

# Current Practice of Joint Graduation Projects in Chinese Architectural Education: A Quantitative and Visualized Study

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**Abstract:** Amidst the rapid technological advancements and increasing complexity of the construction industry, the demand for architects and engineers with comprehensive knowledge and interdisciplinary skills has grown significantly. Joint graduation projects, which involve students from related fields such as architecture, urban and rural planning, and landscape architecture, have emerged as an effective means to cultivate such skills. However, the status and development trends of joint graduation projects in Chinese architectural education remain unclear. This study aims to address this gap by conducting a comprehensive analysis of these projects using bibliometric and visualization methods. The results reveal that while the field is exhibiting an upward trend, there is a notable lack of high-level publications, highlighting the need for improved innovation. Therefore, this study proposes several strategies, including establishing stable activity brands, exploring multi-disciplinary collaboration models, and conducting projects with specific themes, to foster innovative and practical architectural talents through effective inter-university and inter-disciplinary collaboration.

## 1. Introduction

In the era of rapid development of information technology, the technical integration and complexity of the construction process in the architecture industry are becoming increasingly prominent <sup>[1]</sup>. This transformation has raised higher requirements for the comprehensive quality, professional ability, and interdisciplinary knowledge of architects and engineers. As an important part of practical teaching in undergraduate education, graduation projects aim to comprehensively test the overall quality and theoretical and practical abilities of the graduates in architectural engineering. Reform in this area is particularly important.

Joint graduation projects in architecture refer to comprehensive design tasks that involve undergraduates majoring in closely related fields such as architecture, urban and rural planning, and landscape architecture, participating across schools or majors during their graduation stage. This form of design requires students to combine theoretical knowledge with practical experience and complete an innovative architectural design plan through team collaboration. It is not only a comprehensive test of the professional knowledge and skills of students but also an important part of cultivating their interdisciplinary cooperation and comprehensive abilities <sup>[2]</sup>.

In China, many kinds of joint architectural graduation design activities are undertaking every year; however, few educational research results about these activities have been conducted. Therefore, this study aims to conduct an in-depth analysis of the current development status of joint graduation projects in Chinese architecture through bibliometric methods, aiming to provide useful references for the future development of joint graduation projects in Chinese architecture.

## 2. Materials and Methods

This study refers to the exhaustive retrieval method of systematic review for research material organization (Figure 1). The primary retrieval channel was the China National Knowledge Infrastructure (CNKI), with the retrieval formula of “ [theme: 建筑 (architecture)] AND [theme: 联合毕业设计 (joint graduation project)]”, yielding 125 results. Additional searches were conducted on Baidu Academic and a total of 13400 results were retrieved. Sorted by relevance, 100 results were screened out through title browsing. Then, using COOC 14.9 software, the retrieval results were merged and deduplicated, resulting in 121 unique documents. Finally, supplementary global information was obtained through Meta AI search, with a search intensity of "research", yielding 39 effective retrieval results. And additional valid information was obtained through institutional surveys.

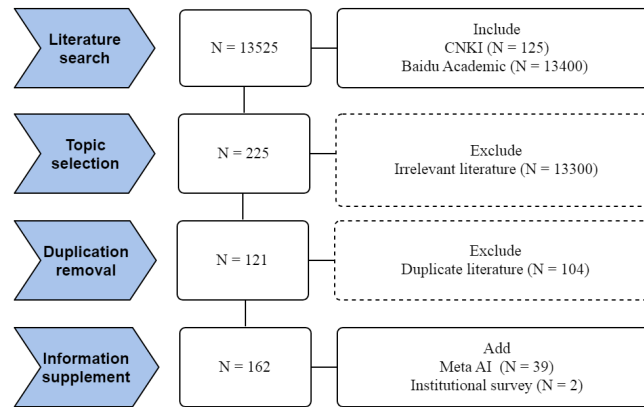


Figure 1 Systematic review process.

Note: As the search results are up to June 2, 2024, the annual number of publications in 2024 is not the final number (similarly hereinafter).

## 3. Results

### 3.1. Number of Publications

The number of documents is an important indicator of the development of a field within a certain period. The first document related to joint graduation projects in architecture was published in 2004<sup>[3]</sup> (Figure 2). Although that paper belongs to the field of civil engineering and involves interdisciplinary joint graduation projects, it does not cover architectural majors. After several years of no publications, in 2007, Tsinghua University and seven other universities initiated the first multi-school joint graduation project in architecture and urban and rural planning in China<sup>[4]</sup>. Then, since 2009, papers on joint graduation projects in architecture have been continuously published. Based on the logistic curve model<sup>[5]</sup>, the practice and research in this field are in an upward trend, and it is expected that more related research results will be published in the coming years.

