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Research on the Digital Practice Path of Professional Courses under the Guidance of UGIS Cooperation

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ABSTRACT
Based on the UGIS (University-Government-Institute-School) collaborative framework, this study takes the science education course "Design and Guidance of Science Play Performance Activities" as an example to construct a "four-in-one" practical community, develop integrated online and offline digital resources, implement a "project-driven, scenario-immersed" teaching approach, and establish a multi-stakeholder collaborative evaluation mechanism. This has successfully established a digital practice pathway for specialized courses under the guidance of UGIS cooperation. The research demonstrates that the deep integration of the UGIS collaborative model with digitalization is an effective approach to enhancing the quality of practical teaching in specialized courses and cultivating innovative talent suited for the digital era.

KEYWORDS
UGIS cooperation; Digitalization; Science play; Practical path

1 Introduction

The Opinions on Accelerating the Digitalization of Education by the Ministry of Education and Nine Other Departments (People's Government, 2025) explicitly calls for the comprehensive promotion of intelligentization, facilitating the role of artificial intelligence in advancing educational reform, promoting the digital upgrading of academic disciplines and majors, and integrating AI technologies into all elements and processes of education and teaching. This points to a new direction for the reform of specialized course teaching in higher education institutions.

On the other hand, the Plan for Strengthening Teacher Education in Basic Education in the New Era (People's Government, 2022) encourages high-level normal universities to establish collaborative innovation platforms for teacher education, with the aim of comprehensively enhancing the quality of teacher education in China..However, the singular University-School (U-S) cooperation model often faces challenges due to cultural gaps between universities and schools, resource scarcity, and insufficient sustainability (Liu Changhai et al., 2021). Against this backdrop, the UGIS partnership model, which incorporates education bureaus (G) and teaching institute(I), enables complementary advantages (Shao Kaize et al., 2022).

The course "Design and Guidance of Science Play Performance Activities" aims to cultivate students' ability to design and direct science play performances. However, traditional teaching models predominantly rely on theoretical instruction and on-campus rehearsals, which often fail to translate theoretical knowledge into practical skills, resulting in creations that tend to remain theoretical exercises.

Therefore, based on the UGIS cooperation framework and using the course "Design and Guidance of Science Play Performance Activities" as a case study, this research deeply explores the application paradigm of the UGIS cooperation model in the digital practice of specialized courses. By establishing a collaborative mechanism among normal universities, government（education bureaus）, teaching institute , and primary and secondary schools, it investigates methods and pathways to systematically guide the digital practice of specialized courses, with the aim of enhancing both the quality of course instruction and students' comprehensive competencies.

2 Literature review

2.1 The connotation and development of the UGIS cooperation model

The UGIS cooperation model is an extension and expansion of the U-S (University-School) cooperation model. Western scholars have found in U-S collaborations that the support of local educational administrative departments (Government) and teacher training institutions (Institute) is crucial for resolving cultural conflicts between universities and schools, providing resource support, and enhancing the "legitimacy" of cooperation. Li Guodong et al. (2013) pointed out that the U-D-S (University-District-School) partnership is a bottom-up comprehensive education reform model, the core of which lies in uniting the strengths of heterogeneous entities through teacher empowerment, democratic consultation, and mutualistic symbiosis. The practice of Shao Kaize et al. (2022) further highlighted the pivotal role of teaching research institutions (I), forming a UGIS teacher education community aimed at strengthening the organic integration of pre-service teacher training and in-service teacher development.

Based on the UGIS cooperation framework, this paper interprets the UGIS cooperation model as a collaborative model involving normal universities (University), education bureaus (Government), teaching institute (Institute), and primary and secondary schools (School). Its goal is to integrate resources from all parties, leverage complementary advantages, and jointly promote the development of education.

2.2 The connotation and drivers of digital transformation

In the context of education, digitalization in a broad sense refers to the comprehensive transformation of the education system through deep integration with technology. In a narrow sense, it involves the introduction of technology into educational organizations, along with innovations and reforms in products, processes, or models based on these technologies (Zhu Zhiting et al., 2022). Educational digitalization is a historical process (Yang Zongkai, 2024) that integrates digital technology into all levels of the education sector, driving comprehensive innovation in educational organizations, curriculum content, teaching processes, and evaluation methods (Zhu Zhiting et al., 2022), thereby promoting educational reform and innovation (Yuan Zhenguo, 2023).

