Original Paper

The Value and Innovative Path of College Students' Participation in Community-Based Bilingual Science Popularization

—Take the "Summer Science Popularization Volunteer Team Project of HuBei University of Technology" as an Example

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Abstract

In today's context of increasing emphasis on civic engagement and science literacy, it is essential for college students to step beyond the confines of campus and actively participate in community development. Taking the 2024 Summer Science Popularization Volunteer Team Project of the School of Foreign Languages at Hubei University of Technology as a case study, this paper explores the significance, service pathways, impact analysis, and innovative teaching approaches of bilingual science communication activities carried out by college student volunteers in local communities. Drawing from the volunteer team's real-world experiences, the study finds that such activities provide a relaxed and engaging learning environment for community youth, while offering college students new perspectives on bilingual science education in grassroots contexts. The findings suggest that community-based bilingual science outreach not only contributes to local cultural development but also plays a constructive role in promoting the sustainable growth of volunteerism among university students.

Keywords

college students, bilingual science communication, community engagement, volunteer service, innovative education

1. Introduction

In today's rapidly developing era of globalization and information technology, higher education not only bears the responsibility of knowledge dissemination but also shoulders the historical mission of cultivating high-quality talents with a sense of social responsibility, innovation, and practical skills.

College students, as important forces for social progress, must not limit their growth path to theoretical learning on campus but should transform and elevate their knowledge through social practice. Particularly in the field of social service, college students, by participating in community volunteer activities, can not only apply their professional knowledge in practice but also enhance their social responsibility and civic awareness. Community service, as a bridge connecting universities with society, offers college students a unique platform to link professional knowledge with societal needs.

In this context, college students engage in community service by conducting bilingual science popularization activities, which not only represents an innovative practice of English major education but also serves as an important means of social responsibility and cultural dissemination. This study adopts a case study approach, combining the practical experiences of the volunteer team from the School of Foreign Languages at Hubei University of Technology to systematically analyze the educational effects and social impact of bilingual science popularization activities, focusing on the innovative mechanisms and implementation strategies behind them. Through innovative measures such as situational education, gamified learning, and science popularization short video production, this research reveals effective pathways for knowledge transfer and cultural dissemination in a relaxed and enjoyable atmosphere, providing both theoretical and practical references for optimizing college volunteer service models and expanding community education resources. In conclusion, this paper aims to offer valuable insights for the sustainable development of college student volunteer services and promote bilingual science popularization as an important component of social education, further fostering the diversification and harmonious development of community culture.

2. The Significance of College Students Engaging in Community Service

2.1 Significance for College Students

2.1.1 Strengthening Ideological Education of College Students

Volunteer service is a meaningful social activity that provides college students with a valuable opportunity to step out of the campus and into society, serving as an important means of cultivating a spirit of dedication and labor. Through participation in volunteer practices, college students can train themselves in real social contexts, gradually forming good moral qualities and establishing the core value of "serving the people, dedicating to society." This concept not only guides personal growth but also provides a profound interpretation of social responsibility. During volunteer service, college students come into direct contact with the diversity and complexity of society. For example, in community service activities, they may face the actual needs of grassroots residents, such as companionship for the elderly and educational support for teenagers. These experiences increase their understanding of social issues, thus stimulating their sense of social responsibility and mission.

2.1.2 Promoting Comprehensive Development of College Students

College students, through systematic coursework, acquire solid professional knowledge and possess high professional competence. However, the current model of education in universities still tends to

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emphasize theoretical learning while neglecting practical training, leaving college students with few opportunities for practical exercises. Volunteer service provides college students with a platform to apply theoretical knowledge in practice, bridging the gap between the campus and society. This practice-based education model is increasingly recognized by universities and students alike. For example, students majoring in English can combine language skills with the dissemination of traditional culture through bilingual science popularization activities. In these activities, students not only design teaching content using their professional knowledge but also explain Chinese traditional culture, scientific knowledge, environmental protection concepts, and more to community youth in English. This process not only hones their language expression skills and cross-cultural communication abilities but also cultivates their public speaking, organizational, coordination, and teamwork skills. Such multifaceted participation enables students to achieve comprehensive development and significantly improve their overall competence. In conclusion, volunteer service provides college students with a platform for comprehensive development, allowing them to combine professional knowledge with social needs while cultivating a wide range of abilities. This educational model not only compensates for the shortcomings of classroom learning but also provides a broader space for students' growth and helps them realize self-worth through serving society.

