Design Insights

Article

Research on the Development of Employability of Environmental Design Students in the Context of Knowledge Production Mode Transformation

Jie Bai [1,*] and Ajmera Mohan Singh [1]

[1] Faculty of Social Science Arts and Humanities, Lincoln University College, 47301, Malaysia
* Correspondence: Jie Bai, Faculty of Social Science Arts and Humanities, Lincoln University College, 47301, Malaysia

Abstract: Driven by the rapid changes in the knowledge economy and societal demands, higher education is undergoing a significant transformation from the traditional knowledge production mode (Mode 1) to a new mode of knowledge production (Mode 2) characterized by practice orientation and interdisciplinary collaboration. This transformation imposes higher requirements on the educational model of environmental design programs, particularly in cultivating students' employability. Against this backdrop, this study explores the connotation and core dimensions of employability for environmental design students, including professional competence, innovation capability, interdisciplinary collaboration, and practical application skills. Based on an analysis of the current status and challenges, this paper proposes targeted strategies such as optimizing the curriculum system, building diversified practical teaching models, fostering interdisciplinary collaboration and innovation, and strengthening the linkage between career guidance and industry connections. The study argues that by actively responding to the transformation of knowledge production modes, environmental design programs can significantly enhance students' employability, thereby bridging societal demands and individual career development. This research provides both theoretical and practical references for educational reform in environmental design programs and serves as a model for other practice-oriented disciplines.

Keywords: knowledge production mode; environmental design; employability; interdisciplinary collaboration

Published: 26 November 2024

1. Introduction

With the rapid development of the global knowledge economy and the continuous evolution of societal demands, higher education is undergoing profound changes. Among these changes is the shift in knowledge production modes, from the traditional, discipline-centered approach of Mode 1, which emphasizes theoretical knowledge accumulation, to Mode 2, which is problem-oriented and focuses on practice and interdisciplinary collaboration. This transformation has not only redefined the way knowledge is produced and disseminated but has also set new standards for professional education in universities. As a discipline that integrates design and practice, environmental design is directly influenced by this trend, necessitating adaptations in its educational model to better cultivate students' employability and meet the evolving needs of society and industry.Employability is a key factor for environmental design students to succeed in the competitive job market. It encompasses not only a solid foundation of professional knowledge but also the ability to collaborate across disciplines, think innovatively, apply practical skills, and adapt to changes in industry demands. However, current educational models face several limitations in enhancing students' employability, such as a disconnect between curriculum design and societal needs, insufficient practical teaching, and limited opportunities

for interdisciplinary collaboration [1]. These issues hinder the improvement of students' competitiveness and restrict the effectiveness of educational reforms in environmental design programs. Therefore, exploring strategies to cultivate employability in the context of the transformation of knowledge production modes is of significant theoretical and practical value.This study, grounded in the context of the knowledge production mode transformation, systematically analyzes the connotation and core dimensions of employability for environmental design students by combining theoretical exploration with practical insights. It examines the current status and challenges of educational models and proposes targeted strategies for improvement. By offering recommendations for reforms in curriculum design, practical teaching methods, interdisciplinary collaboration, and career guidance, the research aims to provide a reference for educational innovation in environmental design programs and other practice-oriented disciplines. This paper not only contributes to enhancing the employability of environmental design students but also explores effective pathways for higher education to adapt to the new knowledge production modes [2].

2. The Relationship Between Knowledge Production Mode Transformation and Environmental Design Programs

2.1. The Transformation and Characteristics of Knowledge Production Modes

The transformation of knowledge production modes is an inevitable result of social and economic development and technological progress. Since the mid-20th century, the traditional knowledge production mode (Mode 1) has shown increasing limitations in adaptability. Mode 1 is characterized by being discipline-centered, theory-driven, involving a single type of knowledge producer, and being relatively disconnected from practical applications. It predominantly focuses on foundational research conducted in fixed environments such as universities or research institutions, emphasizing theoretical depth and systematic knowledge but lacking in addressing complex societal problems.In the 21st century, diverse societal demands and rapid technological advances have driven the transformation towards Mode 2, a practice-oriented approach. Mode 2 emphasizes interdisciplinarity, multi-stakeholder collaboration, and application-oriented knowledge production. Knowledge is no longer confined to academia but involves the active participation of governments, industries, and social organizations. Additionally, knowledge production sites have expanded beyond traditional academic settings to more open social spaces, leading to the "resocialization" of knowledge and greater focus on its practical value.This transformation is further accelerated by the integration of digital and intelligent technologies [3]. Innovations such as big data and artificial intelligence offer unprecedented convenience in knowledge acquisition, processing, and dissemination, enhancing the dynamism and immediacy of knowledge production. These characteristics allow Mode 2 to address complex societal challenges with greater flexibility and efficiency while providing new opportunities for educational reform in higher education.Under the backdrop of this transformation, the field of education is undergoing significant change. Environmental design, as a practice-oriented discipline, must embrace this trend by incorporating the features of Mode 2—interdisciplinary integration, multi-stakeholder collaboration, and practical application—into its educational framework. By doing so, environmental design programs can cultivate students' comprehensive capabilities and better prepare them for the demands of complex societal environments and competitive job markets. The characteristics of Mode 2 not only redefine the curriculum design and teaching methods in environmental design education but also offer critical theoretical and practical guidance for its innovation [4].

