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Reframing the Campus: A Systematic Scientometric Review of Global Research on University Campus Design

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Keywords

Biblioshiny, Scopus, University campus design, VOSviewer, Web of Science.

Abstract

This study charts research on university campus design from 2010 to 2025 using a mixed-methods bibliometric review. Records were retrieved from Scopus and Web of Science, screened with PRISMA, and analysed in VOSviewer and Biblioshiny for performance, collaboration, and thematic structures. The dataset shows sustained growth, with a clear acceleration after 2016 and peak activity between 2021 and 2024. Publication patterns are dominated by journal articles, and disciplinary profiling indicates a strong base in the social sciences alongside substantial contributions from engineering and computer science. Country and institutional maps reveal a concentrated yet international landscape led by the United States, with notable output from China, Australia, and the United Kingdom, and strong clusters around leading universities. Keyword co-occurrence and timeline views highlight three converging trajectories. Sustainability and environmental performance remain central, including life cycle assessment, microclimate, and pedestrian comfort. Digital transformation gains prominence after 2020, covering smart campus instrumentation, information management, and the infrastructural demands of hybrid learning. Human-centred themes persist around students, education, and university life. Gaps include modular and scalable campus typologies, more balanced cross-country collaboration, and stronger evidence on inclusivity, mental health, and community integration. The review provides an up-to-date baseline and a reproducible workflow for future studies, supporting planning approaches that integrate climate responsiveness, data-driven operations, and user well-being.

Introduction

The term “university” embodies a profound historical legacy, derived from the Latin word “universitas,” meaning “the whole” or “totality.” Following the establishment of the Republic, this concept was further enriched through the French term “université”, denoting an institution that serves the entirety of society and where all forms of knowledge are cultivated. In its original Latin usage, universitas referred to a collective body of individuals possessing legal autonomy and united by shared professional interests; essentially, the guilds of the Middle Ages, which later evolved into the foundational model for the earliest universities [1].

The origins of universities can be traced back to the 12th century, and over time, they have continuously evolved, expanding their scope and reinforcing their social significance. Kortan [2] characterises universities through two foundational Latin concepts: universitas magistrorum et scholarium, referring to the association of teachers and students and the communal spaces dedicated to scholarly pursuits; and universitas literarum, denoting the comprehensive unity of the sciences in modern understanding. The term campus, on the other hand, derives from the French word campus [3], signifying the designated area or terrain of an educational institution.

A campus refers to a designated area allocated for an educational institution, such as a university or college [4]. Functionally, university campuses operate as dynamic microcosms of urban life due to their spatial and operational complexity. They typically encompass diverse facilities that support education, research, and administration, as well as spaces for accommodation, sports, recreation, and social engagement. In this sense, the campus functions as both an

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academic and social ecosystem, integrating instructional, residential, and communal components within a cohesive physical environment [5].

Originally established as single structures within urban centres, universities gradually expanded and diversified to meet evolving academic and spatial demands. Over time, separate faculties were founded in different parts of the city, requiring students to travel between multiple locations. To overcome this fragmentation, universities in cities such as Rome and London were planned as integrated elements of the urban fabric. In contrast, universities in the United States adopted a peripheral model, developing campuses located beyond city boundaries. The earliest examples of this approach, inspired by the Roman castra (military camps), include the University of New York, founded in 1813, and the University of Virginia, built between 1817 and 1826 (Fig. 1) [2], followed by Princeton University in the latter half of the 19th century [6].

Fig. 1. University of Virginia campus, one of the first campus examples [2].

During the 20th century, as both the number and population of universities expanded, identifying suitable urban sites for campuses became increasingly difficult. This challenge led to the emergence of "university cities," located beyond traditional urban centres and envisioned as self-sufficient entities, in contrast to the classical "city universities" of Europe. The integration of universities into city centres, as in the European model, offered notable advantages. Students benefited from social interaction and informal education within the city, while local residents gained access to academic and cultural resources, including libraries, auditoriums, and sports facilities.

Until the last quarter of the 20th century, when the number of campuses grew rapidly, research on university campus design primarily addressed the subject from a broad theoretical perspective. In recent decades, however, studies have shifted toward more specialised themes such as sustainability, accessibility, and environmental performance. Despite the continuous increase in campus users, including students, academics, and administrative personnel, many campus designs still fail to adequately consider future growth and flexibility, leading to limited spatial adaptability under changing conditions.

From this standpoint, a comprehensive examination of the planning and design of university campuses is the primary motivation for this study. Accordingly, this article systematically analyses the body of research on university campus design. Bibliometric data obtained from the Scopus database using specific keywords were processed and visualised through various mapping techniques. Network maps, analyses, and graphical representations reveal the key relationships, research trends, collaborations, and conceptual structures shaping the field.

I. Materials and Methods

Manual reviews of existing research are often constrained by the vast volume of literature available on a given topic, making comprehensive evaluation difficult [7]. Furthermore, traditional manual reviews in scientific analyses are prone to subjectivity and interpretation bias, limiting their reliability and depth [8]. These limitations underscore the need for a mixed-method systematic review approach to synthesise diverse sources of knowledge and enhance both the scope and analytical rigour of literature evaluation [9]. Mixed-method systematic reviews integrate quantitative and qualitative techniques to examine and consolidate existing studies within a coherent analytical framework [10].

Within this framework, the bibliometric analysis method, widely adopted in contemporary academic research as a systematic literature review approach, was employed to identify relationships, patterns, and the impact of data obtained in the study. The bibliometric mapping and analysis method aims to generate visual representations that reveal how scientific data are distributed and interrelated across various research domains [11]. It also serves as a descriptive analytical tool frequently utilised in academic studies [12]. By mapping the relationships among research fields, bibliometric analysis helps identify conceptual gaps and emerging topics, thereby supporting the development of more original and targeted future research [13].

In this study, appropriate software tools were first selected to facilitate analysis. Search criteria and keywords for the bibliometric query were defined, and bibliographic data were extracted from the Scopus and Web of Science databases. These data were processed and visualised using VOSviewer and Biblioshiny to map relationships based on country, publication year, disciplinary field, and other relevant parameters. Research gaps were identified through visual graphs, followed by evaluation of the findings and determination of future research directions. The methodological framework of the bibliometric analysis applied in this research is illustrated in Fig. 2.

