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Challenges and Strategies for the Sustainable Architectural Education in the Context of Post-Urbanization and Climate Change

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Abstract: The transformation of urbanization patterns due to the pandemic and climate change have significantly reshaped construction market demands, presenting substantial challenges to current architectural education (AE) models. In order to address these challenges and propose effective reform strategies, this study utilizes questionnaires and expert interviews to gather perspectives from architecture students and professionals in a Chinese university. The findings highlight three main issues in AE: (1) misalignment between talent development stages and educational goals; (2) slow updates to curriculum content, leading to lagging behind the needs of times; and (3) inadequate integration of curriculum design with practical application, coupled with excessively lengthy academic programs. To address these challenges, the study proposes the strategies: (1) adopting multi-objective and multi-track approaches for educational goals; (2) reducing length of programs and implementing flexible academic structures; and (3) developing curricula that integrate knowledge with practice. This research offers valuable insights for reforming architectural education within the framework of sustainable development, emphasizing the need for educational goals, curriculum, and cultivation system to evolve to meet the demands of modern practice and development.

Keywords: Architectural Education; Curriculum Reform; Urbanization; Sustainable Development.

1. Introduction

The global climate change and pandemic pose serious and long-lasting challenge on the sector of architecture. The intensification of global climate change has heightened the demand for sustainable architecture around worldwide[1,2]. Green buildings, low-carbon architecture, renewable energy sources, and energy-saving technologies have become the mainstream trends in the architecture market of some developed countries[3,4]. Meanwhile, the outbreak of the pandemic has led to a fundamental shift in people's demands for the built environment. It becomes the consensus that architecture need to provide safer and healthier spaces to reduce the risk of virus transmission[5]. Furthermore, the widespread adoption of remote work has introduced new requirements for space and environment[6]. In all, sustainable, resilient, and healthy buildings are emerging as the predominant trend within the architecture sector.

As one of the world's largest building market, China has now progressed into a post-urbanization phase characterized by quality enhancement, sustainable development, green ecology, urban-rural integration, and a people-centered approach[7]. As a result, the architecture sector has encountered significant challenges over the past three years due to the pandemic and a transition in urbanization[8]. The industry has been affected by declining investments, reduced demand, rising costs, and widespread project delays. Statistics from the first half of 2020 indicates that 12,000 construction projects nationwide were halted, representing 30% of all ongoing projects[9]. These disruptions have directly influenced the supply and demand dynamics of architectural professions in China. University enrollment in architecture programs has markedly declined, with numerous reports of graduates struggling to align their skills with the evolving industry requirements[10,11]. Students face increasing uncertainty about their academic and career prospects, leading to a growing trend of architecture graduates pursuing careers outside the field[12]. Additionally, many employers have expressed concerns about a decline in the overall competency of recent graduates, noting deficiencies in the practical and interdisciplinary skills essential for today's architectural landscape[13].

The climate change and pandemic have significantly impacted urban development patterns, necessitating a re-evaluation of architectural education (AE) to better align with the evolving demands of the industry. Throughout history, AE has been grounded in both theoretical knowledge and practical skills, typically transmitted through mentorship, focusing on spatial, formal, and constructive principles to cultivate architectural professionals, primarily architects. From Vitruvius' "Ten Books on Architecture" in ancient Rome to the emergence of specialized AE during the Renaissance, and the establishment of academically oriented AE systems, to the development of modern university-based architectural education, the evolving socio-economic and cultural contexts have continuously shaped AE and profession[14]. However, AE has long faced criticism for its slow pace of change and misalignment with industry demands[15]. The developmental trajectory of the architectural profession across different periods has consistently driven changes in the required competencies and knowledge structures of architects, thereby serving as the impetus for reforms in AE[16].

However, against the backdrop of climate change, environmental concerns, and public health issues, the existing AE system, rooted in traditional teaching methods and

frameworks, is no longer adequate to meet the evolving needs of the architectural industry[17]. There is an urgent need to cultivate architectural professionals capable of addressing the demands of green building, sustainable development, low-carbon construction, and healthy living environments through interdisciplinary approaches and innovation[18]. Therefore, this study examines the current state of AE in China, identifying key issues and proposing strategies for reform to ensure the relevance and effectiveness of educational practices in the context of sustainable development.

2. Methods

This study employs a mixed-method research design, integrating quantitative data collection through questionnaires and qualitative insights through expert interviews. This approach was chosen to gain a holistic understanding of the challenges and necessary reforms in architecture education, specifically within the context of a Chinese university facing shifts in post-urbanization.

