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Exploration of the Path of Empowering the Curriculum Ideology and Politics Construction of Multi-rotor UAV Technology and Control with Digital Intelligence Technology

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Abstract: Under the background of the continuous deepening of comprehensive reform in higher education, digital intelligence technology has brought new opportunities and challenges to vocational education reform. As an important course for UAV majors, the Multi-rotor UAV Technology and Control course not only cultivates students' professional skills but also shoulders the important mission of shaping their professional literacy and character. From the perspective of digital intelligence technology, this paper explores effective paths for technology to empower the curriculum ideology and politics construction of this course, including strengthening top-level design and consolidating the ideological and political teaching syllabus; deeply mining ideological and political elements and building an organic integration system; innovating teaching methods in multiple ways and implementing detailed teaching links; and driving evaluation innovation with intelligence to lay a solid foundation for the quality of curriculum ideology and politics in Multi-rotor UAV Technology and Control, so as to help students fasten the first "button" of UAV professional learning.

Keywords: Digital intelligence technology; Multi-rotor UAV technology and control; Curriculum ideology and politics.

1. Introduction

The Multi-rotor UAV Technology and Control course is a core professional compulsory course for UAV majors, covering the definition, classification, aerodynamics, development history, composition structure, and flight operations of UAVs, which plays an important enlightening role in building students' UAV knowledge system and cultivating practical abilities. This course contains rich professional knowledge and is continuously expanded through interdisciplinary subjects and scientific research progress, embodying abundant ideological and political connotations such as the spirit of scientific and technological innovation, safety awareness, and professional responsibility, providing a good foundation for carrying out curriculum ideology and politics. Many scholars have also made useful explorations on the construction of curriculum ideology and politics resources for UAV courses and the improvement of teachers' capabilities. In the process of multiple rounds of construction, teachers' awareness of educating people and their practical abilities in curriculum ideology and politics have been improved to a certain extent. Through excavating ideological and political elements and designing teaching methods, the implementation effect of curriculum ideology and politics has been enhanced.

At present, although it has become normal for colleges and universities to carry out curriculum ideology and politics teaching in Multi-rotor UAV Technology and Control and achieved certain results, there are still some common or disciplinary-specific dilemmas, including but not limited to:

(1) Insufficient top-level design, insufficient attention to the role of ideological and political elements in talent cultivation, and failure to fully integrate educational goals into teaching syllabi and curriculum content.

(2) The excavation of ideological and political elements is not deep enough, and the integration method is superficial, with a problem of formalism. For example, when explaining the development history of UAVs, only some famous UAV manufacturers are simply mentioned, without organically combining them with ideological and political connotations such as the spirit of scientific and technological innovation and national scientific and technological development.

(3) The teaching model is relatively traditional and single, mainly based on teacher lectures, with low student participation, which is not conducive to the achievement of knowledge and skill goals and difficult to ensure the realization of educational goals. At the same time, in the practical teaching link, some colleges and universities do not pay enough attention to flight operation training, and the integration of theory and practice needs to be strengthened.

(4) The evaluation system is unbalanced, lagging, and not highly accurate. The evaluation method and effect of curriculum ideology and politics have always been a weak link in curriculum ideology and politics research[1]. In reality, teaching evaluation overemphasizes knowledge assessment, with a single dimension for measuring the achievement of ideological and political education goals, insufficient attention to the shaping of students' emotions, attitudes, values, and professional literacy cultivation. Moreover, the evaluation subjects are mostly limited to teachers, with the lack of student self-evaluation and peer evaluation, and the combination of process and final evaluation is not good, making it difficult to comprehensively and objectively reflect the effectiveness of ideological and political teaching[2].

2. Opportunities and Breakthroughs Provided by Digital Intelligence Technology for The Construction of Curriculum Ideology and Politics in Multi-Rotor UAV Technology and Control

With the popularization of digital intelligence technology, the education sector is undergoing digital and intelligent transformation, which has brought new opportunities for the construction of curriculum ideology and politics in Multi-rotor UAV Technology and Control. Digital intelligence technology has been gradually applied to UAV course teaching, showing unique advantages in teaching assistance, knowledge graph construction, virtual simulation experiments, etc.[3], but there is a lack of in-depth exploration in curriculum ideology and politics construction.