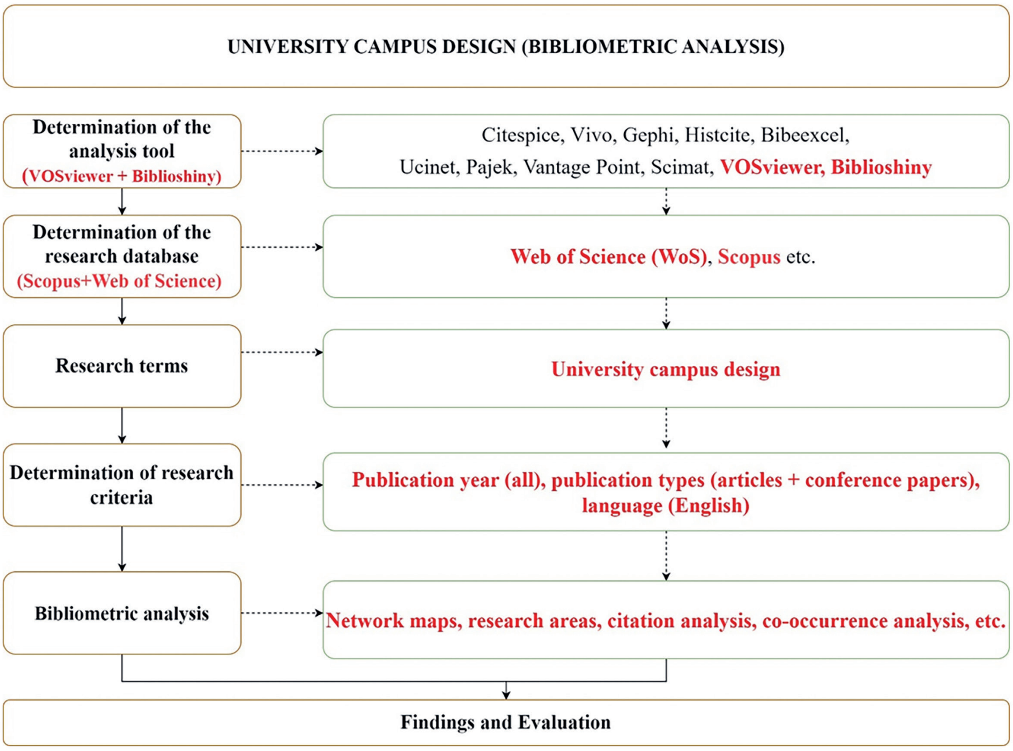


Fig. 2. Bibliometric analysis workflow [by the authors].

II. Bibliometric Analysis and Findings

Various software tools exist for bibliometric mapping and analysis of large-scale scientific datasets [13]. Citespice, Vivo, Gephi, Histcite, Bibeexcel, Biblioshiny, Ucinet, Pajek, Vantage Point, Scimat, and VOSviewer are among the prominent tools. Still, VOSviewer and Biblioshiny are the most intensively used in scientific studies [11], [14]. In this study, “university campus design” was determined as the keyword for bibliometric analysis, and this search term was analysed in VOSviewer and Biblioshiny based on their practicality and prevalence. Both applications require information obtained from common databases to analyse scientific datasets. They can transform this information with relevant tools and produce maps and content for analysis.

In the search conducted in the Scopus and Web of Science databases on 3 November 2025, 10 771 studies published between 2010 and 2025 containing the words “university campus design” in the title, abstract, or keywords were identified.

Some of these studies were excluded from the evaluation to make a meaningful and holistic analysis and evaluation. For the studies included in the assessment, the criteria of being conducted after 2010, having English as the language of publication, and being a research article as the publication type were determined. Using these criteria, 9800 studies were reduced to 5753, and based on these studies, network maps were produced.

General information related to the search outcomes is presented in Fig. 3. Additionally, the PRISMA 2020 app was utilised to facilitate the creation of flow diagrams for systematic reviews [15]. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is a globally recognised framework designed to enhance the transparency and quality of systematic reviews and meta-analyses. PRISMA provides researchers with a standardised checklist and a flow diagram to ensure that every aspect of the review process is thoroughly documented [16]. PRISMA ensures transparency throughout the systematic review process, from study selection to data synthesis. It emphasises the need to outline how studies were clearly identified, the criteria used to select them, and the methodology for analysing the data. This approach allows readers to fully understand the scope, methods, and results of the review [17]. In this scope, the PRISMA workflow of the research is shown in Fig. 4.

Fig. 3. Main general information obtained via Biblioshiny [by the authors using Biblioshiny].