2.2 Significance for the Community

2.2.1 Meeting Community Service Management Needs

Community after-school care programs, an essential platform to address the after-school care issues for children from dual-income families, serve a large number of students. However, the limited number of staff and teachers results in low management efficiency, monotonous teaching content, and an inability to meet the diverse needs of students. This "management shortcoming" not only affects the educational quality of these programs but also hinders the overall effectiveness of community services. College student volunteer teams, combining professionalism and diversity, not only possess specialized knowledge but also have various skills and innovative capabilities, effectively supplementing the community's human resources. By involving college student volunteers in the process through reasonable division of labor and collaboration, it can ease the pressure on community after-school care programs, enrich teaching content and formats, improve community service efficiency, and provide residents and children with high-quality and diverse volunteer services right at their doorstep.

2.2.2 Enhancing Community Cohesion

The arrival of college student volunteers injects fresh energy into the community. By organizing diverse community volunteer service activities, such as bilingual science popularization classrooms, traditional cultural experiences, and environmental protection campaigns, these activities not only build community culture but also promote communication and interaction among residents, bringing neighbors closer together and enhancing mutual understanding and trust. This interaction improves residents' sense of happiness and fosters a harmonious and friendly community atmosphere. Over time, community

cohesion is strengthened, and residents' sense of belonging and identity with the community increases, laying a solid foundation for building a harmonious community.

3. Pathways for College Students to Conduct Community Teaching Services

3.1 Promoting Volunteer Service Philosophy and Strengthening Volunteer Practice Promotion

Volunteer service is not only an altruistic social act but also an important means of personal development and character building. The spread of volunteer culture and the implementation of volunteer spirit are closely related. Volunteer culture should be integrated into daily life through school education and job training, promoting knowledge about volunteer services, actively spreading the philosophy and spirit of volunteerism, and attracting more outstanding students to join the volunteer team. Efforts should be made to establish a "mentor-mentee" system to ensure the continuous and effective development of community volunteer services. Additionally, publicity is a key method for expanding the influence of volunteer services. By using traditional media such as campus radio and bulletin boards, and social media platforms like WeChat and Weibo, universities can construct a shared volunteer service ecosystem, enhancing awareness of volunteer activities among students. For instance, the volunteer team at Hubei University of Technology's School of Foreign Languages records and publishes each volunteer activity on their official WeChat account, increasing students' understanding of the volunteer team and spreading the spirit of volunteer service.

3.2 Emphasizing Content Innovation in Volunteer Services and Enriching Volunteer Activities

College students, as the main body of volunteer services, are characterized by their active thinking and strong innovation abilities. In the process of designing and innovating volunteer service content, instructors can encourage students to engage in independent discussions and brainstorming sessions to explore innovative forms and content. For example, the volunteer team from the School of Foreign Languages at Hubei University of Technology, under the guidance of their instructors, discusses and determines multiple teaching themes, covering Chinese traditional culture (such as Chinese architecture and intangible cultural heritage crafts) while incorporating contemporary topics like science and environmental protection. This approach reflects the timeliness and educational value of volunteer services. For instance, in an environmental protection-themed class, volunteers designed a waste sorting game and an environmental knowledge quiz in conjunction with English teaching, allowing teenagers to learn English while developing environmental awareness. Such volunteer activities not only provide community youth with new knowledge during their free time but also stimulate their interest in learning and exploration. For college student volunteers, these activities provide opportunities to demonstrate their acquired knowledge and skills while fostering their growth.