Digital intelligence technology can high-quality expand teaching time and space and upgrade the hybrid teaching model, contributing to the implementation of precise teaching. In the construction of curriculum ideology and politics for Multi-rotor UAV Technology and Control, digital technology can enrich teaching resources, reshape the teaching model, and empower the excavation of ideological and political resources. Relying on big data analysis and generative artificial intelligence, teachers can better combine disciplinary characteristics and curriculum content to deeply understand ideological and political connotations such as the spirit of scientific and technological innovation, safety awareness, and environmental protection concepts, expand the integration paths of ideological and political elements or cases, and promote the transformation of curriculum ideology and politics construction from "universal" to "exclusive"[4]. For example, by analyzing UAV application cases in different fields, the ideological and political elements contained therein can be excavated, such as the application of UAVs in agricultural plant protection reflects the ideological and political connotation of technology helping agricultural development and ensuring food security.

Digital intelligence technology can also deeply empower the practical teaching link. Using augmented reality (AR) and virtual reality (VR) technologies, students can participate in UAV simulation flights, assembly, and debugging in an immersive manner. On the one hand, this solves the problems of insufficient UAV equipment and limited practical venues in some colleges and universities. On the other hand, it creates an immersive learning environment, enriching teaching forms while strengthening the attractiveness and appeal of ideological and political education. For example, simulating UAV flight missions in complex environments through VR technology allows students to understand safety awareness and professional responsibility in practice.

In addition, digital intelligence technology can facilitate the transformation of learning evaluation. By leveraging big data intelligent profiling and artificial intelligence algorithms to deeply mine the panoramic teaching process, a smart evaluation system can be constructed, making learning evaluation more diverse and intelligent [5]. In the construction of ideological and political education in courses, digital intelligence technology can be used to unobtrusively collect and analyze learning data, depicting the learning profile. For instance, by integrating and analyzing multi-dimensional data such as online learning duration, homework completion status, classroom interaction performance, practical operation attitude and completion rate, not only can the students' knowledge mastery level be assessed more accurately, but also their learning attitude and professional qualities can be potentially analyzed and judged. This enables a more comprehensive evaluation of students' ideological and political quality performance. Moreover, through intelligent profiling and intelligent push, the continuous learning and personalized learning needs of students can be met, truly fulfilling the guiding role of evaluation.

3. Practical Paths for Empowering the Construction of Curriculum Ideology and Politics in Multi-rotor UAV Technology and Control with Digital Intelligence Technology

3.1. Strengthen the top-level design and consolidate the ideological and political teaching outline

The ultimate goal of digital intelligence technology is to deeply integrate with educational concepts. Specifically, in the construction of curriculum ideology and politics, strengthening top-level design and using technology to consolidate the foundation of ideological and political construction is the core key. In top-level design, closely focusing on the talent cultivation objectives of vocational education, combined with the characteristics of UAV majors, the teaching syllabus should be redesigned to build a systematic and complete curriculum ideology and politics framework, clarify the ideological and political goals and tasks carried by each chapter and teaching link, and promote the coordinated development of "knowledge transmission, ability improvement, and value guidance". For example, in the chapter "Composition Structure of UAVs", set the first-level ideological and political goal as professional literacy, and the second-level goals as teamwork spirit, innovative consciousness, and safety awareness. Combine with practical application cases of UAVs, and support relevant ideological and political cases such as "Application of UAVs in Emergency Rescue and Safety Precautions", starting from top-level design to implement effective paths for curriculum ideology and politics construction. When sorting out the ideological and political teaching syllabus, the integration points and integration paradigms of digital intelligence technology should also be planned from a macro perspective to ensure their deep integration and collaborative efforts.