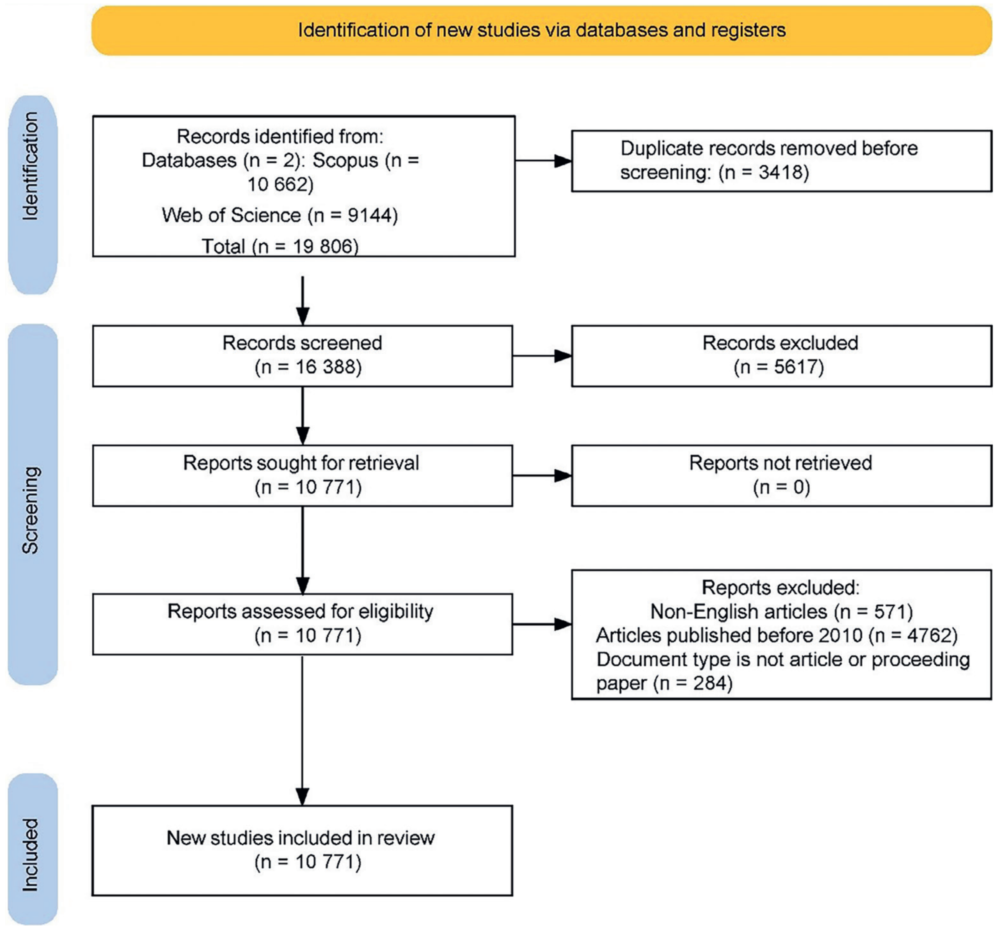


Fig. 4. PRISMA workflow for the inclusion and exclusion of the research items [by the authors].

According to the information obtained from Biblioshiny, a total of 10 771 articles from 4744 sources were identified as a result of the relevant research conducted between 2010 and 2025. The total number of authors of these articles is 31 696, the number of single-author publications is 1365, and the average number of authors per publication is 3.92. The total rate of publications with international authors is 11.37 %, and the annual increase rate in the number of publications is 6.08 %. The total number of keywords used in these publications is 25 163, and the total number of references used is 251 016. The average age of the publications is 6.16, and the average number of citations per publication is 9.63.

In the mapping process, publications containing the "university campus design" concept with at least five citations were evaluated, and the total number of articles, 10 771, was reduced to 6575 for the VOSviewer process. Then, the studies produced in countries that published at least five papers and those that received at least five citations were subjected to the final evaluation. As a result of the evaluation, the following results and findings emerged.

Figure 5 illustrates the annual distribution of publications in the Scopus and Web of Science databases, indicating a consistent upward trend in research activity from 2010 to 2025. A noticeable acceleration occurs after 2016, with the number of documents steadily increasing and reaching its highest levels between 2021 and 2024. This trend indicates a growing academic interest and diversification of studies related to the topic throughout the last decade. Although the year 2025 shows a temporary decline, this decrease is attributed to the fact that the data collection was conducted early in the year, before all publications had been indexed in Scopus.

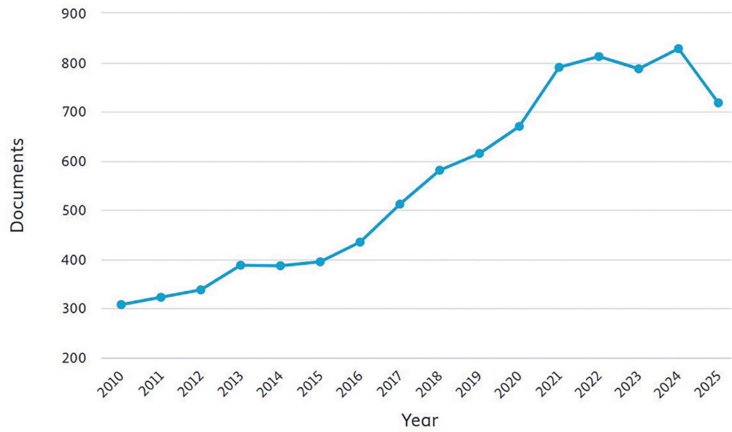


Fig. 5. Distribution of publications on research terms by years [by the authors].

Fig. 6. Most productive countries and their relations (network map from VOSviewer).