Educational digitalization has evolved into a new requirement for adapting to economic and social development, resolving contradictions between social development and talent supply and demand, and enhancing social productivity (Zhu Zhiting et al., 2022). From the perspective of driving factors, the digital transformation of education is primarily influenced by four key dimensions: first, changes in the external environment brought about by socio-cultural evolution; second, the continuous innovation of digital technologies providing foundational support; third, policy guidance at the national level; and fourth, the inherent development demands of the education system itself. These factors interact in complex ways, collectively forming a powerful driving force for transformation. In this process, the interplay of internal and external demands and motivations ultimately creates a composite dynamic mechanism that propels the digital transformation of education.

2.3 Practical and research aspects of science play courses

"Design and Guidance of Science Play Performance Activities" is a core professional course for students majoring in science education. Following the newly revised Popular Science Law by the Ministry of Science and Technology (2024), which states that "the nation places popular science on equal importance with technological innovation, fully leveraging its role in integrating the advancement of education, technology, and talent development," science plays, as a significant form of popular science, have gained even greater prominence. The course focuses on the creation, performance, and educational application of science plays, aiming to deepen students' understanding of the essence, characteristics, and educational value of science plays through a series of teaching activities.

Existing research often explores the curricular value and social impact of science plays from pedagogical, artistic, and communication perspectives. Li Huan (2013) and Zhu Peiyu (2019) pointed out that science plays can achieve the "integration of science education and humanistic education," not only conveying scientific knowledge and methods but also promoting the spirit of science through character development and plot interpretation. Ye Bo (2013) proposed the strategy of "contextualizing course content," transforming scientific knowledge into dramatic conflicts and real-life scenarios to optimize educational outcomes. Wu Tianren (2025), from an artistic perspective, analyzed that science plays must adhere to the fundamental principles of drama creation, using character development and conflict to drive the plot while ensuring scientific accuracy. Zhang Nan (2016), from a communication perspective, found that "TV + internet" is the primary channel for information acquisition, with online new media gradually becoming mainstream due to their prolonged dissemination duration and low redistribution costs. However, research on how to systematically integrate multi-stakeholder collaboration and digital means into teacher training curricula remains insufficient.

2.4 Bottlenecks in traditional practical teaching

In the traditional practical teaching of "Design and Guidance of Science Play Performance Activities," the limitation of stakeholder collaboration is particularly prominent. The course is primarily delivered by universities as a single entity, with university teachers dominating the teaching process and responsible for imparting theoretical knowledge and practical skills. The lack of deep involvement from diverse stakeholders such as education bureaus, teaching institute, and primary/secondary schools results in ineffective implementation of popular science education policies, limited innovation in methods and depth of popular science education, and a lack of practical experience in real-world scenarios. Another issue is the absence of digital tools. In script creation, students mainly rely on offline text-based methods, which are inefficient and hinder team collaboration and resource sharing. The difficulty in accessing rich digital teaching resources restricts students' learning horizons and the cultivation of innovative thinking.

In summary, while existing research provides a solid foundation for UGIS collaboration and digital teaching, combining these two aspects and focusing on pathway research for professional courses holds significant research value.

3 Construction of the digital practice path for courses under the guidance of UGIS cooperation

Based on the concept of "community" proposed by the German scholar Ferdinand Tönnies (1887), this study constructs a digital practice path for professional courses under the guidance of UGIS cooperation.