2.2. Analyzing the Knowledge Production Characteristics of Environmental Design

Environmental design is a practice-centered, interdisciplinary field of study with distinct characteristics of diversity and dynamism in its knowledge production. These char-

acteristics require a balance between theoretical depth and practical breadth while ensuring flexibility in solving complex problems. The transformation of knowledge production modes significantly impacts environmental design, particularly in the emphasis on practice orientation, innovation, and collaborative capabilities in employability development.First, the knowledge production in environmental design is highly interdisciplinary. Design processes involve the integration of knowledge from fields such as architecture, landscape design, ecology, sociology, and information technology, requiring students to transfer and integrate knowledge across disciplines [5]. For instance, urban public space design necessitates not only spatial planning expertise but also considerations of ecological sustainability, social culture, and user behavior. This interdisciplinary nature underscores the importance of breaking down academic silos and fostering students' ability to synthesize knowledge and innovate collaboratively.Second, environmental design emphasizes problem-oriented and practical knowledge production. Design practice often addresses specific societal needs, such as urban renewal, ecological restoration, or smart community construction, generating and applying knowledge within real-world contexts. This aligns closely with the application-oriented nature of Mode 2, demanding that students accumulate hands-on experience and develop problem-solving skills through practical engagement. The user-centered aspect of design further requires students to remain attentive to societal trends and user needs, transforming design concepts into solutions of tangible value.Additionally, environmental design knowledge production is characterized by continuous updates. As societal demands evolve and technologies advance, the knowledge base in design fields undergoes constant iteration, necessitating students' capacity for lifelong learning. For example, digital technologies and artificial intelligence are reshaping design workflows and knowledge systems, from building information modeling (BIM) to parametric design. This dynamic landscape requires environmental design education to be more flexible, equipping students with sensitivity to new technologies and adaptability to emerging professional challenges.In summary, the characteristics of knowledge production in environmental design demand a restructured educational approach in response to the transition towards Mode 2. By integrating theoretical and practical knowledge, fostering interdisciplinary collaboration, and promoting dynamic knowledge updating, environmental design programs can align with societal needs, enhancing students' employability and professional growth[6].

3. The Connotation and Dimensions of Employability for Environmental Design Students

3.1. The Definition and Components of Employability

Employability refers to an individual's ability to obtain, retain, and advance in their career, integrating knowledge, skills, attitudes, and external resource coordination. For environmental design students, employability not only determines their competitiveness in entering the workforce but also serves as the key to adapting to industry changes and sustaining professional development. With the transformation of knowledge production modes, the definition of employability has expanded beyond traditional professional skills to encompass a dynamic and diversified set of competencies.The core of employability lies in solid professional knowledge and technical skills [7]. For environmental design students, this includes foundational academic knowledge such as design theory, spatial planning, and sustainable design principles, as well as proficiency in design tools like AutoCAD, SketchUp, and Revit. While these form the basis for fulfilling specific job responsibilities, they must be integrated with interdisciplinary knowledge, such as ecology, information technology, or sociology, to address complex design problems in today's societal context.Innovation is another critical component of employability. In the context of Mode 2 knowledge production, design tasks in environmental design increasingly involve open-ended and complex problem-solving. This requires students to possess creativity in