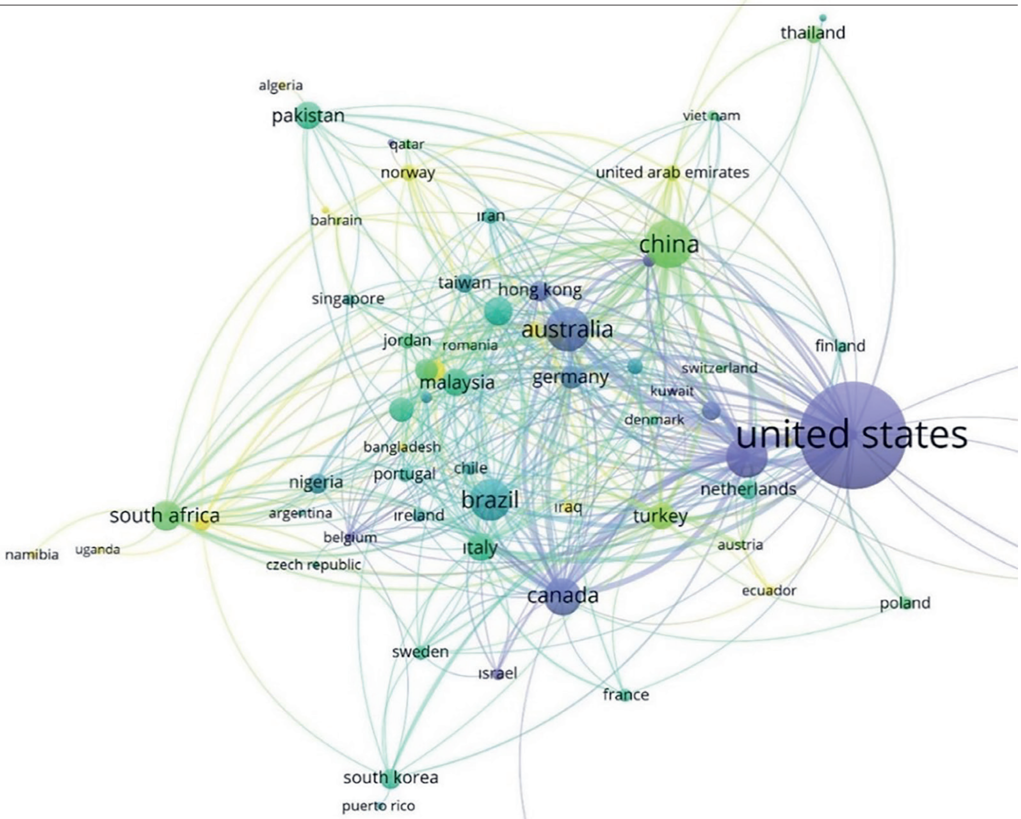
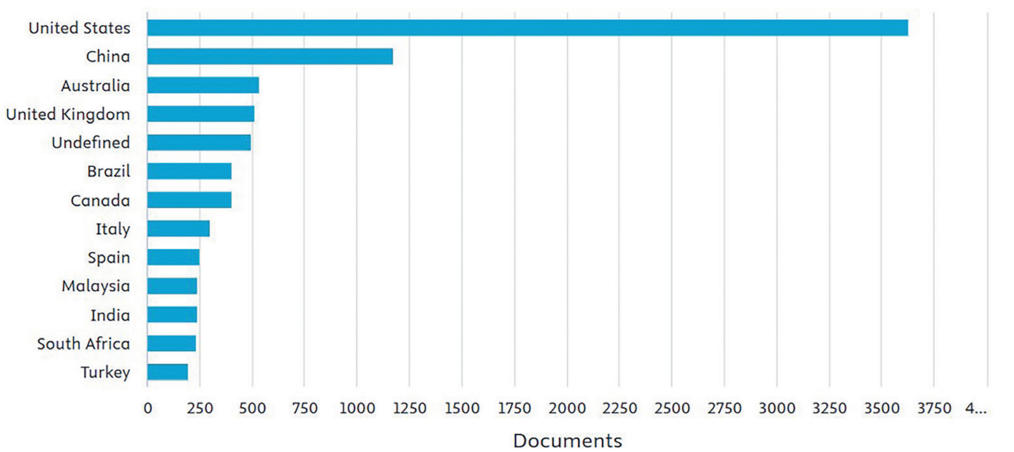


Fig. 7. Countries producing the most publications on university campus design [by the authors].



According to Figs. 6 and 7, the United States produces the highest number of publications within the analysed field, maintaining a dominant position in global research output. Following the U.S., China, Australia, and the United Kingdom stand out as the next leading contributors, showing significant productivity and international collaboration. Other countries such as Brazil, Canada, Italy, and South Africa also demonstrate notable research engagement, forming secondary clusters of cooperation in the global network. This distribution indicates that research on the relevant topic is strongly concentrated in developed countries with expanding international connections.

Figure 8 lists the universities and institutions that produce the highest number of publications in the related field. Pennsylvania State University ranks first, followed closely by Texas A&M University and Purdue University. Other leading institutions include Arizona State University, Politecnico di Milano, and the University of Michigan, Ann Arbor, each contributing significantly to the research output. Based on the obtained data, it is evident that U.S. universities and research institutions play a dominant role in shaping scholarly production in this area, while a few notable contributions also come from international universities such as Politecnico di Milano and Tsinghua University.

Figure 9 shows the researchers who produced the most publications on university campus design. Hassanain (2024, 2023, 2022, 2016), Tagliabue (2022, 2021, 2019, 2016, 2015), and Ciribini (2021, 2017, 2016, 2015) are identified as the most productive authors in the field. Their research primarily focuses on themes such as sustainability, energy efficiency, and building information systems within the context of university campus environments. In addition, scholars such as Attakora-Amamianpong, Yalvac, and Angioli, also contribute significantly to this body of literature, indicating a diverse international research interest in the topic.A. Neue Nationalgalerie, Berlin – Modernism

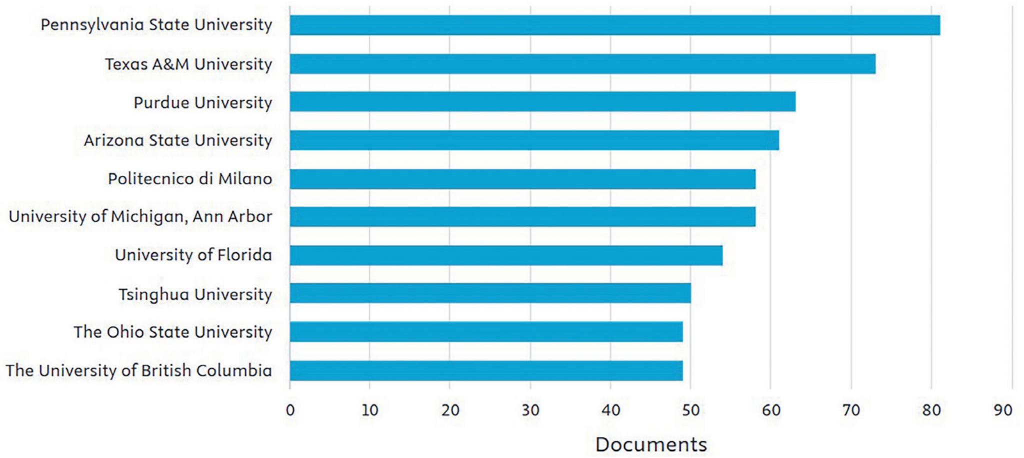


Fig. 8. Universities and institutions producing the highest number of publications on the research terms [by the authors].

