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Research and Practice of Virtual Teaching and Research Office for Electronic Information Specialties

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Abstract: With the inexorable march of educational informatization, Sanya University has embarked on a proactive journey to explore and implement the construction of virtual teaching and research offices amidst its transformation into an application-oriented university. This initiative is particularly evident in the realm of electronic information majors, where the university has meticulously analyzed the limitations and challenges posed by traditional teaching and research offices. As a result, a dedicated virtual teaching and research organization tailored for electronic information majors has been established. This organization not only serves as a catalyst for reforming teaching modes but also cultivates a novel pathway for collaborative education, thereby fostering the growth and evolution of virtual teaching and research content. By harnessing the power of collective intelligence and delving into collaborative teaching and research mechanisms, Sanya University has taken significant strides in enhancing the quality of practical teaching. The construction of virtual simulation experimental teaching platforms and virtual teaching and research offices has further bolstered students' practical abilities and nurtured their innovative spirits. These advancements not only align with the university's commitment to fostering applied talents but also reflect its dedication to keeping pace with the rapid advancements in educational technology.

Keywords: Electronic Information Majors; Virtual Teaching and Research Office; Collaborative Teaching and Research Mechanism; Practical Ability

1. Introduction

Current teaching and research office activities often require teachers to gather physically in the office, which entails high time costs and may not necessarily allow teachers to find the most suitable research community for themselves [1,2]. This traditional physical format often faces various issues such as geographical inconvenience, transportation difficulties, and scheduling conflicts. Meanwhile, the current structure of teaching and research offices is monolithic, unable to meet the diverse communication needs between teachers, especially between university faculty and enterprise personnel, thereby failing to form a high-quality teaching and research platform [3,4]. In recent years, the Teaching and Research Office of the Electronic Information Department at the Automotive College of Sanya University has meticulously arranged and formulated a schedule for teachers' Office Hours in accordance with the school's requirements. Each teacher is scheduled to be present in the office for more than the stipulated period, and professional exchanges are conducted at least eight times per semester during times when all are free from classes. These exchanges cover various topics including the inspection of teaching documents at the beginning of the semester, the conclusion of national and Hainan provincial innovation and entrepreneurship projects for university students, the application status of national innovation and entrepreneurship projects for university students, the Internet+ Competition, summaries of students' winter vacation preview experiences, professional development, the completion status of undergraduate graduation thesis, the development of courses in terms of "three degrees" (relevance, difficulty, and practicality), teacher skills competitions, the exchange of course construction and classroom teaching experiences, summaries of course video shooting, summaries of introductory guidance courses for

majors, the progress of ongoing research projects, and the application process for National Natural Science Foundation grants. The Electronic Information Department has provided effective institutional, human, and project support for collective activities of the teaching and research office, along with written and visual records. The leaders of the sub-college regularly engage in professional exchanges and inspect the implementation of activities organized by the department's teaching and research office, promptly acquiring information, identifying problems, and addressing them.

Since passing the undergraduate teaching work assessment by the Ministry of Education in 2014, Sanya University has actively responded to the call of the national educational informatization drive and continuously promoted campus informatization construction. In the field of electronic information majors, facing numerous problems with traditional experimental teaching models, such as limited experimental venues, high equipment costs, and heavy teaching management pressures, Sanya University began constructing a virtual simulation experimental teaching platform in 2015 and actively explored the development of virtual teaching and research offices.

2. Background of Construction

2.1 Issues with Traditional Teaching and Research Offices

Limited Role of Teaching and Research Office Directors: The directors of teaching and research offices have failed to fully exert their leadership roles in the construction of these offices, resulting in a lack of clear directions and goals for the work of the offices.

Inadequate Infrastructure for Teaching and Research Offices: The offices lack the atmosphere and conditions necessary for conducting teaching and research activities. This includes a shortage of essential teaching and research equipment and materials, as well as a lack of a good teaching and research environment. These limitations restrict the enthusiasm and effectiveness of office members in carrying out teaching and research activities.

Absence of Information-Based Teaching and Research Practices: Teaching and research offices have not fully utilized information-based means for organizing and implementing teaching and research activities. This includes the failure to use online platforms for resource sharing and communication, as well as the lack of utilization of data analysis tools for teaching quality assessment. These limitations restrict the potential of the offices in terms of teaching reform and innovation.