3.3 Strengthening Volunteer Team Management and Improving Volunteer Service Quality

As the scale of college student volunteer teams continues to grow, managing the team effectively and improving service quality becomes an urgent issue. Firstly, a complete volunteer evaluation system should be established with scientific and objective evaluation criteria to comprehensively assess the

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service process and outcomes of college student volunteers. Secondly, the training of college volunteers should emphasize the integration of theory and practice. Experienced and excellent volunteers should be invited to share their practical experiences, helping new members adapt quickly to community service needs and cope with various challenges. For example, before conducting bilingual science popularization activities in the community, the volunteer team from the School of Foreign Languages at Hubei University of Technology organizes collective lesson preparation and trial classes under the guidance of instructors, anticipating possible emergencies in class and developing corresponding strategies. This systematic preparation not only improves volunteers' professional abilities but also boosts their confidence and adaptability. Lastly, improving the incentive mechanism is key to ensuring the sustainable development of volunteer services. Incentives such as awards, certificates, and credit rewards should be implemented, offering both material and spiritual rewards to stimulate volunteer enthusiasm and promote a positive cycle of volunteer activities.

4. The Effectiveness of College Students' Bilingual Science Popularization in the Community

4.1 Individual Development of College Students

The integration of social practice into volunteer initiatives for college students represents a critical pedagogical approach in contemporary ideological and political education. By bridging theoretical frameworks with practical application, this method mitigates the limitations of passive knowledge acquisition, fostering self-education, self-improvement, and self-development among students. Such experiential learning facilitates the internalization of moral and ideological principles, transforming abstract theories into tangible behavioral outcomes.

Beyond theoretical instruction, higher education aims to cultivate individuals capable of contributing to national development and societal progress. Volunteer services serve as a socialization mechanism, enabling students to engage with communities beyond academic confines. Through these interactions, students develop a nuanced understanding of societal dynamics, reconcile idealized perspectives with practical realities, and employ rational approaches to conflict resolution and rights protection (Mei Xia, 2014).

During volunteer service, college students learn how to deal with contradictions that arise from the clash between idealized concepts and social realities using a correct attitude. They further use proper channels and legal methods to protect their rights and interests. The mission and philosophy embedded in volunteer service subtly cultivate citizens' noble sentiments, encouraging the spirit of helping others and goodwill. By delving into the grassroots, students understand the lives of different social classes, hone the resilience of youth, integrate team collaboration and dedication into the youth's spiritual framework, and meet the political, economic, and cultural needs of society, thereby driving the progress of human society.

4.2 Community Culture Level

Through bilingual science popularization activities, residents are helped to acquire scientific knowledge. After professional training, the Science Volunteer Service Team of Hubei University of Technology conducts science popularization activities in various forms, such as classroom lectures, experiential activities, and field study tours, allowing residents to experience the process of knowledge dissemination. Bilingual science popularization focuses on themes such as aerospace, traditional culture, and bridging the digital divide for the elderly, combining social hot topics to cover various practical fields and meet the knowledge needs of different residents.

As external actors, college student volunteers function as intermediaries between communities and external resources, fostering inclusivity and cohesion. Interactive platforms, such as collaborative model-building (e.g., aerospace crafts, traditional paper-cutting), promote intergenerational dialogue and shared learning. Bilingual programming further bridges generational and cultural divides, ensuring accessibility for vulnerable groups through simplified explanations and tangible demonstrations. This model establishes a sustainable framework for cross-cultural exchange, transitioning communities from multicultural coexistence to cultural symbiosis.

4.3 Social Development Level

College students, as bridges, bring resources from university research institutions into the community, improving community service levels. Through bilingual science popularization activities, college students can deliver complex scientific knowledge in an easy-to-understand manner to community residents, especially the elderly and children. This helps them understand basic scientific principles, daily knowledge, and health information, thereby enhancing the overall scientific literacy of the community and the public. At the same time, bilingual activities provide a platform for community residents to engage with and learn about different cultures. During these activities, college students not only impart scientific knowledge but also spread the cultural background and ways of thinking of English-speaking countries, promoting cultural exchange and integration between China and foreign countries. Cross-cultural communication helps enhance community residents' understanding of the international community, cultivating citizens with a global vision and laying the foundation for building a harmonious and diverse society.