analyzing issues, developing solutions, and implementing designs. Innovation capabilities are cultivated through design thinking education and further enhanced by iterative learning in project practices. Specifically, innovation manifests in proposing unique and practical design solutions that respond to societal needs, user behaviors, and environmental conditions.Interdisciplinary collaboration is a significant dimension of employability for environmental design students. Modern design projects often involve coordination among architects, engineers, ecologists, and policymakers. Such complex working environments require students to understand the language and logic of different fields and to communicate and collaborate effectively in interdisciplinary teams. Cultivating this ability requires educational strategies that offer students opportunities for interdisciplinary collaboration through course design and practice-based projects while emphasizing teamwork and task division.Practical application skills are another indispensable element of employability. As an applied discipline, environmental design demands that students translate theoretical knowledge into practical design solutions. This involves the entire process from conceptualization to detailed refinement and implementation. Developing these skills depends not only on classroom teaching but also on active participation in real-world projects, internships, and industry partnerships to accumulate hands-on experience.Finally, employability encompasses professional attitudes and soft skills such as responsibility, stress management, self-directed learning, and communication with clients and teams. These non-technical abilities play a vital role in workplace performance and career development. In the context of Mode 2, which emphasizes social responsibility and collaboration, environmental design students must also develop strong professional ethics and user-oriented thinking.In summary, employability is a multidimensional construct. For environmental design students, its core components include professional knowledge and technical skills, innovation, interdisciplinary collaboration, practical application capabilities, and professional attitudes and soft skills. These abilities must be cultivated through an integrated approach to curriculum design, teaching models, and practical activities to comprehensively enhance students' competitiveness and adaptability in the job market [8].

3.2. The Demands of Knowledge Production Mode Transformation on Employability

The shift in knowledge production modes from the theory-oriented, discipline-centered Mode 1 to the interdisciplinary, practice-oriented Mode 2 imposes new and higher requirements on the employability of environmental design students. Mode 2 emphasizes the societal value and practical application of knowledge, requiring students to integrate theory with practice and to solve complex real-world problems through interdisciplinary collaboration and innovation. In this context, students' employability must evolve from a singular skill orientation to a multidimensional, comprehensive competency system.First, the transformation highlights the importance of interdisciplinary knowledge integration. In Mode 2, design work is no longer confined to the perspective of a single discipline but instead requires balancing knowledge across architecture, ecology, engineering, sociology, and more [9]. For instance, urban design projects often encompass environmental sustainability, traffic planning, and sociocultural considerations, necessitating students' ability to analyze problems and formulate holistic solutions using interdisciplinary knowledge. Thus, developing students' ability to integrate interdisciplinary knowledge is crucial for meeting Mode 2 demands and enhancing their long-term career competitiveness.Second, Mode 2 places greater emphasis on practical application skills. In a practice-oriented knowledge production context, environmental design projects are typically goal-driven, aiming to address real-world issues. Students must possess end-to-end capabilities, including needs analysis, concept design, technical execution, and project management. For example, in designing community spaces, students need to create solutions that meet aesthetic and functional requirements while collaborating with multiple stakeholders to ad-

dress practical challenges. Cultivating these skills requires expanded opportunities for industry collaboration, case-based teaching, and internships.Additionally, innovation gains renewed significance in Mode 2. The dynamic and real-time nature of knowledge production necessitates that environmental design students respond swiftly to societal and technological changes, proposing original and socially valuable design solutions. For example, the rise of smart and digital technologies is reshaping design practices with data-driven and technology-integrated trends. Students must develop the ability to incorporate innovation into their designs, such as using parametric tools for intelligent space planning or developing sustainable building solutions.Professional ethics and social responsibility are also vital under the Mode 2 paradigm. With its focus on the societal impact of knowledge, Mode 2 demands that environmental design students integrate ethical considerations and user needs into their work. For instance, urban renewal projects require students to balance the rights of low-income groups with the long-term benefits of community development. This ethical awareness and sense of responsibility are key to achieving the societal value emphasized in Mode 2.Finally, the openness and multi-stakeholder collaboration inherent to Mode 2 require stronger communication and teamwork skills. Design projects often involve participants from governments, enterprises, academia, and community organizations, requiring students to communicate effectively in complex team environments to achieve project goals. In international projects, language proficiency and cross-cultural communication skills also become essential components of employability.In conclusion, the transformation of knowledge production modes demands enhanced interdisciplinary knowledge integration, practical application skills, innovation, professional ethics, and collaboration abilities from environmental design students. These demands reflect the evolving expectations of the modern design industry and provide clear directions for educational reform. By systematically enhancing these competencies, students can better adapt to rapidly changing societal needs and achieve greater value and success in their professional development [10].

