

Exploring the Path of “Project Team Style” Faculty Development for Applied Undergraduate Programs

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Abstract: Applied undergraduate education plays a crucial role in higher education, serving as a key platform for nurturing innovative talents. However, the lack of practical and innovative skills among teachers in applied undergraduate programs, who primarily come directly from academic institutions, hinders the cultivation of students' abilities in these areas. This limitation also affects the professional growth of teachers. The Internet of Things engineering program at Guangdong Institute of Science and Technology has successfully implemented a 'project team type' teacher training approach over three years, yielding positive outcomes. By utilizing diversified integration within project teams, this model fosters collective team development. Such a model holds significant value in enhancing the quality of applied undergraduate faculty and driving the transformation and advancement of local undergraduate institutions.

Keywords: Applied Undergraduate Program; Project Team Style; Faculty Development; Convergence of Diverse Elements.

1. Introduction

As society evolves and industrial structures adjust, there is a growing demand for application-oriented talents. Applied undergraduate colleges and universities are responsible for nurturing individuals with practical skills and comprehensive qualities to meet the changing societal needs. The Guiding Opinions on Guiding Some Local Ordinary Undergraduate Colleges and Universities to Transform into Applied, issued by China's Ministry of Education, the National Development and Reform Commission, and the Ministry of Finance in 2015, explicitly calls for colleges and universities willing to do so to pioneer the exploration of application-oriented development models. As China prioritizes the development of applied talents, policies have set higher standards for faculty construction in applied undergraduate institutions. For instance, the Decision on Accelerating the Development of Modern Vocational Education in China emphasizes the importance of bridging vocational education with general education, integrating vocational education with economic and social progress, and enhancing the quality of talent development. This necessitates closer collaboration between applied undergraduate institutions and industry partners to establish a faculty team with practical expertise. Teachers play a crucial role in achieving the objectives of these institutions, as their quality and capabilities directly impact talent cultivation. Therefore, applied undergraduate institutions must focus on enhancing teachers' professionalism, practical skills, and educational competencies. Additionally, as education reform advances, there is a growing recognition of the significance of applied talent development. These institutions should continuously update their educational approaches, prioritize hands-on teaching and skill development, strengthen industry partnerships, and build a faculty team that can adapt to the evolving demands of education reform, thereby providing essential support for cultivating applied talents.

Conant, the former president of Harvard University in the United States, emphasized that the true honor of a university lies not in its physical infrastructure or enrollment numbers,

but in the enduring quality of its teachers across generations [1]. According to Mr. Mei Yiqi, former president of Tsinghua University, a distinguished scholar is not merely a structure, but a master in their own right. Recognizing the pivotal role of teachers in shaping the essence of a university, it is clear that they are the cornerstone of higher education institutions. The impact of teachers on the essence and quality of higher education is profound, highlighting their indispensable role in the success and advancement of applied undergraduate colleges and universities [2].

The construction of faculty in applied undergraduate education is crucial as higher education shifts focus from 'scale expansion' to 'quality enhancement'. With an emphasis on cultivating practical skills and innovative thinking in students, new requirements are placed on teaching staff. Teachers are a key human resource in applied undergraduate institutions, making research on faculty development essential for promoting sustainable growth, improving education quality, and enhancing the university's social image and reputation.

In order to meet the demands of the fast-paced society and the specific needs of applied undergraduate institutions, this study has investigated and implemented a three-year initiative to develop a 'project-type team' model for faculty construction. This model aims to enhance teacher training, boost motivation, and facilitate their professional growth.

2. Related Work

Applied undergraduate education plays a crucial role in providing practical talents for local economic and social development. To meet the needs of their communities in a sustainable and effective manner, colleges and universities must focus on fully developing their human resources. Therefore, enhancing the comprehensive development of faculty through teacher training programs is a top priority for applied undergraduate institutions.

However, the faculty construction of applied undergraduate colleges and universities has greater difficulties, and there are mainly six aspects of the problem, as shown in Figure 1.



Figure 1. Problems of Faculty Development in Applied Undergraduate Colleges and Universities

China's applied undergraduate colleges and universities play a significant role globally. The focus on faculty construction centers around the 'dual-teacher, dual-competence' model [3]. This approach combines industry-teaching, university-enterprise collaboration, summer internships, special projects, horizontal projects, and partnerships with external companies to enhance teachers' practical skills and innovation capabilities. Additionally, the Teachers' Development Center at these institutions provides training on teaching methodologies, while collaborations with domestic and international universities aim to enhance overall teacher and faculty capabilities through research and development.

Scholars like Tam T. Phuong [4] and others in Asian countries have examined how applied higher education in Vietnam has focused on faculty development to better connect with the global community. Vietnam has established its unique model for faculty development and capacity building.