2.2 Construction Needs for Virtual Teaching and Research Offices

With the rapid development and widespread application of modern information technology, the field of education is undergoing unprecedented transformation, among which the virtual teaching and research room has emerged as an innovative and efficient teaching model. The emergence of this model has broken the time and space constraints of traditional teaching and research activities, enabling teachers to conduct in-depth exchanges and cooperation across regions and time on virtual platforms. By constructing virtual teaching and research rooms, schools can more effectively integrate various teaching resources, facilitate knowledge sharing and experience transfer, thereby significantly enhancing teachers' teaching abilities and professional qualities, and further promoting the overall improvement of teaching standards. After thoroughly examining and reflecting on the limitations and shortcomings of traditional experimental teaching models, Sanya University, as an institution of higher learning dedicated to cultivating high-quality talents, has taken a decisive step forward in establishing virtual teaching and research rooms. Especially in the field of electronic information specialties, Sanya University deeply recognizes that the construction of virtual teaching and research rooms can provide students with a more flexible, open, and challenging learning environment. Here, students can not only access a wide variety of teaching resources but can also actively participate in virtual experimental projects under the guidance of teachers, thereby honing and enhancing their practical abilities and innovative thinking through practice. This initiative not only aids Sanya University in cultivating more electronic information specialists with solid professional foundations and a strong sense of innovation but also serves to lead and

drive the entire education industry towards a more intelligent and personalized direction to a certain extent. Sanya University is contributing its own efforts to constructing an education system that meets the requirements of the new era through concrete actions [5-7].

3. Implementation Process

3.1 Building Virtual Teaching and Research Organizations for Electronic Information Majors to Drive Teaching Mode Reform

Starting from the needs of student cultivation, we construct a student-centered collaborative education model that focuses on holistic personal and academic development. This approach ensures that educational activities are tailored to meet the diverse learning needs and aspirations of students, fostering their critical thinking, creativity, and problem-solving skills. From the perspective of industrial development demands, universities and enterprises collaborate to embody the engineering education philosophy of interdisciplinary and cross-border integration. They establish virtual teaching and research organizations that facilitate the exchange of knowledge, ideas, and resources across different fields. These organizations serve as platforms for collaborative research, curriculum development, and practical training, promoting innovation and technological advancement in the industry [8].

Moreover, based on the requirements of social services, we strive to create a cross-boundary cultivation mechanism characterized by "openness, cooperation, collaboration, integration, and innovation" that integrates education with industry. This mechanism encourages seamless transitions between academic learning and professional practice, enabling students to gain real-world experience and insights while still within the educational setting. It fosters environments where students, educators, industry professionals, and researchers work together to address complex challenges, driving innovation and societal progress. By aligning education with the needs of students, industry, and society, we aim to cultivate a future-ready workforce equipped with interdisciplinary skills, entrepreneurial mindsets, and a commitment to sustainable development. This holistic approach ensures that education remains relevant, impactful, and responsive to the ever-evolving demands of the modern world [9,10].

3.2 Collaborative Education Promotes New Pathways for Virtual Teaching and Research Content Development

We will devise a top-down design and innovate talent training models, exploring new pathways and methods for joint construction by universities and enterprises. By expanding educational resources and constructing an interdisciplinary curriculum system, universities and enterprises will jointly develop cutting-edge courses and new textbooks. Research and exploration will be conducted on professional construction, curriculum implementation, teaching content, teaching methods, teaching means, and educational evaluation reforms, with the aim of optimizing the evaluation feedback system and promoting innovations in the management system.

3.3 Leveraging Group Capabilities to Explore Collaborative Teaching and Research Mechanisms

We will build a high-quality shared educational teaching resource library to apply and promote the results of teaching reform research. Utilizing advanced means of Internet + Smart Education, we will explore forward-thinking educational and teaching concepts and methodologies that keep pace with the times by conducting online and offline, virtual-real combined teaching and research activities and practical teaching activities. This will lead and demonstrate talent training models and educational and teaching reform innovations on a broader scale and at a higher level.

4. Construction Content

With the development of information technology, educational models have begun to shift towards digitization and networking. Through internet technology, teachers can more conveniently and rapidly access teaching information, exchange research results, enhance classroom teaching efficiency, and improve the quality of education and teaching. The virtual teaching and research office for electronic information majors is an online education platform that provides a communication platform for teachers' teaching and research, facilitating academic sharing, collaboration, and innovation among teachers.

Building upon the existing teaching and research office, we will incorporate senior engineers and managers from Guangdong Yueqian

Communication Technology Co., Ltd., as well as project managers from Shenzhen Hualicreation Technology Co., Ltd., to form a virtual teaching and research office for electronic information majors. We will establish a virtual teaching and research community to conduct training, lectures, seminars, and other teaching and research activities. Together, we will formulate construction plans for communication engineering, electronic information engineering, and integrated circuit design and integrated system majors, clarifying the development directions and goals of each major. We will develop a professional curriculum system and construct core courses for professional foundations. Targeted teaching materials such as course syllabi and lecture notes will be developed. A team of teachers for professional foundation and core courses will be formed, and seminars on simulated teaching courses and teaching methods will be held to exchange teaching experiences and practical insights. Students will be guided to participate in competitions such as the "Challenge Cup," "Internet+," and electronic design contests.

