the nation, to challenge the limits of human capability, and to explore the unknown with courage and discipline. As a living continuation of the nation's scientific and ideological

heritage, the Spirit of Manned Spaceflight provides rich pedagogical resources for ideological and political education in universities, inspiring students to integrate patriotism, innovation, and perseverance into their pursuit of personal and national advancement.

2.3. The Spirit of March and the New Era BeiDou Spirit

Innovative Development of the Space Spirit. On 17 December 2020, the Chang'e-5 mission was completed. This achievement solidified the resolve of China's aerospace professionals to serve their nation through space exploration, crystallizing the lunar exploration ethos characterized by "pursuing dreams, daring to explore, collaborating to overcome challenges, and achieving mutual success" [5]. In 2012, the BeiDou-2 satellite navigation system commenced operations, followed by the completion and launch of the BeiDou-3 global satellite navigation system in 2020. This propelled the BeiDou system from inception to global coverage, crystallizing the new-era BeiDou spirit characterized by "independent innovation, open integration, unity of purpose, and pursuit of excellence".

The spirit of space exploration serves not only as a vital cultural pillar for China's modernization drive but also as a powerful force propelling scientific innovation and nurturing innovative talent. Its integration into the ideological and political education of university students has been effectively explored, revealing both its contemporary value and innovative pathways.

3. The Value Implications of Integrating the Space Spirit into University Ideological and Political Education

3.1. Establishing Ideals and Convictions

The "space spirit" plays a crucial role in shaping the values and belief systems of contemporary university students. In the context of accelerating information globalization and increasingly complex ideological environments, students are constantly exposed to a multiplicity of cultural narratives and value orientations. This pluralism, while enriching, also brings ideological confusion and moral relativism, making it imperative to strengthen "faith, conviction, and confidence" as enduring anchors of identity and purpose. Promoting the spirit of space exploration—characterized by unwavering dedication, collective endeavor, and self-transcendence—provides powerful ideological guidance for young people. It inspires them to internalize Marxist ideals, cultivate a firm belief in socialism with Chinese characteristics, and develop a rational, value-oriented worldview. Through engagement with the narratives of space scientists and national space achievements, students can better understand the inseparable link between personal growth and national rejuvenation. Ultimately, the vigorous dissemination of the space spirit helps consolidate ideological consensus, reinforce moral resilience, and nurture a generation of youth committed to realizing their self-worth through active participation in the construction of a space power.

3.2. Cultivating Innovative Talent

The aerospace sector stands as a strategic frontier of national innovation, serving as both a cradle for high-level scientific talent and a driving force behind China's technological modernization. Its workforce constitutes not only the lifeblood of industrial progress but also the cornerstone of the nation's scientific and technological self-reliance. Data reveal that youth-driven innovation has become a defining feature of China's space achievements: the chief and principal designers of the five major subsystems in the lunar exploration program are largely in their thirties and forties; the average age of the Long March 5 rocket research team is below 33; and researchers under 35 account for nearly 80% of the development team in China's manned space program. Similarly, recipients of the 2019 National Natural Science Award averaged just 44.6 years of age, with the youngest

award-winning team averaging only 35 years [6]. These figures vividly demonstrate that young scientists and engineers have become the intellectual backbone of China's aerospace and broader scientific enterprise.

Integrating the spirit of space exploration into university ideological and political education thus holds profound implications for talent cultivation. By embedding the values of exploration, perseverance, and innovation into the ideological framework of higher education, universities can inspire students to pursue excellence in science and technology, strengthen their sense of mission toward national rejuvenation, and nurture a forward-looking mindset aligned with the country's strategic development goals. This integration not only promotes the formation of high-quality innovative reserves for the aerospace sector but also lays a solid foundation for enhancing students' scientific literacy, creativity, and moral responsibility in the pursuit of a powerful modernized nation.

3.3. Enhancing Innovation Capacity

No great enterprise can flourish without the spirit of innovation. The enduring vitality of China's aerospace industry and its leadership in global space technology stem fundamentally from its unwavering commitment to independent innovation and its deep integration of scientific progress with national aspirations. The active participation of the people—scientists, engineers, educators, and citizens alike—has become an essential driving force in advancing technological frontiers. Moreover, the unique advantage of China's socialist system, which enables the concentrated mobilization of resources for major national undertakings, has significantly accelerated the realization of high-level scientific and technological self-reliance and self-strengthening.