3.2. Deeply explore ideological and political elements and build an organically integrated system

With the help of digital intelligence technology, deeply analyze the knowledge system of the Multi-rotor UAV Technology and Control course, and closely follow the ideological and political syllabus to clarify the core issues of "what to excavate" and "how to excavate". Using big data technology to accurately identify students' knowledge gaps and value concept cultivation needs, and then accurately match appropriate digital intelligence resources and ideological and political materials, is an effective path to achieve the organic matching of the supply side and demand side and deeply excavate ideological and political elements.

In specific operations, according to the description of ideological and political connotations (spirit of scientific and technological innovation, safety awareness, environmental protection concepts, professional responsibility, etc.), dynamically collect and sort out UAV-related ideological and political cases and materials according to the teaching syllabus, and promote the integrated implementation of curriculum ideology and politics and curriculum construction through carriers such as digital courseware, electronic teaching plans, and online learning platforms[6]. For example, taking the "loose-leaf electronic textbook" as the carrier for element excavation and curriculum construction, breaking the inherent model of traditional textbooks, guided by specific teaching objectives, teaching problems, and teaching effects, disassembling and reconstructing the original UAV knowledge, systematically presenting it in the form of knowledge points or knowledge graphs, and using digital intelligence technology to organically integrate ideological and political cases, such as "Development History of UAVs and Independent Innovation of UAV Technology in China" and "Application of UAVs in Environmental Protection". Moreover, the "loose-leaf electronic textbook" can be jointly built by teachers and students, promoting teaching and learning together, truly student-centered, and promoting the deep integration of disciplinary knowledge and ideological and political elements to improve teaching effectiveness and educational achievements.

3.3. Innovating teaching methods in multiple ways and implementing detailed teaching links

In the process of digital intelligence technology reshaping the teaching environment and teaching ecology, the diversity and accessibility of learning resources have increased, teaching time and space have been extended, the proportion of personalized and adaptive learning has increased, and the interaction methods between teachers and students/students have become more abundant. These changes provide a reference path for digital intelligence technology to empower the construction of curriculum ideology and politics in Multi-rotor UAV Technology and Control, that is, to take advantage of the situation, innovate teaching methods in multiple ways, and improve the teaching effectiveness of each teaching link. In fact, some experts and scholars also believe that in the teaching process of professional courses, the "best" curriculum ideology and politics effect is to improve teaching efficiency and quality, help students understand "knowledge" and understand "principles", achieve the goal of deep learning, and achieve emotional goals and ideological and political goals while actively building knowledge systems and exercising skills. In specific practice, the author and the teaching team rely on two lines (online and offline) and three periods (pre-class, in-class, and after-class) to integrate digital intelligence technology into each teaching link, innovate teaching methods in multiple ways, and focus on achieving four-dimensional teaching objectives (knowledge, ability, literacy, and ideology and politics) around the "five educations" (moral, intellectual, physical, aesthetic, and labor education), as shown in Figure 1.

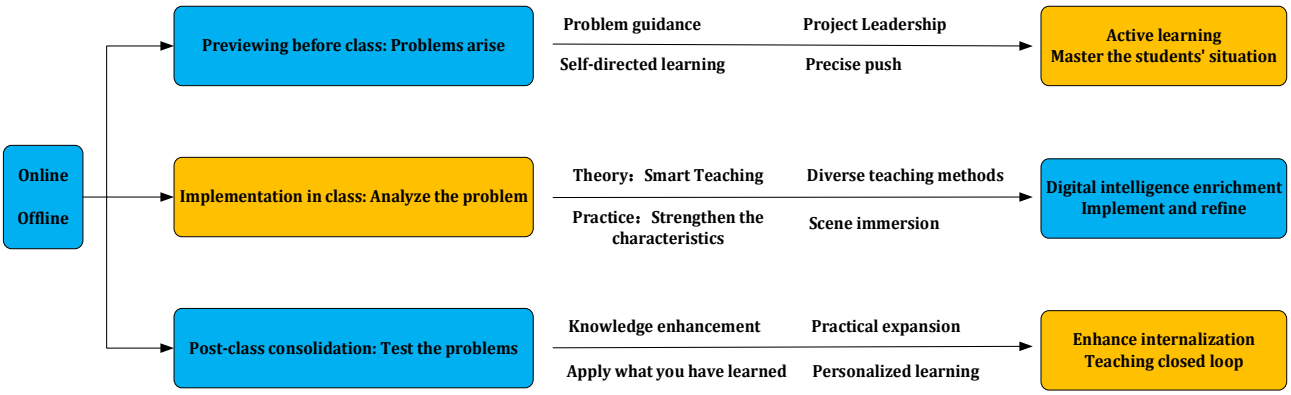

Figure 1. Integrating digital and intelligent technologies into all teaching stages helps to effectively implement course ideological education.