We will engage in cooperative exchanges with Guangdong Yueqian Communication Technology Co., Ltd. to understand industry demands and conduct virtual teaching and research activities. Students majoring in electronic information will undergo practical training both inside and outside the school to cultivate their practical abilities. We will implement the "multiple teachers for one course" teaching innovation for core foundation courses such as "College Physics," "Fundamentals of Electric Circuits," "Fundamentals of Analog Electronics," "Fundamentals of Digital Electronics," and "High-Frequency Electronic Circuits." Members of the teaching and research office will jointly develop course syllabi, design teaching methods, and implement relay teaching, dual-teacher teaching, or multi-teacher teaching to emphasize the effect of collaborative education. Utilizing the virtual teaching and research office, we will conduct online teaching and share teaching resources to improve teaching efficiency. Teachers will be organized to participate in teaching skills training to enhance their classroom teaching effectiveness and quality. Educational and teaching research will be conducted to develop curriculum and teaching reform plans, promote educational and teaching innovation, apply for teaching reform projects from the Hainan Provincial Department of Education, and enhance professional characteristics and core competitiveness. Students will be guided to participate in relevant competitions and publish related research papers [10].

We will continue to expand industry-academia-research-application cooperation with enterprises, conduct virtual teaching and research activities, and sign internship and training agreements. Based on thorough research and exchanges, the virtual teaching and research office team will collaborate to develop a high-quality shared educational and teaching resource library. Typical cases of teaching organization within the teaching and research office will be summarized, and a final report on construction progress will be completed. The application and dissemination of teaching reform research results will be strengthened.

5. Achievements and Outlook

5.1 Achievements

Enhanced Practical Teaching Quality: The establishment of virtual simulation experimental teaching platforms and virtual teaching and research offices has addressed the issues present in traditional experimental teaching, thereby elevating the quality and standards of practical teaching.

Strengthened Students' Practical Abilities and Innovative Spirits: Through the construction of virtual teaching and research offices, students have had more opportunities to engage with real-world projects and cases, applying theoretical knowledge into practice, which has enhanced their innovative capabilities and practical abilities.

Promoted Teaching Reform and Innovation: The construction of virtual teaching and research offices has explored new experimental content, methods, and tools, optimizing the experimental teaching model and fostering teaching reform and innovation.

Through the research on teaching reforms in recent years, utilizing the resources of professional laboratories within the university and signing internship and training agreements with enterprises, we have established internship and training bases both inside and outside the university, as well as an innovation and entrepreneurship mechanism. A new mechanism for universities, industries, and enterprises to

jointly cultivate talents has been established. Based on the principle of "learning for application," we have proposed and practiced a "new" concept of applied talent cultivation that is "oriented towards industries, focused on application, and grounded in practice." Adhering to the principle of "unity of knowledge and action," we have explored and formed a four-in-one cultivation mode integrating "teaching, learning, competition, and innovation." This achieves mutual promotion and integration among "teaching and learning," "learning and competition," and "learning and innovation." "Teaching and learning" ensures the implementation of "competition and innovation," while "competition and innovation" ensures reflection on "teaching and learning," thereby achieving sublimation in "teaching and learning" and realizing the integration of "learning promoting teaching, competition promoting learning, and competition integrated with innovation." This enables students to "learn by doing, do while learning, think while learning, and innovate while thinking." The existing teaching reform achievements have enhanced students' practical and innovative abilities, cultivating a large number of "broadly based, highly capable, and high-quality" applied undergraduate talents. These achievements have been highly recognized by employers and have attracted the attention of peer institutions, who have applied our experience and model to the cultivation of talents in electronic communication majors at their own schools.

5.2 Outlook

Deepening Industry-University Collaboration: Sanya University will continue to seek cooperation opportunities with more outstanding enterprises to jointly build internship and practical training bases, providing students with more practical opportunities and platforms.

Expanding the Functions of Virtual Teaching and Research Offices: Sanya University will further expand the functions of virtual teaching and research offices, enrich teaching resources, strengthen the construction of the faculty, and improve the teaching standards and quality of virtual teaching and research offices.

Promoting the Development of Educational Informatization: Sanya University will continue to actively respond to the national call for the construction of educational informatization, intensify efforts in campus informatization, and drive the development of educational informatization.

6. Conclusion

Sanya University has established virtual teaching and research offices within its electronic information majors. By constructing virtual simulation experimental teaching platforms and virtual teaching and research offices, it has improved the quality of practical teaching and enhanced students' practical abilities and innovative spirits. In the future, Sanya University will continue to deepen industry-university collaborations, expand the functions of virtual teaching and research offices, and promote the development of educational informatization, contributing to the cultivation of more high-quality talents with innovative spirits and practical abilities.

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