3.1 Construction of the UGIS cooperation framework

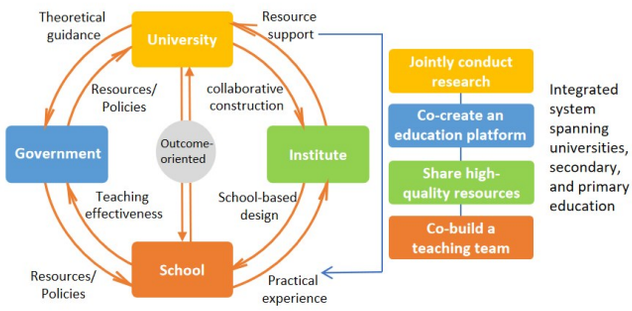

Figure 1 Construction of the UGIS cooperation framework

In the UGIS cooperation framework, the four interconnected forces are normal universities, education bureaus, teaching institute, and primary/secondary schools. This framework aims to integrate resources from all parties, leverage complementary advantages, and jointly promote the development of education. Facilitated by this collaborative framework:

Normal Universities, with their profound academic resources and research capabilities, collaborate with various stakeholders to conduct research, providing solid theoretical support and co-construction platforms. Experts and scholars from normal universities, with their deep expertise in education and teaching, explore new ideas and methods that can be applied to the teaching practices of professional courses. This not only offers theoretical foundations for updating course content and improving teaching methods but also provides new insights for teaching reforms and innovations in primary and secondary schools. In this case, the normal university is responsible for imparting theoretical knowledge on the design and guidance of science play performance activities, such as the educational value of science plays and the theoretical basis of script creation.

Education Bureaus play a critical role in policy formulation, resource allocation, and macro-management. They co-create educational platforms, provide financial support and venue guarantees for collaborative projects, and facilitate the smooth implementation of cooperation, thereby offering support and assistance for science play performance activities.

Teaching institute, by externally promoting regional educational innovation achievements and internally introducing advanced educational concepts, integrate high-quality resources within the region. They establish shared platforms such as online resource databases and remote training bases to expand regional influence. In terms of school-based development, they serve as a bridge for communication between universities and schools, providing support for the conceptual deepening and practical implementation of science plays. This helps schools develop their unique characteristics and address common challenges, while also promoting the transformation of research 成果 into practical applications.

Primary and Secondary Schools, as the direct implementers of education and teaching, serve as the practical platform for the UGIS cooperation model. Schools organize student participation in practical activities and, based on educational policies, deliver theoretical knowledge from universities and school-based design schemes from teaching institute to students through courses, achieving quality and efficiency in education. Meanwhile, primary and secondary schools regularly provide feedback on the application effects of science plays in real classroom settings. Based on this feedback, universities adjust the creation and performance of science plays to better align with students' learning needs and interests. Schools and universities jointly establish a "Science Play Educational Resource Repository," transforming outstanding science play works created by students, along with teaching experiences and cases accumulated during practice, into materials for after-school services in primary and secondary schools. These materials enrich the content of after-school services, provide additional learning resources for students, further promote science play performance activities, and enhance the educational value and social impact of science plays.

The UGIS cooperation model efficiently integrates resources from normal universities, education bureaus, teaching institute, and primary/secondary schools. It enables joint research, co-creation of educational platforms, sharing of high-quality resources, and collaborative development of teaching teams. This integration creates a powerful educational synergy that spans universities and schools, optimizes resource allocation, enables precise talent cultivation, and produces high-quality professionals who meet market demands. At the same time, it provides robust resource support for the digital practice of professional courses.

3.2 University construction of an "online + offline" digital integration system

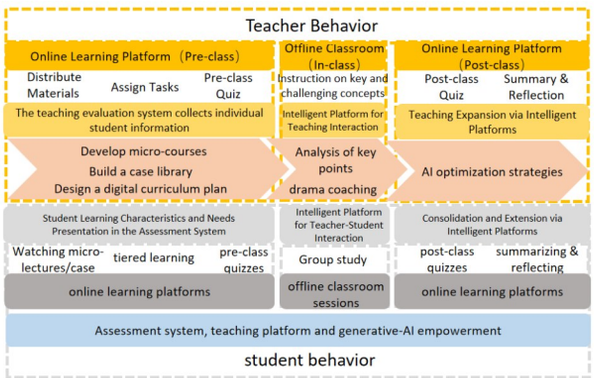

Figure 2 "Online + offline" digital integration system

The digital restructuring of course content serves as the foundation for the digital practice of the curriculum. One key initiative is the development of a series of micro-courses covering topics such as "Dramatized Transformation of Scientific Knowledge Points" and "Usage of Digital Scriptwriting Tools." These engaging and repeatable online micro-lessons help students master the transformation of scientific knowledge into science play scripts and productions.