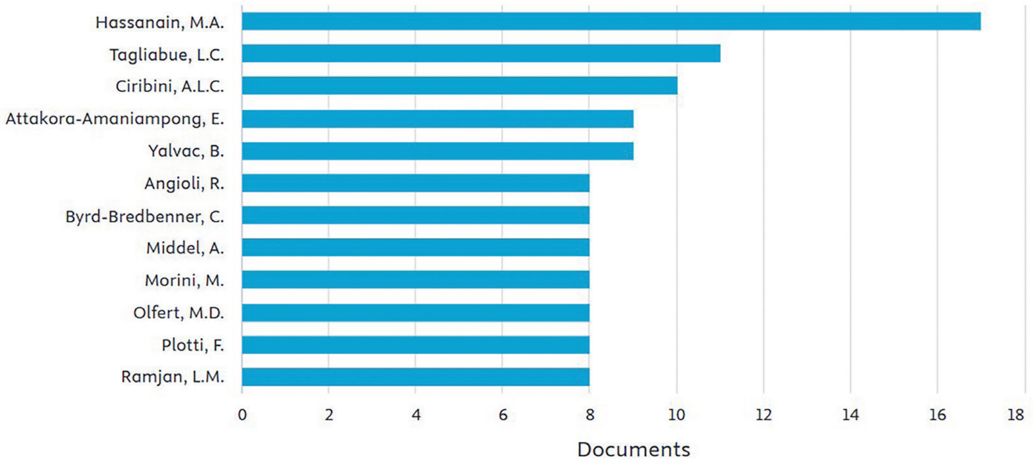


Fig. 9. Researchers who produced the most publications on university campus design [by the authors].

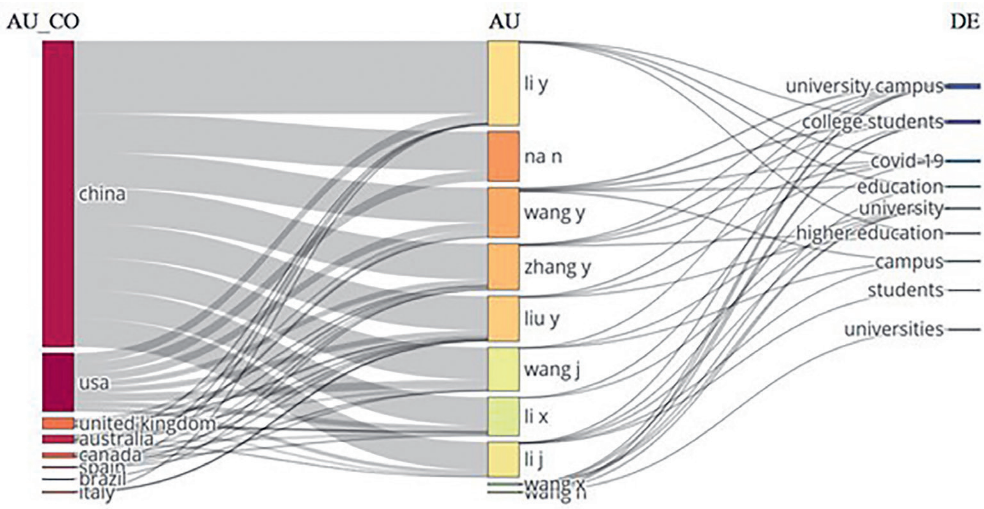


Fig. 10. Three-field plot produced with Biblioshiny.

Three-field chart showing countries (left), authors (middle), and keywords (right) is presented in Fig. 10. The rectangular nodes represent the collaboration networks among these three dimensions, while the width of the connecting lines indicates the strength of the relationships. According to the data in Fig. 10, China emerges as the country with the highest level of collaboration, followed by the United States and the United Kingdom. Among the authors, Li, Y., Na, N., and Wang, Y. appear as the most active contributors in the field. The most frequently used keywords include “university campus,” “college students,” “COVID-19,” “education,” “university,” and “higher education.” These findings reveal that the topic of university campus research is strongly connected with educational and pandemic-related themes in the international literature.

When the types of publications produced on university campus design are analysed as in Fig. 11, articles represent the largest share of the total number of publications, accounting for 59.6 % of all outputs. This category is followed by conference papers (32.2 %) and book chapters (3.8 %), which also constitute a considerable portion of the research output. Other publication types, such as reviews, books, and conference reviews, appear in smaller proportions. These results indicate that scholarly dissemination in this field primarily occurs through peer-reviewed journal articles, supported by conference-based and book chapter contributions.

According to Fig. 12, the social sciences represent the leading research area in studies on university campus design, accounting for the largest share among disciplines. This is followed by engineering and computer sciences, which also constitute significant portions of the research field. Additionally, areas such as medicine, environmental sciences, and energy make meaningful contributions to the interdisciplinary structure of the topic. The remaining categories, including business and management, agricultural sciences, mathematics, and arts and humanities, have smaller shares but reflect the diverse academic interests surrounding the subject.

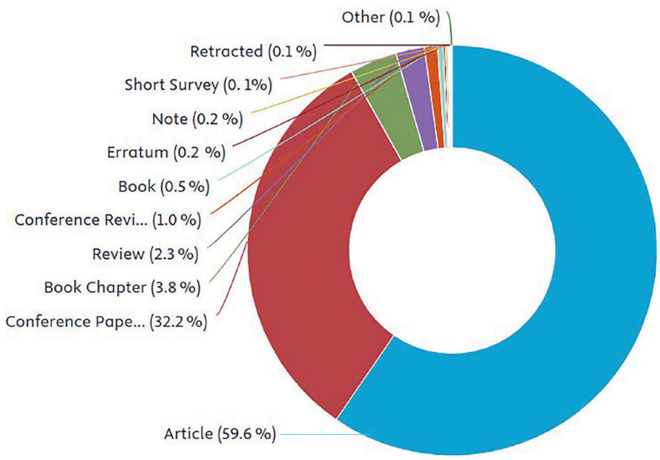


Fig. 11. Distribution of types of publications produced on the research terms [by the authors].