In the pre-class stage, problem guidance and project leadership are the main approaches. Teachers set up micro-lessons, 3D digital models or animations related to drones on the intelligent learning platform. In accordance with the ideological and political teaching syllabus, they use digital and intelligent technologies to imperceptibly push teaching materials integrated with ideological and political elements. The learning is mainly self-study by students, which helps them initially build a knowledge framework and enhance their interest in learning about drones. Based on the key and difficult points of the current learning content, dynamic online preview tests are set up. Data collection and analysis are used to identify knowledge weak points, providing precise references for subsequent classroom teaching. For example, when previewing "The Power System of Quadcopters", 3D digital models can be embedded into the learning system, and supplementary reading materials such as "The Development History and Innovative Cases of Quadcopter Power Systems" can be set up. The system records the operation trajectory and reading dwell time, and through system algorithms, personalized exercises and supplementary reading materials are pushed, thereby understanding the overall preview situation of students.

The in-class link is of utmost importance. The rich ideological and political connotations contained in the Multi-rotor UAV Technology and Control course should also be combined with the course characteristics to enhance the attractiveness of the classroom and students' effective participation through teaching model innovation and diversified teaching methods. In theoretical classrooms,

simple smart teaching environments can be created with the help of digital intelligence technology, and appropriate teaching methods and technologies can be used according to the course content, including lecture methods, case teaching methods, scenario teaching methods, discussion teaching methods, etc. Combined teaching methods can also be used, such as after explaining the main knowledge content, setting professional subject questions and questions containing ideological and political elements (teamwork spirit, innovative consciousness, safety awareness, etc.) through specific cases, encouraging students to discuss or express their opinions, attracting "phubbers" to look up or achieving the goal of "completing teaching tasks while looking down". In the practical class link, teaching effectiveness should be improved and ideological and political integration should be promoted by firmly grasping flight operation training. In addition to regular flight operation training, appropriate "activities" should be designed to enrich teaching links and test teaching effects, such as "team flight tasks" to enhance collaboration and "flight operation experience sharing" to exercise knowledge transfer and expression abilities. With the support of digital intelligence technology, immersive teaching scenarios can also be created through VR and AR technologies, especially when explaining complex UAV flight operation skills, students can experience flight attitudes and operation details immersively, enhancing intuitive feelings, truly making students the main body of learning, and carrying out immersive learning, thinking, practice, and understanding combined with teaching design.

After-class improvement is an important link to promote knowledge internalization, improve application abilities, and consolidate the formation of knowledge systems, and it is also an effective way to build a "double helix" of "knowledge transmission - ideological and political guidance". With the help of digital intelligence technology and teaching platforms, knowledge review homework and extended practical tasks can be assigned to further expand the time and space of education. By using big data to invisibly collect and track students' after-class task learning progress and participation, and through intelligent algorithms to push personalized review suggestions or supplementary learning materials, a complete teaching closed loop is formed, comprehensively improving the teaching quality of the Multi-rotor UAV Technology and Control course, which is the best foundation for achieving the deep integration of curriculum ideology and politics and value guidance.