2.1. Data Collection

The mixed-method approach allows for a comprehensive analysis of the problem by combining quantitative and qualitative perspectives:

A structured questionnaire was distributed to architecture students to capture their general perceptions of issues related to the current AE education they received. This data provides statistical insights into students' perspectives on curriculum, instructional goals, and the alignment of educational content with the evolving architectural industry. The questionnaire includes four sections: an introduction with the study's aim and profile questions; an analysis of educational goals with three rating questions and two open-ended questions, using a 5-point Likert scale for comparability while mitigating response limitations through open-ended questions; an analysis of the educational structure with three closed-ended and two open-ended questions; and an examination of curriculum development with five closed-ended (including one multiple-choice) and two open-ended questions.

Semi-structured interviews with architecture experts were conducted to gain in-depth insights into the key issues of current architecture education. These interviews allow experts to discuss complex educational challenges in details and offer grounded recommendations based on professional and academic experience. Based on these expert inputs, the student questionnaire was similarly structured into four sections-introduction, goals, structure, and curriculum-comprising twelve closed-ended questions. Each interview was recorded, transcribed, and coded for thematic analysis.

2.2. Participants

The study recruited 8 architecture Experts and 30 currently enrolled architecture students, all of whom volunteered. The selection criteria for experts was: the holding both undergraduate and graduate degrees in architecture; having at least five years of relevant experience in architecture and education; and possessing prior experience in guiding studio courses. Data were collected through in-depth interviews and questionnaires for the professionals, and questionnaires for the students. The 30 student participants included a representative sample of architecture students from a University in Yunnan. Their responses reflect a range of educational stages, from foundational to advanced coursework.

2.3. Data Analysis

Responses from the questionnaires were analyzed using descriptive statistics by SPSS (v 28.0) to identify the main AE's issues from student perspectives. It provided insights into commonly perceived challenges in AE, such as curriculum lag, goal misalignment, and practice integration.

Thematic analysis was employed to analyze the expert interview transcripts. Key themes related to issues and improvement recommendations of AE were identified, coded, and compared to student feedback. This allowed for comparison between student and expert data, providing a holistic understanding of current AE.

2.4. Validity and Reliability

To ensure the reliability of the findings, another coders reviewed and cross-checked the themes emerging from the expert interviews. Member checking was also conducted by sharing initial findings with a subset of expert participants, ensuring that interpretations accurately reflected their views. Additionally, the questionnaire was piloted with a small group of students to refine the clarity of questions and improve its internal consistency.

3. Result

The respondents included 13 males (43.3%) and 17 females (56.7%), with 20 undergraduate students (66.7%) and 10 graduate students (33.3%). The most respondents (76.7%) believe that the current AE is inadequate in cultivating talents for sustainable development. The main issues include lagging course content updates (53.3%), insufficient interdisciplinary collaboration (26.7%), and weak practical teaching components (13.3%). The factors influencing the sustainable development of AE are diverse, including external motivations such as employment and further study prospects (66.7%), as well as internal constraints such as knowledge and skill reserves (30%) and degree type (33.3%). Additionally, economic conditions (3.3%) are also an influencing factor to a certain extent. This suggests that AE reform requires not only internal efforts from universities but also collaboration from industry, society, and other parties. Cultivating sustainable architectural design talents faces numerous obstacles, mainly concentrated in knowledge integration (19.9%), digital application (20.9%), heritage conservation (21.9%), and practical teaching (21.9%). This reflects the shortcomings of AE in cross-disciplinary integration, new technology application, and the combination of theory and practice, which urgently need improvement. In terms of improvement strategies, respondents generally suggest strengthening practical teaching and school-enterprise cooperation (56.7%), offering interdisciplinary courses (56.7%), balancing the proportion of theory and practice (30%), and promoting digital teaching (20%). These measures help to improve the pertinence and adaptability of talent cultivation and provide students with diversified growth paths [6]. Meanwhile, streamlining the program duration (63.3%) and adopting flexible training approaches are also important directions for reform.