4. The Current Status and Challenges in Cultivating Employability of Environmental Design Students

As a highly practical and applied discipline, environmental design aims to equip students with robust employability to meet societal demands and industry requirements. However, the current models for cultivating employability face numerous shortcomings, posing significant challenges for students transitioning into the workforce.In curriculum design, many universities still adhere to traditional academic structures, focusing heavily on theoretical instruction while allocating a relatively small proportion of courses to practical application. Although some institutions have introduced training courses and industry collaboration projects, these initiatives often lack the depth and breadth needed to meet industry standards. Additionally, course content updates have lagged behind advancements in areas like green design, smart technologies, and sustainability, leaving students inadequately prepared for technological changes in the field.Traditional lecture-based teaching methods dominate most programs, limiting student engagement and stifling creativity. While project-based learning and workshops have been piloted at some institutions, their effectiveness is undermined by the lack of comprehensive evaluation criteria and instructors' limited experience in guiding practical projects. Moreover, career support services in universities often focus on basic job-seeking skills like career planning and interview preparation, neglecting the development of interdisciplinary collaboration, innovation, and project management skills crucial for employability.Insufficient resources for practical training further hinder the development of employability. As an applied discipline, environmental design requires students to gain experience through real-world projects. However, limited investment in practical teaching restricts students' opportunities to participate in authentic projects. Moreover, industry-university collaborations often

lack depth and fail to provide students with exposure to the latest industry trends, adversely affecting their practical skills and adaptability to the job market.Innovation and soft skill development remain critical gaps in current employability cultivation. With the shift toward practice-oriented knowledge production, the design industry increasingly demands innovation. Yet, the emphasis on standardized answers in traditional education systems stifles students' creative thinking, leaving them ill-prepared for complex and open-ended design tasks. Additionally, students often lack a deep understanding of essential design principles such as social responsibility, user-centric approaches, and sustainability, limiting their long-term competitiveness in the industry.Finally, shortcomings in interdisciplinary collaboration and internationalization also pose challenges. Modern design projects often require teamwork across disciplines, but most academic programs lack sufficient interdisciplinary coursework, leaving students unprepared for collaborative professional environments. Similarly, limited access to international courses and exchange programs restricts students' exposure to global design trends and standards, diminishing their competitiveness in the global job market.In summary, the current state of employability cultivation for environmental design students falls short of meeting societal and industry needs. Outdated curricula, limited practical resources, inadequate focus on innovation, and gaps in interdisciplinary and international skill development are pressing issues. Addressing these challenges requires comprehensive reforms in educational philosophy, teaching models, and resource allocation to better align with the demands of the knowledge production mode transformation and enhance students' competitiveness and adaptability in the workforce.

5. Strategies for Cultivation in the Context of Knowledge Production Mode Transformation

As the knowledge production mode shifts from the discipline-centered and theory-driven Mode 1 to the practice-oriented and interdisciplinary collaborative Mode 2, the educational and training approaches in environmental design programs require comprehensive reform to better align with industry demands and societal changes. This transformation necessitates adjustments in curriculum systems, teaching models, and practical resource allocation while building an integrated training framework focused on innovation and professional competencies to holistically enhance students' employability and adaptability.First, optimizing the curriculum system is essential to construct a framework that integrates interdisciplinary knowledge and practice orientation. The complexity and diversity of the environmental design industry demand that students master comprehensive knowledge across multiple fields. Therefore, the curriculum should break traditional disciplinary boundaries and incorporate content from ecology, information technology, sociology, and other disciplines. For instance, modules on green design, intelligent technology applications, and human-computer interaction design can address industry frontiers. Additionally, the curriculum should emphasize practical content by incorporating real project cases, university-industry collaboration courses, and interdisciplinary workshops, enabling students to engage deeply in design practice and develop problem-solving skills.Second, it is crucial to diversify and enhance the effectiveness of practical teaching models by building richer platforms for practice. Universities can collaborate with enterprises, governments, and social organizations to establish long-term, stable partnerships, providing students with more opportunities to participate in real-world projects. For example, organizing design competitions, industrial training programs, and community service projects allows students to directly engage with industry needs and gain hands-on experience. Moreover, technologies like virtual reality (VR) and augmented reality (AR) should be utilized to develop virtual simulation platforms, enabling students to replicate design processes in virtual environments and improve their practical skills.Third, fostering innovation capabilities must permeate the entire educational process. Innovation is the core competitive advantage in environmental design. Developing