Germany, the United States, and other developed countries have reaped the benefits of implementing undergraduate programs in applied technology. Foreign exploration of applied technology faculty, including tenure, management, and further training, has resulted in the establishment of a comprehensive system. In Germany, the University of Applied Science and Technology, known as FH, requires its teaching staff to hold a doctoral degree, pass the school's professor qualification examination (equivalent to our university qualification certificate), and have at least three years of work experience. Notably, 60% of university professors in Germany are part-time. Regarding teacher training, professors are granted six months of physical leave every four years to engage in practical work outside the university, attend conferences, and stay updated on industry trends. Germany places a strong emphasis on candidates' vocational knowledge and practical experience, fostering better connections between universities and industrial enterprises while integrating practical knowledge into the curriculum. In terms of teaching methodology, Prof. Dr. Hermann Karl Heiler from the University of Applied Sciences in Weinsten, Germany, underscores the importance of cooperative learning. Additionally, Ake Ingerman advocates for teachers' self-reflection through video-recorded sessions to enhance their professional development. Jussi Horelli and Salla Niittymäki, using the example of Heimo University of Applied Sciences (HAMK), suggest that teachers should support student learning and cultivate problem-solving skills through teamwork. American community colleges prioritize the continuous hiring of part-time teachers, considering them as essential members of their faculty. This practice not only helps save costs but also demonstrates the schools' adaptability. Wu Changsheng highlights the flexible appointment criteria, rigorous procedures, and varying work experience expectations based on different majors. The lower the educational qualifications, the higher the work experience

required. M Akiba [5] underscores the significance of teacher quality, suggesting it as a promising area for future research.

While certain countries or regions have made progress in addressing these issues, challenges still persist globally. In light of this situation, this paper proposes practical measures and pathways for enhancing the 'project team' faculty construction. This research holds significance in improving the faculty development of applied undergraduates and driving the evolution of local undergraduate institutions [6].

3. Elements and Connotation of "Project Team Style" Faculty Construction for Applied Undergraduate Programs

A 'project team style' faculty consists of teachers with diverse specialties and disciplinary backgrounds who collaborate on teaching, research, and practical tasks within a project. This team structure integrates experts and scholars from various fields to enhance the depth and comprehensiveness of teaching content. By combining course material, theoretical research, and practical applications, students are able to gain a comprehensive understanding of project knowledge and skills, fostering their overall quality and innovation capabilities. Project-based teacher teams must possess interdisciplinary and inter-professional skills, working together to complete project tasks and enhance student development. They should demonstrate innovation, teamwork, project management, and other necessary abilities to ensure effective project-based teaching and quality improvement. Continual updating of knowledge and skills, as well as expanding teaching resources, is essential to keep pace with evolving educational needs. Within the 'project team,' members collaborate closely, communicate effectively, and divide responsibilities to promote in-depth research and teaching exploration within their respective fields while benefiting from the expertise of colleagues in other areas. Moreover, the 'project team' faculty helps strengthen the school's connection to society, fostering discipline construction, research innovation, and educational development.

The faculty within the 'project team' is structured through course teaching and research offices or virtual teaching and research offices. This structure is further enhanced by engaging in seminars focused on teaching modes, methods, and other related topics based on national or provincial first-class courses. These seminars facilitate mutual learning, resource sharing, and ultimately contribute to the enhancement of teaching capabilities. Similarly, the scientific research faculty consists of teachers with shared or complementary research interests, fostering collaboration and knowledge exchange. Each team is led by a highly experienced academic leader and supported by a promising young academic talent. By organizing academic seminars,

encouraging joint research projects, and facilitating collaboration among faculty members, the research faculty generates significant scientific outcomes, cultivates a conducive research environment, and elevates the overall research proficiency of the teaching staff [7].

The "project-team-based" faculty construction is a project-driven, teamwork-oriented, teaching effect-oriented and student-centered faculty construction model. It mainly contains seven elements and corresponding connotations, as shown in Figure 2.