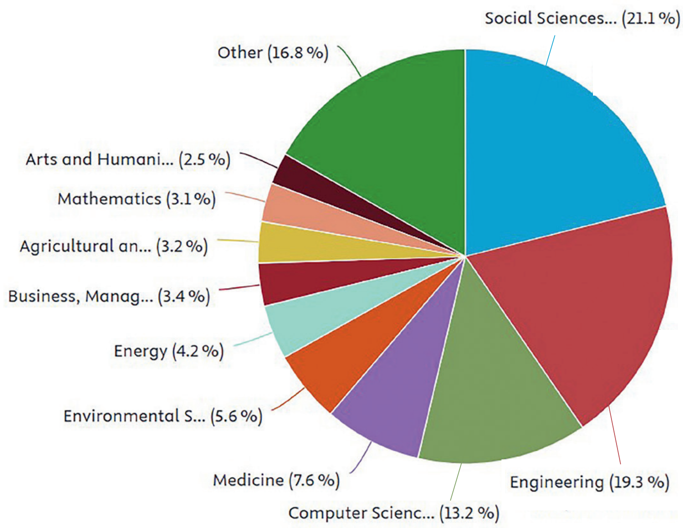


Fig. 12. Distribution of publications on research terms according to the research fields [by the authors].

According to the information in the network map in Fig. 13, the main research areas and keywords in studies related to university campus design are centred around “students,” “human,” “university,” “education,” and “university campus.” These terms demonstrate the dominant themes of research, emphasising the human-centred and educational aspects of campus-related studies. In addition, concepts such as “engineering education,” “sustainable development,” and “sustainability” appear as recurring clusters, indicating the growing integration of environmental and technological perspectives into this field. Overall, the visual and numerical data reveal that the research landscape on university campuses spans interdisciplinary domains, linking educational, social, and sustainability-oriented approaches.

According to Fig. 14, when the publications produced between 2010 and 2025 are examined, it is evident that research activity significantly increased between 2018 and 2023. The colour gradient on the map illustrates the temporal evolution of keyword clusters, showing that certain themes gained prominence in specific periods. For instance, studies focusing on “students,” “education,” and “human” were primarily produced between 2016 and 2019, while research on “university campus,” “engineering education,” and “sustainable development” intensified after 2020. Earlier years are characterised by publications in health- and psychology-related areas such as “mental health,” “young adults,” and “nursing education.” This temporal distribution highlights the progressive diversification of research topics and the growing emphasis on sustainability and technology in recent years.

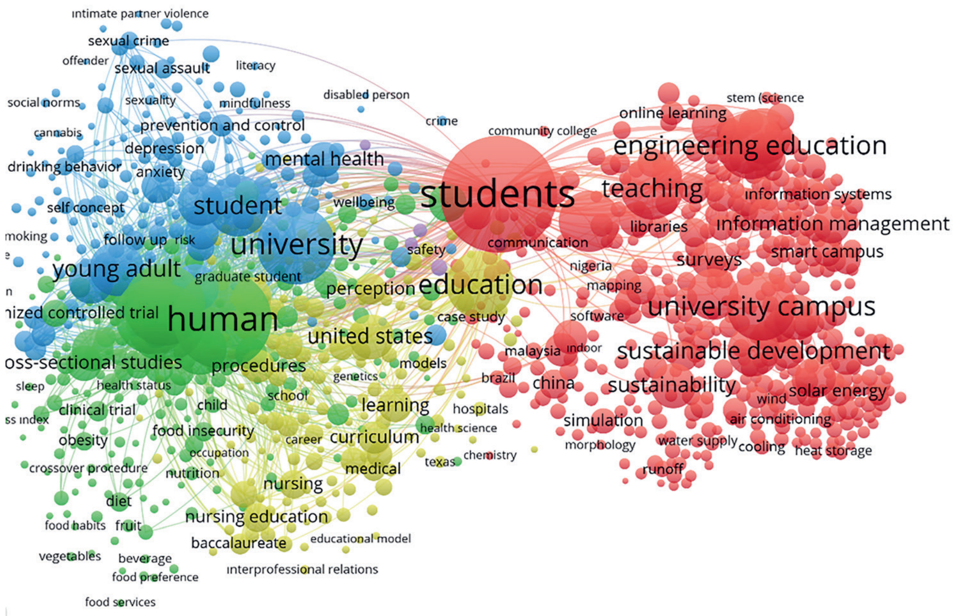


Fig. 13. Interaction network map from VOSviewer related to the research terms.

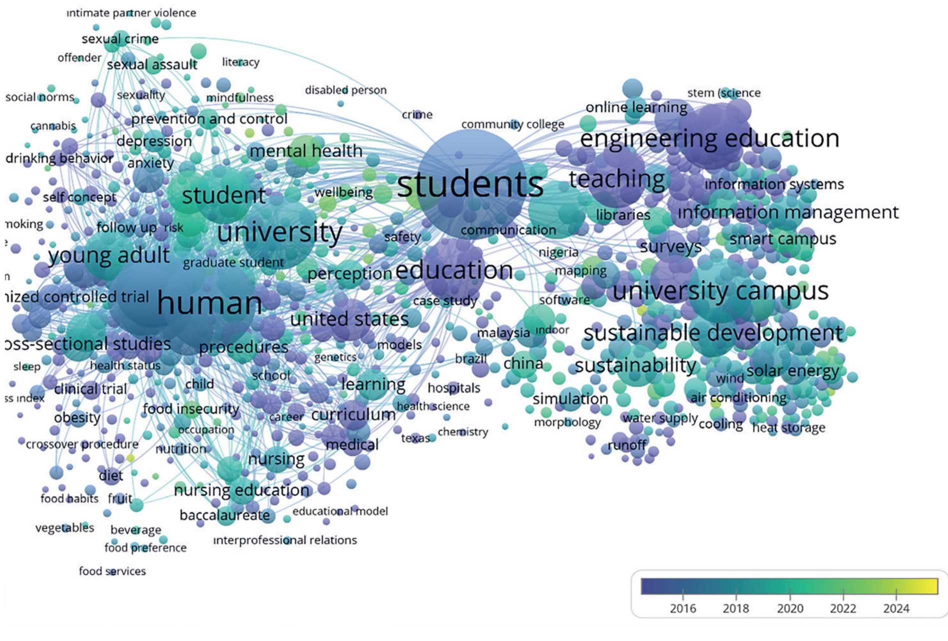


Fig. 14. Distribution map of publications on the research terms by years.