this capability should begin with design thinking, tool application, and practical projects. For example, courses can introduce design thinking exercises, guiding students to analyze open-ended problems and devise diverse solutions to cultivate creativity. Additionally, teaching parametric design tools, BIM technologies, and other intelligent design applications equips students with methods to integrate innovation into their work. Educators should also encourage students to focus on social responsibility and sustainability, aligning innovation with societal value and proposing designs with significant social impact.Furthermore, cultivating interdisciplinary collaboration skills is a critical aspect of education. Modern design projects often require coordination across multiple fields. Thus, teaching models should simulate real work environments by introducing interdisciplinary team projects. For example, students from architecture, urban planning, and engineering disciplines could collaborate on design tasks, enhancing their teamwork skills through task division and mutual exchange. Internationalization is also vital, and universities should incorporate bilingual courses, invite international experts for lectures, and provide overseas internship opportunities to expose students to global design trends and expand their cross-cultural communication skills.Finally, career guidance and industry engagement should be strengthened. Universities must establish robust career development support systems by offering career planning courses, mock recruitment sessions, and expert-led career talks for targeted employment guidance. Additionally, fostering connections with industry associations and companies can create more opportunities for internships, jobs, and entrepreneurial endeavors. Universities could also develop alumni networks, allowing students to learn from alumni success stories to better plan their career paths and enhance their employability.In summary, cultivating environmental design students' employability in the context of knowledge production mode transformation requires a multifaceted approach, focusing on optimizing curriculum systems, diversifying practical teaching, enhancing innovation capabilities, fostering interdisciplinary collaboration, and strengthening career guidance. These strategies not only improve students' adaptability and competitiveness but also provide a roadmap for the development of environmental design education in response to Mode 2 transformation. By implementing systematic, innovative, and practical training programs, universities can better prepare high-quality talent to meet the future needs of the industry.

6. Conclusion

The shift in knowledge production modes from the theory-driven Mode 1 to the practice-oriented and interdisciplinary collaborative Mode 2 poses new requirements for cultivating the employability of environmental design students. This paper identifies the core dimensions of employability, including professional skills, innovation capabilities, interdisciplinary collaboration, practical application abilities, and professional ethics, while analyzing current challenges such as outdated curriculum systems, insufficient practical resources, and weak innovation training.To address these issues, this study proposes strategies for optimizing curricula, enriching practical teaching, strengthening innovation capabilities, promoting interdisciplinary collaboration, and enhancing career guidance, offering valuable insights for educational reform in universities. The transformation of knowledge production modes presents not only challenges but also opportunities to improve educational quality and student competitiveness. Future research should explore the deeper integration of new technologies and university-industry collaboration to continuously drive innovation and development in environmental design education.

References

1. Pocol, Cristina Bianca, et al. "Knowledge co-creation and sustainable education in the labor market-driven university–business environment." Frontiers in Environmental Science 10 (2022): 781075.
2. Urmetzer, Sophie, et al. "Learning to change: Transformative knowledge for building a sustainable bioeconomy." Ecological Economics 167 (2020): 106435.

3. Guerreschi, Asia, Letizia Piras, and Ferdinand Heck. "Barriers to efficient knowledge transfer for aholistic circular economy: insights towards green job developments and training for young professionals." Youth 3.2 (2023): 553-578.
4. Martínez-Cerdá, Juan-Francisco, Joan Torrent-Sellens, and Inés González-González. "Socio-technical e-learning innovation and ways of learning in the ICT-space-time continuum to improve the employability skills of adults." Computers in Human Behavior 107 (2020): 105753.
5. Avsec, Stanislav, Magdalena Jagiełło-Kowalczyk, and Agnieszka Żabicka. "Enhancing transformative learning and innovation skills using remote learning for sustainable architecture design." Sustainability 14.7 (2022): 3928.
6. Roderick, Ian. "Recontextualising employability in the active learning classroom." Discourse: studies in the cultural politics of education 42.2 (2021): 234-250.
7. Zhu, Jiebing, and Di Wang. "Research on curriculum reform of environmental art and design majors in higher vocational education based on school enterprise cooperation." Advances in Vocational and Technical Education 5.8 (2023): 75-80.
8. Papadopoulou, Theopisti. "Developing construction graduates fit for the 4th industrial revolution through fieldwork application of active learning." Higher education pedagogies 5.1 (2020): 182-199.
9. Holdsworth, Sarah, and Ian Thomas. "Competencies or capabilities in the Australian higher education landscape and its implications for the development and delivery of sustainability education." Higher Education Research & Development 40.7 (2021): 1466-1481.
10. Liyanage, Shantha Indrajith Hikkaduwa, and Fulu Godfrey Netswera. "Greening universities with mode 3 and quintuple helix model of innovation–Production of knowledge and innovation in knowledge-based economy, Botswana." Journal of the Knowledge Economy (2021): 1-31.