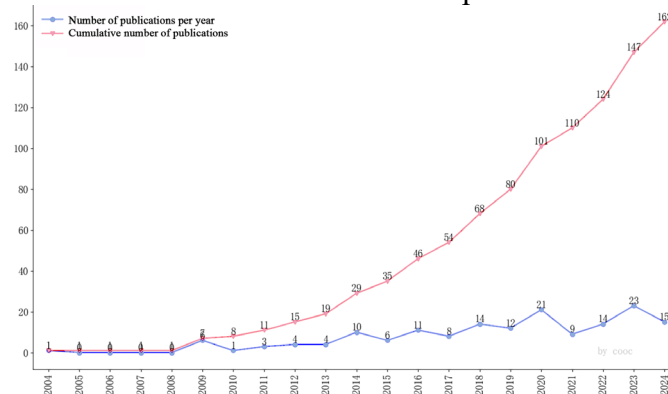


Figure 2 Number of publications.

### 3.2. Highly Cited Papers

To analyse the most influential literature in the field of joint graduation projects in architecture, the top 5 most cited papers are listed in Table 1. In terms of citations, teaching reform papers have relatively low citation frequencies compared to scientific research papers. Although the content of many teaching reform papers is close to activity overviews, the highly cited papers tend to focus on teaching research. Additionally, these highly cited papers were all published before 2018, indicating insufficient publication of high-level papers in recent years and reflecting a lack of innovation in teaching activities related to joint graduation projects in architecture.

Table 1 Highly cited papers.

Ranking	Frequency	Topic	Year	Reference
1	14	Joint teaching mode of graduation design for engineering urban and rural planning major	2016	[6]
1	14	Building Information Modelling in joint graduation design between universities and enterprises	2018	[7]
3	12	Civil engineering multi-specialty joint graduation design	2014	[8]
4	10	Architecture teaching for the cultivation of compound applied talents	2016	[9]
5	9	Joint graduation design teaching model for architecture majors	2018	[10]

### 3.3. Publishing Media

For joint graduation projects in architecture, university official websites had the largest number of publications, followed by “Planners” and “Journal of Architectural Education in Institutions of Higher Learning”. Although there were 77 only media sources, they formed up to 17 clusters, indicating that research hotspots were not concentrated. Among them, the more significant clusters include: (1) the pink cluster, with “joint graduation design” as the core, radiating keywords such as “multi-major joint graduation design”, “school-enterprise joint graduation design”, and “faculty joint graduation design”; (2) the orange cluster, with “graduation design” as the core, connecting keywords such as “graduation internship”, “double mentorship”, “laboratory construction”; and (3) the light green cluster, with “teaching mode” as the core, integrating teaching modes such as “interdisciplinary” and “practice docking”.

### 3.4. Publishing Institutions

Through the analysis of publishing institutions, the participation of different universities in joint graduation projects in architecture can be observed. By processing the publishing institutions and merging the same units, a two-mode matrix is established using publishing institution and source data (Figure 3). If the publishing institutions are divided into three categories, Xihua University, which recently held a joint graduation project for the Western Nine Schools of Architecture Teaching Alliance, has a relatively high number of publications on its official website and forms a separate category. Jilin Jianzhu University, Sichuan University, Beijing University of Civil Engineering and Architecture, etc. also have concentrated publications on their official websites, as well as in journals such as “Journal of Architectural Education in Institutions of Higher Learning” and “Education and Teaching Forum”, forming a second category. Other institutions have scattered publications across various journals and sponsor websites, forming a third category. On the other hand, if the literature sources are divided into three categories, the official website of colleges and universities will form a category due to its absolute quantity. Although “Urbanism and Architecture” has only published 4 articles, it involves many institutions and becomes the second category. Other institutions are combined into the third category.