5. Methodological Innovations in Bilingual Science Popularization for Primary School Students

5.1 Contextualized Pedagogical Models

5.1.1 Life-Contextualized Instruction

Based on the premise of cultivating interest and stimulating initiative (Li Jilin, 2013), the teaching team, under the life education concept, focuses on establishing knowledge connections from children's experiences. In the fire safety science popularization activity carried out in the Ddong Community of Wuhan, volunteers used a fire truck model as a starting point. Through the "phenomenon observation - bilingual description - principle exploration" teaching chain, fire safety knowledge was integrated into

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everyday safety scenarios. By providing bilingual explanations of physical objects, students were guided to understand scientific concepts within familiar life contexts, maintaining the systematic nature of knowledge transfer while enhancing the fun of cross-language learning. This teaching method effectively stimulated children's enthusiasm for active exploration, laying a foundation for subsequent in-depth learning.

5.1.2 Role-Playing Pedagogy

Focusing on developing thinking and creativity, the teaching team created an immersive learning environment in the aerospace-themed course implemented in the Zhongda Community. Through role assignments and simulated dialogues, students participated as "space explorers" in the entire rocket launch process. Combined with hands-on practice using disassemblable models, volunteers explained technical principles step-by-step in both Chinese and English, transforming abstract scientific concepts into tangible understanding. This role-playing approach not only deepened students' understanding of aerospace technology but also cultivated cross-cultural communication awareness through language exchange in teamwork.

5.1.3 Field-Based Learning

Based on guided observation, strengthening sensory experiences, the study activities at the China Architectural Science and Technology Museum showcased the advantages of situational teaching. Through observing the ancient building mortise and tenon structure and constructing modern architectural models, volunteers provided bilingual guided explanations, helping students establish connections between spatial awareness and cultural understanding. In the Taihe Hall dougong analysis segment, students not only grasped the wisdom of traditional architecture but also learned related professional terminology in both languages through a bilingual construction game. This multi-dimensional cognitive experience broke through classroom boundaries, achieving both scientific literacy and cultural heritage enhancement.

5.2 Engagement-Oriented Instructional Strategies

5.2.1 Gamification

Game-based teaching refers to the use of game-based methods in the classroom to conduct educational activities. It is designed to serve classroom teaching, and teachers analyze the characteristics of the teaching material and understand students' psychological traits before applying appropriate teaching strategies (Liu Jing, 2014). The teaching team transformed science popularization knowledge into actionable game formats. The aerospace-themed 3D puzzle game, through structural reorganization challenges, allowed students to naturally learn about aircraft construction during the assembly process. The game setup included bilingual task cards, requiring students to describe the function of components in the target language after completing the puzzle. This enjoyable teaching method not only improved students' spatial thinking abilities but also created natural foreign language application scenarios, fostering a positive interaction between knowledge internalization and language learning.

5.2.2 Cultural Narrative Techniques

During multimedia teaching practice, the advanced multimedia teaching method combined with traditional teaching methods used sound, pictures, and videos, along with participatory learning, to engage primary school students' attention in the multimedia classroom and stimulate their passion for learning (Liu Kai, 2016). In the Shànglóngyuàn paper-cutting cultural course, the teaching team innovatively used multimedia narrative techniques. By creating a bilingual animation called The Story of the Nian Beast, traditional folklore and paper-cutting techniques were organically integrated. After playing the animation, the "picture storytelling" segment guided students to retell the plot and discuss cultural meanings in both Chinese and English. This audiovisual teaching method maintained the depth of cultural interpretation and, through bilingual interaction, cultivated students' cross-cultural expression abilities, effectively bridging intangible cultural heritage with modern educational approaches.

5.2.3 Project-Based Practical Teaching

The solar car project exemplified the "learning by doing" educational philosophy. From material preparation to product testing, volunteers provided bilingual guidance throughout the process, breaking down physical principles into specific steps. In the product demonstration segment, students were required to explain their design ideas in both languages and improve their projects through peer evaluations. This practice-oriented teaching model not only developed students' engineering thinking but also strengthened their bilingual conversion abilities for technical terms through continuous language output, advancing both knowledge application and language development. Starting with real-life contexts, this model encourages students to actively construct new cognitive frameworks based on their life experiences, shortening the distance between students and scientific inquiry, and enabling exploration in familiar contexts (Zhuang Yujiao, 2018).