Integrating the spirit of space exploration into university ideological and political education thus serves as a powerful means of stimulating students' intellectual curiosity and practical competence. By engaging with the narratives of China's aerospace development, students can experience the inspirational power of perseverance, teamwork, and the relentless pursuit of excellence that underpins every space mission. Such integration not only ignites their enthusiasm for exploring the unknown but also cultivates habits of critical inquiry, independent learning, and creative problem-solving. Ultimately, through experiential learning and practice-based education, students are guided to transform abstract ideals into concrete scientific actions—enhancing their innovative awareness, practical abilities, and readiness to contribute to the nation's continued journey toward the stars.

3.4. Cultivating Patriotic Sentiment

The spirit of space exploration is profoundly patriotic in nature, embodying ideals that connect individual dedication with collective national progress. It provides an invaluable source of material for patriotic education in the new era. Since the inception of China's space program, generations of aerospace scientists and engineers have upheld the noble conviction that "the interests of the motherland are paramount, love for the nation is paramount, and dedication to the nation is paramount." Their stories represent the highest expression of loyalty, perseverance, and devotion to the people.

A representative example is the life of Qian Xuesen, who, carrying what has been described as "the eternally awakened soul of the Chinese people," endured a long and arduous "five-year journey home" to contribute to his country's scientific rise. His leadership in achieving the historic goal of "two bombs and one satellite" within a decade exemplifies the ultimate unity of personal destiny and national mission. Likewise, the countless aerospace workers who silently dedicate themselves to research and experimentation have inextricably tied their professional endeavors to the honor, prosperity, and peace of the nation. Their collective achievements vividly demonstrate that patriotism is not an abstract ideal but a concrete practice manifested through innovation, responsibility, and sacrifice.

Integrating the spirit of space exploration into university ideological and political education can thus play a transformative role in cultivating patriotic values among students. By learning from the stories of aerospace pioneers and the evolution of China's space endeavors, students can internalize a sense of pride in the nation's scientific accomplishments, develop emotional identification with national rejuvenation, and strengthen their commitment to serving the country through knowledge and innovation. In this way, ideological and political education not only nurtures patriotic sentiment but also inspires students to unite intellectual aspiration with practical contribution, reinforcing both their scientific literacy and their sense of historical responsibility.

4. Innovative Approaches to Integrating the Aerospace Spirit into University Ideological and Political Education

4.1. Curriculum Integration

Establishing a Systematic Educational Framework for the Space Spirit Integrating the "space spirit" into ideological and political education courses involves effectively conveying its essence to enable students to appreciate the arduousness and brilliance of the space endeavor, thereby igniting patriotic fervor and innovative spirit to maximize educational impact.

Uncovering Educational Materials and Narrating Space Stories: While recounting space narratives, ideological and political education instructors must delve deeper to uncover more effective educational materials and explore the underlying values within these stories. Currently, many manned spaceflight stories remain archived in science museums or archives, with their ideological and political educational value yet to be fully tapped. Educators should transform aerospace educational resources into distinctive moral education materials, using engaging narratives to evoke emotional resonance among students. This enriches the content of ideological and political education in higher education institutions, broadening its scope and depth.

Igniting Patriotic Passion and Cultivating Innovative Thinking: In classroom teaching, educators should guide students to understand the evolution of the aerospace spirit and the development of China's space endeavors. This fosters logical reasoning and innovative capabilities, assists in establishing sound values, and stimulates patriotic sentiment.

Breaking disciplinary barriers and integrating into specialized courses: Higher education institutions can incorporate the spirit of space exploration into teaching across all disciplines and courses, forming a collaborative educational framework between specialized courses and ideological and political education theory classes. Specialized course instructors should strengthen the collection of case studies related to the "spirit of space exploration," uncovering the educational resources for scientific thinking and professional ethics embedded within them. They should integrate the latest achievements in aerospace science and technology into classroom teaching, utilizing the ideological and political elements of the "spirit of space exploration" within specialized courses to achieve the unity of knowledge transmission and value guidance.

4.2. Expanding Practical Education

Establishing Diverse On-Campus and Off-Campus Platforms. Practical education serves as an effective means to cultivate the aerospace spirit. Higher education institutions should proactively establish practical education platforms for students, fostering their practical capabilities while deepening and solidifying ideological and political education.

Co-building Practical Bases to Enhance Scenario Experiences: Universities should actively collaborate with enterprises to establish practical training bases and virtual simulation training facilities. By 2022, 18 of the 453 national practical teaching bases were dedicated to aerospace spirit education. Through joint development of VR training labs for aerospace science popularization and cognition, alongside aerospace intelligent

manufacturing training bases, students' practical abilities and immersive scenario experiences are significantly enhanced.