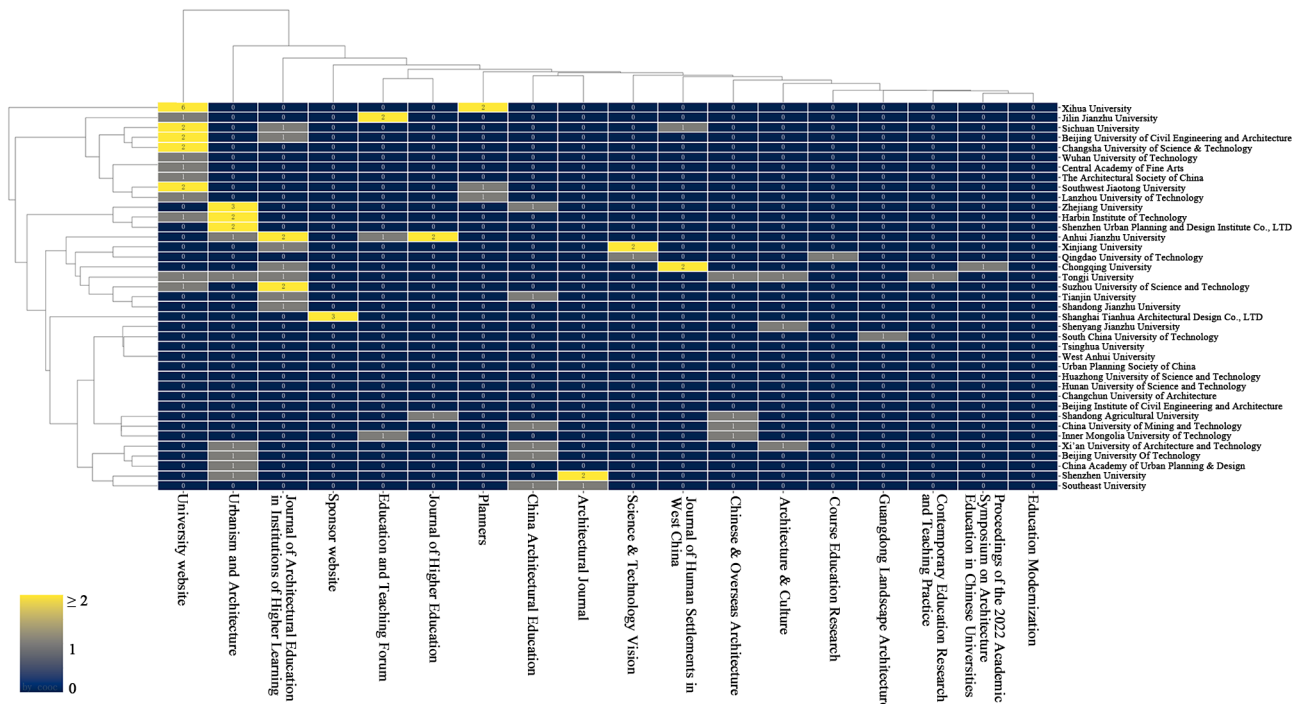


Figure 3 Two-mode tree clustering based on literature source and publishing institution

## 4. Suggestions

### 4.1. Brand Creation and Development

Currently, several influential joint graduation design brands for architecture have been formed among Chinese universities. However, these activities generally suffer from inconsistent naming across different years. For instance, in 2007, Tsinghua University, Southeast University, Tongji University, Tianjin University, Beijing Institute of Civil Engineering and Architecture (now known as Beijing University of Civil Engineering and Architecture), and the Central Academy of Fine Arts organized the “Six-University Joint Graduation Design”. Later, with the inclusion of Zhejiang University and Chongqing University, it was renamed the “Eight-University Joint Graduation Design”. And after Hefei University of Technology and Kunming University of Science and Technology joined, it was then renamed as the “Ten-University Joint Graduation Design”<sup>[11]</sup>. This constant renaming hinders the building of the activity brand to some extent.

To address this issue, it is suggested to name the brand based on the initiating unit or alliance. For example, the “UC4 Joint Graduation Design is an architecture joint graduation design activity jointly organized by Xi'an University of Architecture and Technology, Chongqing University, Harbin Institute of Technology, and South China University of Technology. In 2021, Suzhou University of Science and Technology joined, renaming the activity “UC4+ Joint Graduation Design”. This approach not only retains the original brand “UC4” but also reflects the addition of new members with “+” and retains the possibility of adding more members.

### 4.2. Multi-disciplinary Joint Model for Architecture Plus

In addition to covering the three majors of architecture, Architecture Plus encompasses related fields such as real estate planning and management, civil engineering, and building environment and energy application engineering. Realizing a multi-disciplinary joint graduation design model for civil engineering will effectively enhance the team collaboration skills of the graduates and lay a solid foundation for their practical work. However, during the exploration process at universities like Chongqing University<sup>[12]</sup>, it was found that this model may bring issues such as difficulty in controlling the design cycle and unifying design difficulty.

In terms of design cycle, it is recommended to advance the start time of graduation design by one semester when more than three majors are involved. To ensure smooth graduation design progress,

it is suggested to use Building Information Modelling (BIM) software throughout the process, which requires screening students and instructors proficient in BIM during team formation. Due to the difficulty of cross-disciplinary collaboration, which can be challenging for university organizations, it is recommended to complete it within the professional scope offered by the college.

Regarding design difficulty, it is challenging to unify the graduation requirements of various majors with a single building. For example, most undergraduate students in civil engineering can only undertake structural design for regularly shaped, low-rise buildings, while architecture majors often pursue architectural styling and height, and urban and rural planning and landscape architecture have constraints such as site scale. Therefore, when selecting topics, it is advisable to choose a larger urban or rural area and designate a portion of the site for individual building design. The building should include multiple units, with at least one main building as the focus for the major of architecture, and at least one supporting building for other majors to proceed with their works.