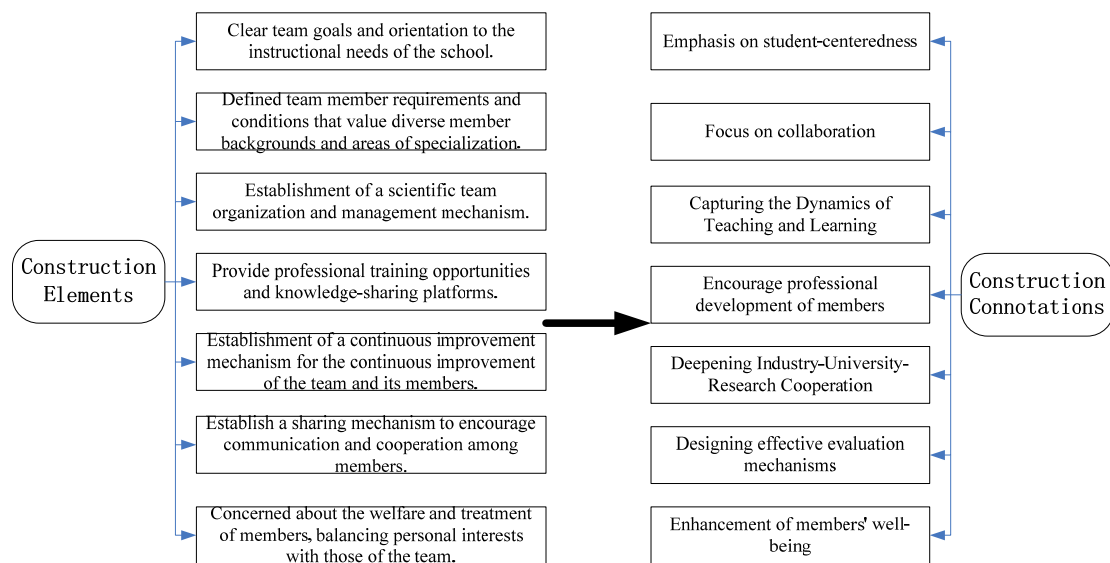


Figure 2. Construction elements and corresponding construction connotations

4. Case Study of "Project Team Style" Teaching Staff Construction for Applied Undergraduate Programs

Guangdong University of Science and Technology, College of Computer Science, Internet of Things Engineering Department was established through the implementation of a 'project team style' faculty construction approach. This method involves conducting scientific research, promoting cooperation among team members, and integrating teaching efforts to achieve enhanced outcomes compared to traditional faculty structures. The goal is to create a dynamic and diverse

faculty team by empowering existing members, attracting top talent, and leveraging various resources. This is accomplished through internal training, external recruitment, interdisciplinary collaboration, resource integration, and knowledge sharing. By utilizing the 'project team' model, the department focuses on enhancing teacher quality through comprehensive training practices, attracting talent through various channels, fostering interdisciplinary collaboration, integrating resources, and promoting knowledge sharing. Ultimately, the aim is to cultivate a highly skilled faculty team in Internet of Things Engineering that excels in teaching, research, and practical applications [8].

Table 1. Old, middle-aged and youth hierarchical progression and diversified integration of scientific research team

Groups	Field of Research	Coordinator	Executioner	Team Member
Group I	IoT, Edge Intelligence	Liwei Tian (professor)	Liang Yu (associate professor)	Xiaochen Zhang, Jiawen Zhang, Ren Zheng
Group II	Intelligent Control, Embedded Technology	Xiangdong Luo (professor)	Cuiji Kang (senior engineer)	Wei Yu, Qiqian Li, Binxin Bai
Group III	IoT, Data Mining	Yongning Li (professor)	Rongfu Wang (associate professor)	Linwei Wang, Zilai Liu, Yantao He
Group IV	Intelligent Networking Technology, Intelligent Transportation	Lunhui Xu (professor)	Lunhui Xu (professor)	Hao Wu, Cui Dong, Xiaoshuo Jia

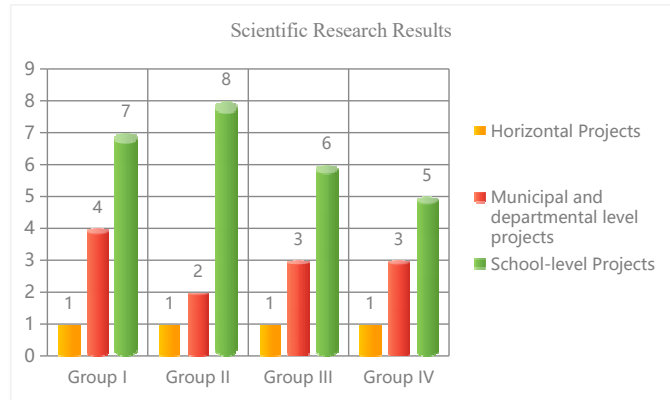


Figure 3. Scientific research achievements of the old, middle-aged and young research team in terms of hierarchical progression and multifaceted integration