Conducting social practice to deepen cognitive recognition: Higher education institutions should fully leverage the role of extracurricular education by organizing experiential practical activities. For instance, arranging student visits to aerospace-themed venues where emerging technologies such as VR and artificial intelligence create immersive virtual environments. This enables students to experience firsthand the rigorous training endured by aerospace personnel and the developmental journey of China's space program, thereby strengthening national identity and pride.

Leveraging Competitions and Research to Enhance Practical Skills: Higher education institutions should integrate specialized courses with aerospace practice activities. By organizing competition projects, they can encourage and guide students to participate in aerospace model design and aerospace innovation contests. Through these competitions, students develop teamwork capabilities, refine their knowledge structures, and strengthen their innovation and practical skills.

4.3. Campus Cultural Immersion

Fostering a "Comprehensive + Immersive" Aerospace Cultural Atmosphere Integrating the "space spirit" into campus cultural development deepens its meaning, fosters a positive campus atmosphere, and enables university students to tangibly experience this ethos through campus activities.

Enrich thematic activities to stimulate engagement: Integrate the aerospace spirit into students' daily practical activities to achieve holistic education. For instance, organize aeromodeling competitions, aerospace-themed film screenings or theatrical performances, and aerospace exhibitions to provide more hands-on opportunities; encourage students to view aerospace-themed audiovisual materials, leveraging the power of imagery to widely disseminate the aerospace ethos.

Optimizing the educational environment for subtle influence: Higher education institutions should proactively integrate the "spirit of aerospace" into campus cultural development, fully leveraging the subtle influence of the educational environment on young students. By cultivating an aerospace cultural atmosphere, we can ignite students' passion for exploring the unknown, disseminate the scientific spirit, promote innovation, and enhance students' awareness and identification with the aerospace cause.

Establishing aerospace societies to build exchange platforms: Higher education institutions may support the formation of student societies centered on aerospace themes, providing platforms for exchange and learning. Development plans should be tailored to members' interests, with regular aerospace-themed lectures and seminars organized to boost student engagement in related activities. This enables spiritual growth through interaction and collaborative work.

4.4. Building a Communication Matrix:

Innovating Space Spirit Dissemination through "Traditional + New Media" Approaches. In this era of rapidly evolving information technology, universities should fully leverage new technologies, media, and tools to construct a diversified, multi-dimensional dissemination matrix. By adopting formats and language that resonate with young students, innovative communication channels and platforms can enhance the pervasiveness and influence of the manned spaceflight ethos.

Leveraging Campus Media to Disseminate Space Culture: Integrate the spirit of space exploration organically into students' daily lives by fully utilizing campus media such as intranets, newspapers, and radio broadcasts to convey this ethos in accessible ways. Examples include displaying posters chronicling manned spaceflight achievements on campus noticeboards and publishing the latest research outcomes from space engineering projects.

Innovating communication formats to enhance appeal: Higher education institutions must continually innovate communication platforms and methods, skillfully employing new media and technologies to enhance the contemporary relevance and appeal of the aerospace spirit. For instance, leveraging social media, video platforms, and mobile applications to advance the dissemination of the "aerospace spirit" towards visualization, integration into daily life, and multidimensionality; utilizing digital technologies to promptly gauge student sentiment, address their needs and concerns, and strengthen emotional resonance.

Aligning with communication characteristics to broaden reach: Higher education institutions must adapt to the nature of online communication and shift their communication philosophy. The current "unidirectional" approach no longer meets the expectations of young people. Institutions should employ emerging technologies such as digital tools, artificial intelligence, and 5G to expand information channels. They should actively seek close collaboration with aerospace enterprises to transition from unidirectional to interactive communication methods, thereby increasing the reach and influence of the aerospace spirit.

5. Conclusion

Integrating the spirit of space exploration into university ideological and political education carries profound and multifaceted significance. It not only serves as a powerful vehicle for political guidance and moral cultivation but also acts as a catalyst for scientific innovation, patriotic consciousness, and cultural self-confidence among students. By drawing on the values embodied in space exploration—such as perseverance, collective dedication, and pursuit of excellence—universities can inspire a new generation to align personal ideals with national development goals. This integration represents an effective pathway for strengthening and modernizing ideological and political work in higher education institutions in the new era. Looking ahead, future research may delve deeper into constructing a systematic evaluation framework for "space spirit" education, exploring digital and experiential learning pathways, and examining its international communication and comparative education dimensions. Such efforts would provide valuable theoretical foundations and practical strategies to enhance the relevance, appeal, and overall effectiveness of ideological and political education in the context of global technological progress.

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