Table 1. Survey framework

Code	Questions	Answer formats
A	Basic information	
A1	Gender	Female/male
A2	Intention to change major	Yes/No
A3	Intention for graduate study	Yes/No
B	Issues about Goal of AE	
B1	Severity of the issues	Likert 5-point scale
B2	Goal of AE	Options
B3	Issues of Goal	Options
B4	Alignment of Goal and dual carbon development'	Options
C	Issues about Length of AE study	
C1	Attitudes to current length	Yes/No
C2	Ideal length of study	Options
C3	Length of study and market demand	Likert 5-point scale
D	Issues about AE content	
D1	Alignment of content and market	Likert 5-point scale
D2	Issues of AE content	Options
D3	Content ought to add	Options
D4	Issues with design courses	Options

Table 2. The dataset of survey

		Number	Percent
A1	Male	13	43.3%
	Female	17	56.7%
A2	Yes	10	33.3%
	No	20	66.7%
A3	Yes	23	76.7%
	No	7	23.3%
B1	1	0	0.0%
	2	10	33.3%
	3	14	46.7%
	4	4	13.3%
	5	2	6.7%
B2	Developing architects	0	0.0%
	Developing professionals in the building industry	4	13.3%
	Cultivating architectural design capabilities	26	86.7%
	Developing academic experts	0	0.0%
B3	Gap between teaching and practice	16	53.3%
	Inadequate teaching staff	2	6.7%
	Lack of interdisciplinary collaboration	8	26.7%
	Insufficient practical opportunities	4	13.3%
B4	1	3	10.0%
	2	6	20.0%
	3	19	63.3%
	4	2	6.7%
C1	Yes	16	53.3%
	No	14	46.7%
C2	Undergraduate 5y, Graduate 3y	8	26.7%
	Undergraduate 5y, Graduate 2y	4	13.3%
	Undergraduate 4y, Graduate 3y	8	26.7%
	Undergraduate 4y, Graduate 2y	10	33.3%
C3	Degree type	0	0.0%
	Financial factors	1	3.3%
	Employment and further study	20	66.7%
	knowledge and skills	9	30.0%
C4	1	2	6.7%
	2	3	10.0%
	3	17	56.7%
	4	5	16.7%
	5	3	10.0%
D1	1	2	6.7%
	2	9	30.0%

	3	17	56.7%
	4	2	6.7%
	5	0	0.0%
D2	Excessive courses	18	24.7%
	Outdated course	15	20.5%
	Lack of interdisciplinary collaboration	11	15.1%
	Shortage of practical-related courses	16	21.9%
	Lack of collaboration between courses	13	17.8%
D3	Ecological and sustainable architecture	18	19.8%
	Digital design and artificial intelligence	19	20.9%
	Heritage conservation and historical buildings	16	17.6%
	Smart construction and materials	19	20.9%
	Data analysis and smart architecture	19	20.9%
D4	Emphasis on knowledge transfer	6	20.0%
	Weak connections between knowledge and practice	6	20.0%
	Inadequate encouragement for innovation	1	3.3%
	Lack of diversity in design values	9	30.0%
	Gap between design course and theoretical	8	26.7%

4. Discussion

The results reveal a significant gap between the current educational practices and the demands of sustainable development in the post-urbanization and climate change era. The high percentage of respondents (76.7%) who believe that AE is not adequately addressing sustainability issues.

The study emphasizes the specific obstacles in cultivating sustainable architectural students, such as the lack of knowledge integration (19.9%), inadequate application of digital technologies (20.9%), and shortage of heritage conservation courses (21.9%). This highlights the need for a comprehensive approach to reform that involves not only educational institutions but also industry partners and societal stakeholders.

The architectural experts' make suggestions for improvement, such as strengthening practical teaching (56.7%), offering interdisciplinary courses (56.7%), and promoting digital teaching (20%), offer valuable strategies for AE reform. These measures aim to enhance the relevance and adaptability of talent cultivation, preparing students to tackle the complex challenges of sustainable development in their future careers.

Overall, these findings highlight the urgent need for AE reform in China. Three main issues of AE and the corresponding solutions are proposed.

4.1. Issue 1: The Mismatch of AE's Goal Positioning at Various Stages

The goals of AE at different stages (undergraduate, graduate, and doctoral) are not well-aligned, leading to a disconnect between the skills and knowledge students acquire and the demands of the industry. This mismatch hinders the effective cultivation of qualified students who can address the challenges of sustainable development in the post-urbanization and climate change context.

It is evident that a significant number of students and professionals perceive substantial deficiencies in the current architecture education framework. Specifically, for undergraduate programs, there is a consensus that a greater emphasis on general AE instead of professional AE is necessary. This perspective, however, conflicts with the current objectives of AE for undergraduate program.

The existing AE model has primarily been structured to provide a substantial number of architects to address the needs of rapid urbanization. Consequently, the training objectives have traditionally encompassed the development of professional architects engaged in design practice, scholars in architectural research, and practitioners in related fields such as construction and management.