3.4. Intelligent drive evaluation innovation, laying a solid foundation for the quality of ideological and political education in multi-rotor UAV technology and control courses

The core purpose of learning evaluation is to promote the effective development of students' knowledge, skills, and literacy, while the evaluation of curriculum ideology and politics effectiveness has always been difficult to quantify. Digital intelligence technology based on artificial intelligence and big data has also brought new driving forces to evaluation tools and evaluation models. In specific practice, teaching and evaluation should be comprehensively considered, requiring coordinated planning and precise anchoring in top-level design, unifying ideological and political goals with knowledge and ability goals at the source of the teaching syllabus, and reasonably planning the assessment framework according to the characteristics of the Multi-rotor UAV Technology and Control course to ensure the collaborative resonance of teaching, learning, and evaluation. In addition, teachers need to be able to fully master intelligent evaluation tools, and with the help of big data analysis technology, deeply mine multi-dimensional data of students in the learning process, including online learning duration, resource browsing preferences, frequency of interactive communication, and homework completion, to accurately analyze students' knowledge mastery progress and the internalization degree of ideological and political values, such as judging their professional literacy and safety awareness cultivation by analyzing students' operation details and decision-making logic in flight simulation practice. Moreover, the innovative integration of diversified evaluation methods is also an effective path. The characteristics of UAV courses and teaching realities (online, offline, theoretical, practical, etc.) should be fully considered to build a network of close collaboration among student self-evaluation, peer evaluation, and teacher evaluation, such as introducing group peer evaluation in practical classes, interspersing student self-evaluation in online theoretical learning, and carrying out peer evaluation in case discussion sessions, to comprehensively measure students' ideological and political growth trajectories and strongly promote the implementation of educational goals. Based on the collection and analysis of panoramic teaching data, teachers should also accurately capture teaching trends, quickly feedback, and cleverly design, integrating "teaching - learning - evaluation" for overall iterative upgrading, such as timely integrating cutting-edge UAV application cases and moral factors in hot news, creating UAV practical simulation tasks of certain difficulty, leading students to use professional knowledge to solve real-world problems, continuously optimizing learning strategies, and improving comprehensive literacy, consolidating the foundation of moral education in professional courses, and injecting lasting vitality and effectiveness into the curriculum ideology and politics construction of Multi-rotor UAV Technology and Control.

4. Conclusion

In exploring the path of empowering the curriculum ideological and political construction of Multi-rotor UAV Technology and Control with digital intelligence technology, we face numerous challenges, including shortages of technical equipment and resources, limitations in teachers' technical literacy and teaching capabilities, and differences in students' autonomous learning and information literacy, all of which affect teaching quality and the effectiveness of curriculum ideological and political education. Additionally, issues and challenges associated with digital intelligence technology, such as data privacy and ethical norms, require attention.

During implementation, it is crucial to maintain a balance between technology and humanism. On one hand, leverage digital intelligence technology to improve teaching efficiency, expand teaching time and space, enrich resources, and enhance interactivity to provide high-quality learning experiences; on the other hand, adhere to student-centered education, focusing on emotional needs, value shaping, and professional literacy to avoid technological dependence or supremacy. Despite challenges like insufficient investment, reasonable planning and resource integration can gradually

alleviate equipment and resource shortages. Providing continuous professional training for teachers can enhance their technical application capabilities and teaching concepts, enabling them to better integrate professional knowledge with ideological and political education in digital intelligence environments. For students, guidance and training should be strengthened to stimulate learning motivation and improve autonomous learning and information processing abilities, helping them adapt to digital intelligence-supported learning models. Furthermore, safety, responsibility, and ethical norms must be prioritized to ensure that digital intelligence technology in teaching and curriculum ideological and political construction complies with moral and legal standards, particularly regarding data privacy and security risks in data collection.

In summary, despite challenges, the development of digital intelligence technology has provided new ideas and paths for the curriculum ideological and political construction of Multi-rotor UAV Technology and Control. In practice, integrating online and offline teaching resources, following the principles of suitability, timeliness, and moderation, strengthening teachers' digital literacy and ideological and political capabilities, and cultivating students' professional literacy and social responsibility through top-level design,ideological-political resource repository, diversified teaching methods, and intelligent teaching evaluation will enable digital intelligence technology to continuously empower curriculum ideological and political construction. This will lay a solid foundation for cultivating morally and technically competent UAV professionals, strongly promoting the innovative development and quality improvement of vocational education, and achieving deep integration and collaborative progress between technology and education.

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