Figure 15 presents the top 10 most cited articles along with their corresponding citation counts. According to the data, Bao (2020) ranks first with a total of 1571 citations, followed by Scheuer (2003) with 631 citations, and Middel (2014) with 527 citations. Other highly cited publications include Berman (2014), Engel (2015), and Blocken (2012), each of which makes significant contributions to the field's academic influence. Table 1 provides detailed information about these top-cited publications, including their research focus and methodological approaches. These findings indicate that highly cited studies predominantly address themes such as sustainability, environmental modelling, and technological innovation, reflecting the interdisciplinary nature of current research trends.

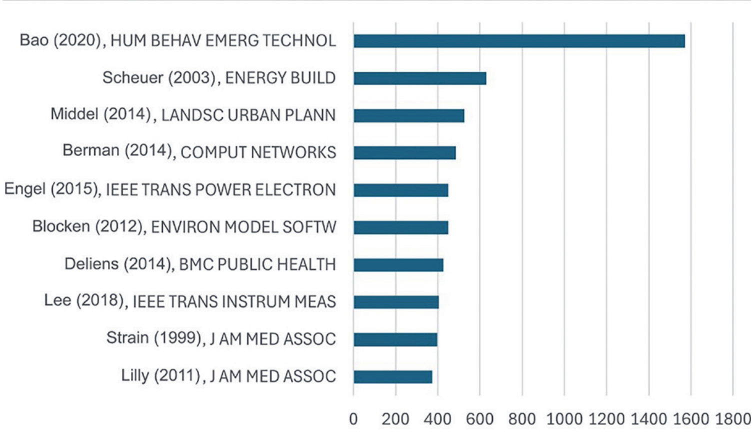


Fig. 15. Most cited articles [by the authors].

TABLE I

Summary of the Top Ten Most Cited Articles [by the authors]

Article title	Method	Reference
COVID-19 and Online Teaching in Higher Education: A Case Study of Peking University	Analyses instructional strategies and principles for effective online education during the COVID-19 pandemic, focusing on design, delivery, and contingency plans for higher education.	Wei Bao, 2020 [18]
Life Cycle Energy and Environmental Performance of a New University Building	Utilises life cycle assessment to evaluate energy consumption, material use, and environmental impact across a building's lifespan, highlighting challenges in sustainable design.	Scheuer et al., 2003 [19]
GENI: A Federated Testbed for Innovative Network Experiments	Describes the design and deployment of GENI as a virtual testbed for advanced networking experiments, including SDN and distributed computing innovations.	Berman et al., 2014 [20]
Impact of Urban Form and Design on Microclimate in Phoenix Local Climate Zones	Uses ENVI-met simulations to study how urban design influences mid-afternoon microclimate conditions, identifying effective cooling strategies for semi-arid cities.	Middel et al., 2014 [21]
Comparison of Modular Multilevel DC Converter and Dual-Active Bridge Converter	Benchmarks two power converter types for HVDC and MVDC grids, evaluating efficiency, cost, and scalability in renewable energy applications.	Engel et al., 2014 [22]
CFD Simulation for Pedestrian Wind Comfort and Safety in Urban Areas	Develops a framework using CFD to evaluate wind flow, safety, and comfort in urban environments, validated with field measurements, and applied to Eindhoven University.	Blocken et al., 2012 [23]
Moderate- vs High-Dose Methadone in the Treatment of Opioid Dependence	Conducts a randomised trial comparing efficacy and retention rates of moderate- and high-dose methadone for opioid dependence treatment.	Strain et al., 1999 [24]
Determinants of Eating Behaviour in University Students: A Qualitative Study	Explores factors influencing eating behaviours through focus groups, offering tailored recommendations for promoting healthy eating in a university setting.	Deliens et al., 2014 [25]
Monitoring of Large-Area IoT Sensors Using LoRa Wireless Mesh Network System	Designs and evaluates a LoRa mesh network for IoT sensor monitoring, demonstrating enhanced packet delivery ratio and cost efficiency.	Lee & Ke, 2018 [26]
Hospital Mortality, Length of Stay, and Preventable Complications with Tele-ICU	Analyses the impact of tele-ICU systems on critical care outcomes, emphasising adherence to best practices and reduction in preventable complications.	Lilly et al., 2011 [27]

According to Table I, the ten most frequently cited publications encompass a broad spectrum of themes, including sustainability, microclimatic performance, user comfort, and the application of digital technologies within campus environments. These studies adopt diverse methodological frameworks (ranging from case analyses and simulation-based models to experimental approaches and qualitative investigations), thereby providing multidimensional insights into contemporary challenges in campus design. The overarching trends emerging from these studies emphasise two pivotal directions – the transition toward sustainable development and the digital transformation of academic environments, both of which signify the evolution of university campuses into energy-efficient and technologically adaptive spaces.