Notably, in contrast to the previous decade, a significant shift has occurred. An increasing number of undergraduate graduates are considering further academic pursuits at the graduate level. Concurrently, the deceleration of growth in the construction market has reduced the demand for professional architects, leading many students to seek flexible employment opportunities in alternative sectors.

Both educators and professionals broadly advocate for a clear distinction between academic and professional master's programs. However, the existing training objectives for these two categories often exhibit minimal differentiation. The ambiguity could be attributed to the constraints imposed by the current educational framework-which mandates that both undergraduate and graduate professional degrees adhere to the Canberra Architecture Education Protocol and national professional assessment criteria-has resulted in significant overlaps in training objectives and educational content for undergraduate and graduate programs. It further complicates the clear educational goals for graduate education.

4.2. Issue 2: Slow Update of AE Knowledge System

The experts highlighted that the knowledge system of architecture encompasses various disciplines such as aesthetics, history, construction, structure, and management. In the era of knowledge explosion, the boundaries of these disciplines are rapidly expanding and intersecting, and the impact of multi-disciplinary knowledge on the architectural industry is constantly changing. The AE system curriculum has been continuously complex without removing old courses.

Moreover, under the constraints of credit limits, the course units are becoming more fragmented, and students are struggling to cope with various professional courses, making it difficult for them to grasp the core knowledge of

architecture. Students lack sufficient time to consolidate their foundation, cultivate their interests, engage in independent in-depth study, or carry out practical activities[19].

Some new theories, methods, technologies, and tools urgently needed by contemporary society and the industry have not yet been incorporated into AE curriculum. The course knowledge lags behind the development requirements of architectural intelligence, green design, and industrialization. Courses such as data processing and visualization, basic computer programming languages, sociological theories and methods, green building evaluation, and prefabricated building design are lacking, making it difficult to support design investigation, analysis, and research in the architecture discipline.

To address this issue, experts suggest regularly reviewing and updating the AE curriculum to keep pace with the changing landscape of architecture. This involves collaborating with industry partners, research institutions, and other stakeholders to identify emerging trends, technologies, and best practices in sustainable design. The curriculum should be revised accordingly, incorporating new courses, modules, and teaching materials that reflect the most up-to-date knowledge and skills required for sustainable architectural practice. Furthermore, the curriculum should be streamlined to focus on the core knowledge and skills essential for architectural practice, while providing students with sufficient time and opportunities for in-depth study, practical experience, and independent research.

4.3. Issue 3: Gap between Theory and Practice

A significant concern identified by experts within the field of AE is the growing disparity between architectural theory and practice. Most of the correspondents believe the gap is a serious issue for the sustainable AE development. While academic programs place substantial emphasis on theoretical knowledge, conceptual frameworks, and historical analysis, there is a notable deficiency in how students are trained to apply these concepts in architectural practice, particularly design practice. This disconnect often leads to graduates who are well in architectural theory but underprepared for the multifaceted demands of professional practice.

The current curriculum tends to focus on the intellectual and creative aspects of students' capacities, often neglecting the pragmatic and operational components that are critical in practice. While students may demonstrate exceptional proficiency in theoretical design exercises and studio projects, they frequently lack the necessary exposure to real-world challenges such as project implementation, interaction with clients, compliance with regulatory frameworks, and adaptation to material and budgetary constraints.

In many cases, AE does not systematically incorporate industry collaborations, internships, or apprenticeships into the core of the curriculum. Even when such opportunities are available, they may be inadequately structured or insufficiently supervised, limiting their effectiveness in bridging the theory-practice divide. As a result, students often graduate with limited practical experience.

The rapid advancement of architectural technologies, such as BIM, parametric design, and sustainable construction methods, presents an additional challenge. Many academic programs struggle to keep pace with these innovations, leaving students underprepared to apply the latest tools and methodologies in professional settings.

In the current AE system, the focus on design competitions, conceptual projects, and theoretical problem-solving, while valuable for fostering creativity and critical thinking, may inadvertently marginalize the importance of technical proficiency and practical problem-solving skills. This imbalance can create a scenario where graduates are adept at producing visionary designs but lack the practical knowledge necessary to bring these designs to fruition within the constraints of real-world projects. The widening gap between theory and practice in AE represents a significant challenge that must be addressed through systemic reforms.

4.4. Strategy 1: Develop a Diversified, Network-Based Training Pathway System

To address the mismatch between the goals of AE and the demands of the industry, experts suggest adopting a multi-goal and multi-track approach in AE. This approach involves setting clear and distinct goals for each stage of education, tailoring the curriculum and teaching methods to meet the specific needs of students and the industry.