### **4.3. Conducting Joint Graduation Design with Specific Themes**

Besides the conventional joint graduation design model, conducting joint graduation design with specific themes is also an innovative attempt. This model focuses on specific issues or challenges, such as sustainable development, urban renewal, historical and cultural preservation, and bring together students from multiple universities and majors for research and design. This design process not only hones their professional skills but also cultivates their comprehensive literacy and social responsibility.

During implementation, joint graduation design with specific themes requires more precise organization and planning, including determining themes of practical significance and value, clarifying the division of labour and collaboration among students from different majors, establishing reasonable evaluation criteria, and presenting results. These measures ensure the smooth progress of joint graduation design and achieve the desired teaching effect.

## **5. Conclusion**

This study aims to promote the higher quality and deeper development of joint graduation projects in Chinese architecture, contributing to cultivating innovative and practical architectural talents. Through bibliometric and visualization methods, a comprehensive analysis of the current development status of joint graduation projects in Chinese architecture is presented. The study reveals that the field is in an upward trend, but there is a lack of high-level publications, indicating a need for improved innovation in these projects. To address these issues, a series of development suggestions are proposed, including focusing on building activity brands, exploring multi-disciplinary joint models in civil engineering, and conducting joint graduation projects with specific themes. Through continuous teaching and reflection, it is anticipated that joint graduation projects in architecture will become more diverse, and collaboration among universities and majors will be more effective.

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## **References**

- [1] ZHANG Y. A Model Research on the Interdisciplinary Joint Graduation Design in Civil Engineering University Based on BIM-CDIO[D]. Hebei University of Architecture, 2019.

- [2] YUAN T. Research on Architecture Cross Major Graduation Design Teaching Based on BIM Collaboration[D]. China University of Mining and Technology, 2021.
- [3] ASAAD M, HASSAN G F, ELSHATER A, et al. Global South Research Priorities for Neighbourhood Sustainability Assessment Tools[J]. Open House International, 2023. DOI:10.1108/OHI-10-2022-0278.
- [4] WENG Y. Summary and Thinking on the Teaching Experience of Inter-University Joint Teaching of Graduation Design in Landscape Architecture: A Case Study of UC4[J]. Guangdong Landscape Architecture, 2022, 44(3): 21–24.
- [5] TAN H, LI J, HE M, et al. Global Evolution of Research on Green Energy and Environmental Technologies: A Bibliometric Study[J]. Journal of Environmental Management, 2021, 297(July): 113382. DOI:10.1016/j.jenvman.2021.113382.
- [6] WANG Y. A Preliminary Study on the Joint Teaching Mode of Graduation Design for Engineering Urban and Rural Planning Majors: A Case Study of the Joint Graduation Design for Urban and Rural Planning Majors of Seven Architecture Colleges in China (in Chinese)[J]. Journal of Higher Education, 2016(11): 24–25. DOI:10.19980/j.cn23-1593/g4.2016.11.011.
- [7] WANG W, LI H, LIU Y. Application and Practice of BIM in Joint Graduation Design between University and Enterprise[J]. Journal of Architectural Education in Institutions of Higher Learning, 2018, 27(6): 161–166. DOI:10.11835/j.issn.1005-2909.2018.06028.
- [8] YE X, SHI S, DU L, et al. Innovation and Practice of Civil Engineering Multi-Specialty Joint Graduation Design (in Chinese)[J]. Science & Technology Progress and Policy, 2014, 31(11): 138–141. DOI:10.6049/kjbydc.2014GC0139.
- [9] HUANG H, DENG S, CHEN G. Architecture Teaching for the Cultivation of Compound Applied Talents: The Practice of Interdisciplinary Joint Thesis Design[J]. Journal of Human Settlements in West China, 2015, 30(6): 38–42. DOI:10.13791/j.cnki.hsfwest.20150609.
- [10] ZHOU Q. Multivariate and Spanning: Joint Graduation Design Teaching Model for Architecture Majors[J]. Education and Teaching Forum, 2018(50): 71–73.
- [11] JIA B, ZHANG T, ZHONG D. Dialogue: Teaching Contribution and Academic Value of Joint Graduation Project (in Chinese)[J]. Architectural Journal, 2016(8): 35–38.
- [12] LU F, HUANG H, ZENG X, et al. Convergence and Integration: A Decade Review of the Multi-Professional Joint Graduation Design of the Faculty of Architecture, Chongqing University[C]//Proceedings of the 2022 Academic Symposium on Architecture Education in Chinese Universities. Xuzhou: China Architecture and Building Press, 2023: 7–10.