1. **COVID-19 and Online Teaching in Higher Education: A Case Study of Peking University (Wei Bao, 2020) [18]**
   - Significance: This study elucidates how the rapid transition to online learning during the pandemic necessitated spatial and technological adaptations in higher education institutions.
   - Key Insight: It underscores the role of digital and flexible spatial infrastructures in enabling hybrid modes of education within campus contexts.
2. **Life Cycle Energy and Environmental Performance of a New University Building (Scheuer et al., 2003) [19]**
   - Significance: Through life cycle assessment, this research evaluates the energy performance and environmental footprint of university buildings, offering valuable knowledge for sustainable architectural practice.
   - Key Insight: The study recommends integrating sustainable materials and energy-efficient systems into the design process early to achieve long-term ecological benefits.
3. **GENI: A Federated Testbed for Innovative Network Experiments (Berman et al., 2014) [20]**
   - Significance: This paper explores the establishment of GENI as an experimental platform for advanced networking, highlighting its potential implications for digital innovation in campus infrastructures.
   - Key Insight: It presents campus networks as living laboratories for scalable technological development and interdisciplinary research.
4. **Impact of Urban Form and Design on Microclimate in Phoenix Local Climate Zones (Middel et al., 2014) [21]**
   - Significance: Using ENVI-met simulations, the research examines the impact of urban morphology on local microclimates, particularly within arid regions.
   - Key Insight: It provides actionable strategies for mitigating heat stress in campus environments through spatial organisation and green infrastructure.
5. **Comparison of Modular Multilevel DC Converter and Dual-Active Bridge Converter (Engel et al., 2014) [22]**
   - Significance: This comparative analysis of power converter systems offers insights into renewable energy applications suitable for campus-scale infrastructures.
   - Key Insight: The findings emphasise the potential of modular and scalable energy systems in achieving cost-effective sustainability.
6. **CFD Simulation for Pedestrian Wind Comfort and Safety in Urban Areas (Blocken et al., 2012) [23]**
   - Significance: The study employs computational fluid dynamics (CFD) to assess wind conditions affecting pedestrian safety and comfort on campuses.
   - Key Insight: It introduces a quantitative framework for evaluating aerodynamic influences on campus usability and outdoor spatial design.
7. **Moderate- vs High-Dose Methadone in the Treatment of Opioid Dependence (Strain et al., 1999) [24]**
   - Significance: While focusing on healthcare, this study indirectly highlights the value of campus-based medical and psychological support services.
   - Key Insight: It supports the integration of dedicated health and recovery facilities within university settings.
8. **Determinants of Eating Behaviour in University Students: A Qualitative Study (Deliens et al., 2014) [25]**
   - Significance: This qualitative investigation analyses the social and environmental determinants of students' dietary behaviours.
   - Key Insight: The results advocate for inclusive and health-oriented campus food systems that encourage sustainable eating habits.
9. **Monitoring of Large-Area IoT Sensors Using LoRa Wireless Mesh Network System (Lee & Ke, 2018) [26]**
   - Significance: This study demonstrates the feasibility of IoT-based monitoring systems for campus-scale management.
   - Key Insight: It underscores the growing relevance of data-driven "smart campus" approaches for optimising environmental and operational performance.
10. **Hospital Mortality, Length of Stay, and Preventable Complications with Tele-ICU (Lilly et al., 2011) [27]**
    - Significance: The research examines the impact of telemedicine technologies on healthcare outcomes, highlighting the potential of remote monitoring systems.
    - Key Insight: It advocates incorporating telehealth and digital monitoring infrastructures within academic medical facilities.

III. Synthesis of Findings

The collective analysis of these studies identifies three dominant paradigms in contemporary campus research

- Sustainability and environmental performance: The integration of energy-efficient technologies and climate-sensitive design strategies emerges as a core concern.
- Digital and technological transformation: Smart systems, IoT applications, and hybrid learning environments are redefining campus functionality.

- Human-centred design approaches: Emphasis on health, safety, comfort, and well-being reflects a shift toward inclusive and adaptive campus ecosystems.

IV. Discussion and Conclusion

This study presents a comprehensive bibliometric assessment of university campus design research, tracing its principal trends, gaps, and prospective directions. The corpus was compiled from Scopus and Web of Science and analysed with VOSviewer and Biblioshiny; the search, conducted on 3 November 2025, identified 10,771 publications (2010–2025) containing the term "university campus design," after which inclusion criteria were applied to construct the mapping dataset. The review process was documented using the PRISMA framework to ensure transparency and replicability.

The temporal analysis reveals a sustained increase in scholarly production throughout the period, with a notable acceleration after 2016 and a peak in activity between 2021 and 2024. Aggregate indicators also point to steady expansion and diffusion of the field: the annual growth rate is 6.08 %; international co-authorship accounts for 11.37 % of outputs; the average age of publications is 6.16 years; and the average citations per publication is 9.63. The smaller count in 2025 reflects the early timing of the query, before full-year indexing.

Sustainability emerges as a central thematic axis. Keyword co-occurrence and clustering reveal a persistent focus on "sustainable development" and "sustainability," alongside energy- and climate-responsive strategies that frame campus design as an environmental performance issue. These emphases are consistent with highly cited contributions that foreground life-cycle assessment and microclimate-sensitive planning.

Digital transformation constitutes a second central strand. The post-pandemic expansion of hybrid pedagogy has strengthened the roles of digital infrastructures, smart-campus instrumentation, and data-driven management domains captured by clusters such as "engineering education," "information management," and "smart campus," and exemplified by widely cited work on the rapid pivot to online education and IoT-based monitoring.

The field's interdisciplinarity is evident in its broad scope across multiple disciplines. The social sciences constitute the largest share of research activity, followed by engineering and computer sciences, with additional contributions from medicine, environmental sciences, and energy, underscoring the need to integrate pedagogical, technical, and ecological perspectives in campus planning.

At the same time, several gaps remain. Evidence on modular, scalable campus configurations that can adapt to fluctuating enrollments and technological changes is comparatively limited, and socio-cultural dimensions (including mental health, community integration, and inclusivity) are still underrepresented. Addressing these gaps will require stronger cross-country collaboration networks, longitudinal evaluations of built interventions, and living-lab approaches that couple quantitative performance data with user-centred evidence.

In sum, the knowledge base on university campus design has expanded rapidly. It now coheres around two dominant commitments (environmental stewardship and digital enablement) within a broadly human-centred, educational remit. Future research should build upon these strengths by advancing adaptable spatial frameworks and richer social metrics, thereby equipping campuses to remain sustainable, data-driven, and inclusive in the face of ongoing pedagogical and climatic changes.

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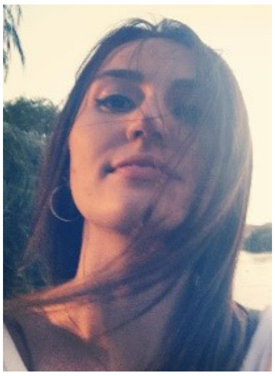

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