The goals of AE can be generally classified into three categories: 1) cultivating students with knowledge and skills for the architectural industry, such as professional architects and design management personnel; 2) cultivating innovative researchers for universities, scientific research institutions, or technical R&D institutions in architecture-related fields; 3) providing students with general knowledge and skills, or interdisciplinary training experience, to society, who may not engage in architecture-related work.

Under these cultivation goals, the experts recommend optimizing the objectives and tracks for undergraduate and graduate students. Overall, the entire training path is divided into two tracks: "professional" and "academic." The former aims to cultivate professionals required by the architectural industry, including professional education for Bachelor of Architecture, Master of Architecture, and future doctoral education. The latter aims to cultivate academic research talents, including academic master program and traditional research-oriented doctoral training.

By adopting this approach, AE can better align with the diverse needs of the industry and society. Undergraduate programs could focus on building a strong foundation in architectural knowledge and skills, while graduate programs could provide specialized knowledge and research capabilities in sustainable design. This approach allows for a more targeted and effective cultivation of architectural talents, ensuring that graduates are well-prepared to tackle the challenges of post-urbanization and climate change in their future careers.

4.5. Strategy 2: Shorten Training Duration and Enhance Industry Participation

To keep pace with the development of architecture and address the issue of excessively long academic systems in AE, experts recommend establishing a regular review and update mechanism for the AE curriculum and shortening the training duration by streamlining degree connections, flexibly setting stage exits, and adjusting the academic system.

The undergraduate training stage adopts two academic systems: a four-year system and a five-year system, corresponding to a Bachelor of Engineering and a Bachelor of Architecture, respectively. Students who intend to pursue further studies or no longer engage in architecture-related work can choose the four-year program

For students continuing to pursue graduate studies in

architecture, their program includes a one-year transition period before the graduate stage. The transition period in the academic training track mainly focuses on learning research methodology and conducting scientific research training, while the transition period in the professional training track is primarily used to improve professional skills and carry out professional practice required in professional assessments.

Furthermore, the shortening of the academic system is reflected in the integration of programs at different stages. By establishing a mutual recognition mechanism between the undergraduate and graduate stages, and removing links that do not align with the training objectives, unnecessary repetition can be avoided.

In addition to shortening the training duration, experts also suggest increasing enterprise participation in AE. This involves collaborating with industry partners to identify emerging trends, technologies, and best practices in sustainable design, and incorporating them into the curriculum. Enterprises can also provide internships, design projects, and research opportunities for students, allowing them to gain practical experience and develop professional competencies.

4.6. Strategy 3: Implementing a System for Updating Cutting-Edge Technological Knowledge

To keep pace with the advancement of technology and society, it is encouraged through various initiatives, such as establishing partnerships with architectural firms, government agencies, and NGOs to provide students with internships, design projects, and research opportunities, integrating practical design studios and workshops into the curriculum, and organizing field trips, site visits, and case studies to expose students to the realities of architectural practice and sustainable design implementation. More efforts should be dedicated to the following aspects:

The digital architecture and intelligent module respond to the development trends of new industrialization and informatization. The training program reduces traditional advanced mathematics courses and collaborates with teachers from the School of Science to develop courses such as an introduction to modern mathematical thinking, and computer data processing and visualization.

The program should expand its content in cutting-edge green building technologies, energy-efficient architectural design, indoor environment and healthy living, and solar energy architecture. In the field of social impact and spatial intervention of architecture, new courses such as urban sociology, architectural anthropology, and engineering ethics are introduced to cultivate students' ability to observe, predict, and intervene in the social impact of architecture, addressing the deficiencies of traditional AE programs in sociological theories and social survey methods.

The humanities and theoretical foundation module provide a humanistic and general education foundation for the study and research of architectural theory, including courses in philosophy, aesthetics, art, logic, and architectural history.

Experts suggest integrating new teaching methods and technologies into AE to enhance the learning experience and bridge the theory-practice gap. This includes adopting problem-based learning, case-based teaching, and experiential learning approaches to engage students in real-world problem-solving and decision-making. Digital technologies such as virtual reality, augmented reality, and building information modeling (BIM) can also be incorporated into the curriculum to provide students with immersive and interactive learning experiences.

5. Conclusion

The study identifies the main problems of AE in the post-urbanization era and proposes corresponding strategies for improvement. The goal, curriculum, and cultivation system of AE should keep pace with the times. The integration of sustainable development concepts into AE is crucial for cultivating architectural professionals who can contribute to the sustainable development of the industry and society.