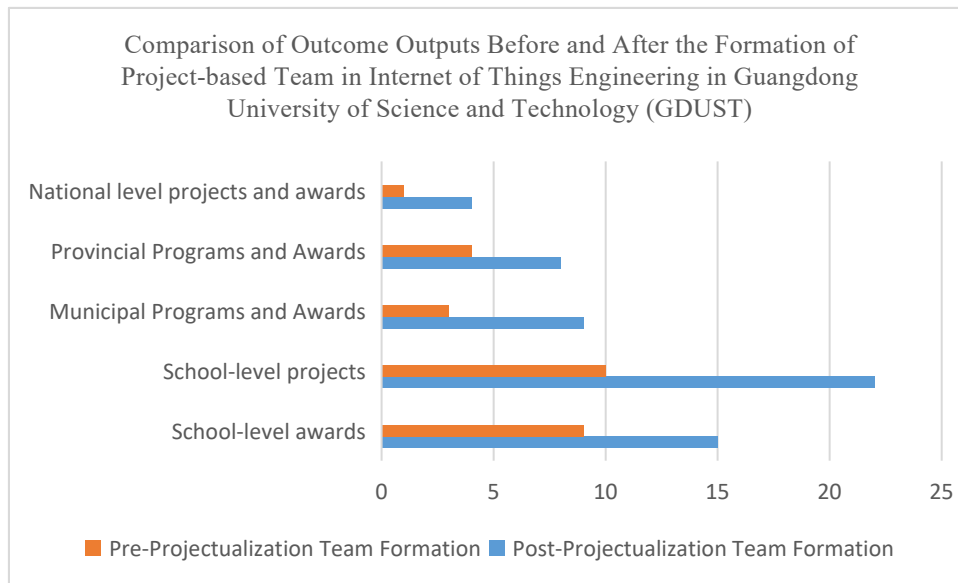


Figure 4. Comparison of outputs before and after the formation of project-based teams

By establishing a scientific research team focused on cooperative growth and development, the provincial Internet of Things R&D and Application Center and Dongguan AIoT Edge Computing Engineering and Technology Research Center have formed a team with a hierarchical structure of 'old, middle-aged, and young' for a diversified approach. Experienced professors lead the team, providing guidance and theoretical expertise, overseeing project submissions, while the younger and middle-aged core members are responsible for project implementation. This approach aims to ensure the team's work is effectively executed, with young teachers actively involved in project and thesis writing. To overcome theoretical challenges, the team emphasizes the need for deep collaboration between universities and enterprises, encouraging increased interaction to identify and address enterprise difficulties. By translating ideas into practice, the team aims to achieve tangible results, as depicted in the scientific research outcomes of 2022. The comparison of results achieved over the first three years by the project-based team further underscores the team's significance, motivating members to contribute with enthusiasm. Over a span of 3-5 years, the team anticipates continuous production of diverse research outcomes, fostering the development of innovative talents. As the young teachers mature into core members, the team will expand by attracting more young talent, reinforcing a cycle of growth and strength. The team places emphasis on the growth of teachers alongside the training of students, with a focus on nurturing students' practical skills and fostering their innovative spirit. The goal is to guide students in mastering professional knowledge at an application level and experiencing the allure of science and technology through hands-on practice. The development of teachers should be integrated with student training, creating a symbiotic relationship that enhances the quality of education. This is achieved by encouraging students to engage in competitions, research paper writing, patent applications, project participation, and more. Specific initiatives include establishing project-based teams, innovation labs, key labs, various engineering centers at all levels, and promoting collaboration between educational institutions and businesses. These efforts aim to implement a student-centered and student development-centered approach to education and training.

Through scientific research and teaching integration, the course teaching and research office or virtual teaching and research office can be utilized to effectively organize teaching modes and methods. Utilizing national first-class courses or provincial first-class courses as a foundation, seminars can be conducted to facilitate mutual learning, reference, and resource sharing, ultimately enhancing teaching capabilities. The Guangdong Institute of Science and Technology College of Finance and Economics and Computer Science College have established a 'project team type' Internet finance course virtual teaching and research room, promoting cross-fertilization and resource sharing. Similarly, the Zhuhai Institute of Science and Technology College of Fine Arts and Design and the School of Computer Science have set up a 'multimedia technology and application' course 'project team type' faculty team, successfully applying for provincial first-class courses in 2021 through collaborative efforts and cross-fertilization, yielding positive outcomes.

5. Conclusion

This paper examines the elements and implications of 'project team-style' faculty development in the context of undergraduate education. By analyzing the current state of the faculty of Internet of Things Engineering at Guangdong Institute of Science and Technology, the study discusses the positive impact of project team-based faculty development on enhancing teachers' teaching and research capabilities, improving teaching quality, enhancing practical application skills, and fostering professional growth. Furthermore, the paper delves into the implementation of project team-based faculty development at the institute, highlighting the successful adoption of this approach within the faculty of Internet of Things Engineering. The outcomes of this implementation offer valuable insights for enhancing faculty development in applied undergraduate education.

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