6. Conclusion

As a collaborative innovation practice between foreign language education in higher education and grassroots cultural governance, the summer science popularization volunteer project of the School of Foreign Languages at Hubei University of Technology deeply integrates bilingual services into community cultural construction. It empirically demonstrates an innovative path of dual empowerment for professional talent cultivation and social service. The study shows that the bilingual science popularization model, based on the advantages of the foreign language discipline, achieves a dual breakthrough in the dimension of knowledge dissemination, enabling both cross-cultural interpretation and the reproduction of local wisdom. On the one hand, bilingual media facilitates the scientific and cultural enlightenment of young people, using language as a bridge to modernize traditional wisdom; on the other hand, professional volunteer services create a platform for dialogue among multiple subjects, enhancing the community's cultural atmosphere.

The practical implementation of the project has verified the virtuous cycle of "professional service - community participation - collaborative development." Its innovative value is reflected in three

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dimensions: the demand-driven knowledge transformation strategy, the cultural dissemination mechanism based on bilingualism, and the construction of contextualized and engaging educational models. This approach not only provides a replicable operational model for the social transformation of foreign language disciplines but also injects professional momentum into the innovation of grassroots cultural governance systems in the new era. This "service as education" practice paradigm ultimately achieves precise alignment between university intellectual resources and community development needs, offering an important reference for the collaborative innovation of talent cultivation in higher education and grassroots cultural governance in the new era.

Fund Project

References

Cui Shunzhe, Yang Rui, Zhao Miaomiao, et al. (2024). Exploring the Path of College Students' Participation in Community Volunteer Services from the Perspective of Aesthetic Education. *Taste·Classics*, *2024*(02), 108-110. (in Chinese)

Li Jilin. (2013). Situational Teaching for Children's Happy Learning. *Curriculum, Teaching Material and Method*, *33*(02), 3-8+28. (in Chinese)

Liang Xiaojian. (2025). The Impact and Evaluation of Volunteer Service on the Comprehensive Quality of College Students. *Journal of Jiamusi Vocational Institute*, *41*(01), 118-120. (in Chinese)

Liu Jing. (2014). *The Application of Gamification Teaching in Elementary School Mathematics Classroom Instruction*. Hebei Normal University. (in Chinese)

Liu Kai. (2015). *Research on the Application Status and Strategies of Multimedia in Elementary School Chinese Teaching*. Northwest Normal University. (in Chinese)

Lu Pingyuan, & Lu Mengmeng. (2023). Optimization Paths for College Students' Participation in Community Sports Volunteer Services. *Chinese Society of Sport Science. Abstracts of the 13th National Sports Science Conference—Poster Exchange (Sports Social Sciences Section)*. Yancheng Normal University, 2023: 2. (in Chinese)

Mei Xia. (2014). *Research on Issues Related to College Student Volunteer Services*. Huazhong Agricultural University. (in Chinese)

Shang Jingjun, & Jiang Yunliang. (2020). Optimization Paths for College Students' Community Volunteer Services in China. *People's Tribune*, *2020*(35), 84-86. (in Chinese)

Wan Kunli, & Zhang Xiaohong. (2018). Research on the Realization Path of the Educational Function of Volunteer Service—Taking the Postgraduate Volunteer Teaching Corps as an Example. *Studies in Ideological Education*, *2018*(09), 118-121. (in Chinese)

Xu Yuan. (2022). Exploration of the Path to Construct a College Volunteer Service System in the New Era. *People's Forum·Academic Frontiers*, *2022*(02), 109-111. (in Chinese)

Zhang Yanyu. (2024). Research on the Construction and Innovation Path of Practical Education System Based on College Students' Volunteer Service Model. *Industrial & Science Tribune*, *23*(24), 268-270. (in Chinese)

Zhuang Yujiao. (2018). Exploratory Research on Model Making in Elementary School Science Based on Innovative Concepts. *Exam Weekly*, *2018*(65), 38. (in Chinese)