The findings highlight the urgent need for AE reform to address the challenges posed by post-urbanization and climate change. By adopting a multi-goal and multi-track approach, regularly updating the curriculum, strengthening industry-university collaboration, and integrating multi-disciplinarian courses and teaching methods, AE in China can better equip students with the knowledge, skills, and competencies necessary for sustainable architectural practice. The study provides a pathway for targeted interventions to bridge the gaps in AE and equip students with the necessary skills and knowledge for sustainable design. The insights gained from this study can inform the development of evidence-based policies and practices to promote sustainable AE and contribute to the creation of a more sustainable built environment.

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References

[1] Megahed, N.A.; Ghoneim, E.M. Antivirus-Built Environment: Lessons Learned from Covid-19 Pandemic. Sustainable cities and society 2020, 61, 102350.

[2] Ebekozien, A.; Aigbavboa, C. COVID-19 Recovery for the Nigerian Construction Sites: The Role of the Fourth Industrial Revolution Technologies. Sustainable Cities and Society 2021, 69, 102803.

[3] Saleh, M.M.; Abdelkader, M.; Hosny, S.S. Architectural Education Challenges and Opportunities in a Post-Pandemic Digital Age. Ain Shams Engineering Journal 2023, 14, 102027.

[4] Hodson, M.; Marvin, S. Can Cities Shape Socio-Technical Transitions and How Would We Know If They Were? Research policy 2010, 39, 477–485.

[5] Chen, M.; Liu, W.; Lu, D. Challenges and the Way Forward in China's New-Type Urbanization. Land use policy 2016, 55, 334–339.

[6] Tzonis, A. Architectural Education at the Crossroads. Frontiers of Architectural Research 2014, 3, 76–78.

[7] Nicol, D.; Pilling, S. Changing Architectural Education: Towards a New Professionalism; Taylor & Francis, 2005; ISBN 0-203-99234-2.

[8] Salama, A.; Crosbie, M. Educating Architects in a Post-Pandemic World. Common\Edge 2020.

[9] Altomonte, S.; Rutherford, P.; Wilson, R. Mapping the Way Forward: Education for Sustainability in Architecture and

Urban Design. Corporate Social Responsibility and Environmental Management 2014, 21, 143–154.

[10] Altomonte, S. Environmental Education for Sustainable Architecture. Rev. Eur. Stud. 2009, 1, 12.

[11] Boarin, P.; Martinez-Molina, A.; Juan-Ferruses, I. Understanding Students' Perception of Sustainability in Architecture Education: A Comparison among Universities in Three Different Continents. Journal of Cleaner Production 2020, 248, 119237.

[12] Domenica Iulo, L.; Gorby, C.; Poerschke, U.; Nickolas Kalisperis, L.; Woollen, M. Environmentally Conscious Design–Educating Future Architects. International Journal of Sustainability in Higher Education 2013, 14, 434–448.

[13] Ren, H.; Folmer, H.; Van der Vlist, A.J. The Impact of Home Ownership on Life Satisfaction in Urban China: A Propensity Score Matching Analysis. Journal of Happiness Studies 2018, 19, 397–422.

[14] Ummihusna, A.; Zairul, M. Investigating Immersive Learning Technology Intervention in Architecture Education: A Systematic Literature Review. Journal of Applied Research in Higher Education 2022, 14, 264–281.

[15] Ibrahim, A.; Al-Rababah, A.I.; Bani Baker, Q. Integrating Virtual Reality Technology into Architecture Education: The Case of Architectural History Courses. Open House International 2021, 46, 498–509.

[16] Zhang, P.; Ma, S.-G.; Sun, Y.; Zhao, Y.-N. Investigating the Gaps between Engineering Graduates and Quantity Surveyors of Construction Enterprises. Sustainability 2024, 16, 2984.

[17] Steinitz, C. On Landscape Architecture Education and Professional Practice and Their Future Challenges. Land 2020, 9, 228.

[18] Rajeev, G.; Mohammad, A.K. Restructuring Architectural Education Post Covid-19: Professional Practice and Construction Industry Expectations. Architecture and Engineering 2022, 7, 29–41.

[19] Donovan, E. Sustainable Architecture Theory in Education: How Architecture Students Engage and Process Knowledge of Sustainable Architecture. Implementing Sustainability in the Curriculum of Universities: Approaches, Methods and Projects 2018, 31–47.