Another important aspect of the digital restructuring of course content is the establishment of a case library. This library collects outstanding science play works and educational application videos generated through UGIS cooperation, which are both exemplary and demonstrative. By reviewing the works and videos in the case library, students can learn from excellent examples of science play creation and performance, understand how science plays are applied in various educational contexts, and broaden their creative thinking and perspectives.

The introduction of an AI-assisted system provides intelligent analysis and feedback on the scientific accuracy of scripts and the fluency of performances. By analyzing script content, the AI system checks the accuracy and logic of scientific knowledge points, identifies issues, and offers suggestions for revisions, thereby ensuring the scientific validity of science play scripts.

By combining online activities (micro-lesson viewing/case library observation/AI script optimization) with offline activities (teacher-student breakthrough of key/difficult points/group learning/science play rehearsal and optimization/costume-prop-set design), an efficient digital-integrated teaching system is formed.

3.3 Implementation of "project-driven and scenario-immersed" teaching method in primary and secondary schools

UGIS cross-institutional project-based learning is a key component of the "Project-Driven and Scenario-Immersed" teaching method. Relevant departments, such as the Education Bureau, set authentic project tasks, such as integrating science popularization activities into schools. Normal universities undertake these tasks by organizing science play performances, where university students contribute their creativity and performance skills to scriptwriting and performance, while university teachers collaborate with teaching institute to refine and guide the productions. Primary and secondary school students engage in immersive learning within carefully designed scenarios, exemplifying the ideal of "teaching and learning from each other" in this educational model.

3.4 Establishing a multi-stakeholder collaborative evaluation mechanism

Diversification of evaluation subjects is the foundation of a multi-stakeholder collaborative evaluation mechanism. Participants in the UGIS collaboration—university teachers, university students, education department personnel, teaching institute staff, primary and secondary school teachers, and primary and secondary school students—are all involved in evaluating learning outcomes. The evaluation focuses on aspects such as mastery of theoretical knowledge, stage performance effectiveness, educational value, and impact on literacy. As direct beneficiaries of the science plays, primary and secondary school students can provide feedback through questionnaires to assess the interestingness and knowledge dissemination effectiveness of the plays. Their feedback offers valuable insights for evaluating the quality and impact of the science plays.

Additionally, both formative and summative evaluations are incorporated. Formative evaluations help identify and address students' challenges and shortcomings during the learning process, providing timely guidance and support. Summative evaluations offer a comprehensive and objective assessment of students' learning outcomes and work quality, providing clear direction and goals for their learning and development.

4 Implementation outcomes

The study shows that, with the support of the practical pathway, university students have significantly improved their science popularization skills, digital literacy, teamwork, and reflective abilities. The implementation of the case has also promoted symbiotic growth among the four UGIS stakeholders: university teachers have gained rich teaching experience and firsthand research cases; the Education Bureau, in collaboration with normal universities, has developed replicable and scalable regional education innovation models; teaching institute have enhanced the targeted nature of their teaching guidance and expanded their scope of work; and primary and secondary schools have acquired high-quality curriculum resources and phased student literacy development. Together, they have created a digital practice paradigm for professional courses under the guidance of UGIS collaboration.

5 Conclusion and outlook

This study thoroughly examines the application of the UGIS collaboration model in the digital practice of the "Design and Guidance of Science Play Performance Activities" course. By constructing a "four-in-one" practical community, developing integrated online and offline digital resources, implementing the "Project-Driven and Scenario-Immersed" teaching method, and establishing a multi-stakeholder collaborative evaluation mechanism, a digital practice pathway for professional courses under UGIS guidance has been successfully built and validated through practice. University students have significantly improved in script creation and interdisciplinary collaboration; the course's social value has been fully demonstrated, serving multiple primary and secondary schools, generating abundant science education resources, and helping several schools become specialized in science and technology education; teaching institute have refined new approaches to quality education, supporting the rapid growth of new teachers; and the Education Bureau has created branded science and technology education activities benefiting the entire city.

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