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Enhancing the Employability of Environmental Design Students Amidst the Transformation of Knowledge Production Modes

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Abstract: Amidst the rapid evolution of the knowledge economy and shifting societal needs, higher education is undergoing a notable shift from the traditional knowledge production paradigm (Mode 1) to a new framework (Mode 2), emphasizing practice-oriented approaches and interdisciplinary collaboration. This shift places greater demands on the educational models of environmental design programs, particularly in fostering students' employability. This study examines the key elements and dimensions of employability for environmental design students, including professional expertise, innovative thinking, cross-disciplinary teamwork, and practical application skills. By analyzing the current state and existing challenges, the research proposes strategies such as restructuring the curriculum, developing diverse practical teaching frameworks, promoting interdisciplinary innovation, and strengthening connections between career guidance and industry partnerships. The findings suggest that adapting to the changing modes of knowledge production can effectively enhance the employability of environmental design students, aligning their skills with societal expectations and career trajectories. This study offers valuable insights and practical guidance for educational reform in environmental design programs and other practice-oriented fields.

Keywords: modes of knowledge production; environmental design; employment competencies; cross-disciplinary collaboration

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1. Introduction

The rapid development of the global knowledge economy and the ongoing evolution of societal demands have brought about profound transformations in higher education. One notable change is the transition in knowledge production modes, moving from the traditional, discipline-centric Mode 1, which emphasizes theoretical knowledge accumulation, to Mode 2, which is problem-oriented and emphasizes practical application and interdisciplinary collaboration. This shift has redefined knowledge creation and dissemination, establishing new standards for professional education in universities. As a discipline combining design and practice, environmental design is significantly influenced by this trend, necessitating reforms in its educational framework to better enhance students' employability and address the shifting requirements of society and industry.

Employability plays a pivotal role in the success of environmental design students in the competitive job market. It entails not only a robust professional knowledge base but also the ability to engage in interdisciplinary collaboration, apply innovative thinking,

demonstrate practical skills, and adapt to changing industry needs. However, existing educational models face several challenges in developing these competencies. Issues such as a lack of alignment between curricula and societal needs, insufficient emphasis on practical training, and limited interdisciplinary opportunities hinder students' competitiveness and restrict the potential for educational reform in environmental design programs [1]. Therefore, exploring strategies to improve employability in the context of knowledge production mode transformation is of critical theoretical and practical significance.

This study, rooted in the context of the evolving knowledge production modes, systematically investigates the concept and core dimensions of employability for environmental design students through a combination of theoretical exploration and practical analysis. It evaluates the current challenges faced by educational practices and offers targeted strategies for improvement. These include optimizing curricula, diversifying practical teaching methods, fostering interdisciplinary collaboration and innovation, and strengthening career guidance in collaboration with industry [2]. This research not only contributes to enhancing the employability of environmental design students but also provides a reference for higher education reform in practice-oriented disciplines, addressing the demands of the new knowledge production paradigm.

2. The Impact of Knowledge Production Mode Shifts on Environmental Design Education

2.1. Evolution and Key Features of Knowledge Production Modes

The transformation of knowledge production modes is a natural outcome of social and economic development, as well as technological advancements. Since the mid-20th century, the traditional knowledge production framework, known as Mode 1, has increasingly revealed its limitations in adaptability. Mode 1 is discipline-focused, theory-centric, involves a single type of knowledge producer, and is largely disconnected from practical applications. It predominantly emphasizes foundational research conducted within structured environments such as universities or research institutions, prioritizing theoretical depth and systematic knowledge over the resolution of complex societal issues.

In the 21st century, diverse societal needs and rapid technological advancements have propelled a shift towards Mode 2, a more practice-oriented paradigm. Mode 2 is defined by its focus on interdisciplinarity, collaboration among multiple stakeholders, and application-driven knowledge production. This mode extends beyond academia, actively involving governments, industries, and social organizations. Furthermore, knowledge production has moved beyond traditional academic settings to encompass more open and dynamic social spaces, fostering the "resocialization" of knowledge and prioritizing its practical utility.

The integration of digital and intelligent technologies has further accelerated this transformation [3]. Innovations like big data and artificial intelligence have revolutionized knowledge acquisition, processing, and dissemination, enhancing both the responsiveness and adaptability of knowledge production. These advancements enable Mode 2 to address complex societal challenges with increased flexibility and efficiency, while also creating new opportunities for reform in higher education.

Against this backdrop, the education sector is experiencing significant transformation. As a practice-based discipline, environmental design must adapt to this shift by embedding the characteristics of Mode 2—such as interdisciplinary integration, multi-stakeholder collaboration, and practical application—into its educational practices. This alignment enables environmental design programs to foster students' comprehensive capabilities and better prepare them for the challenges of complex societal demands and competitive job markets. The principles of Mode 2 not only redefine curriculum development and teaching methodologies in environmental design education but also provide essential theoretical and practical insights for driving innovation in the field [4].

2.2. Analyzing the Key Characteristics of Knowledge Production in Environmental Design

Environmental design is an interdisciplinary, practice-oriented field characterized by diversity and dynamism in its approach to knowledge production. This field requires a balance between theoretical depth and practical application, while also maintaining the flexibility needed to address complex, real-world problems. The shift in knowledge production modes has a profound effect on environmental design, particularly in how it emphasizes practical application, innovation, and collaboration to enhance employability.

Environmental design is inherently interdisciplinary. Design projects often require integrating knowledge from diverse fields such as architecture, landscape architecture, ecology, sociology, and information technology, necessitating students' ability to transfer and synthesize knowledge across disciplines [5]. For example, urban public space design requires expertise in spatial planning, along with an understanding of ecological sustainability, cultural context, and user behavior. This interdisciplinary aspect highlights the need to break down academic silos and foster collaborative, innovative thinking in students.

Environmental design focuses on problem-oriented and application-based knowledge production. Design solutions often respond to specific societal challenges, such as urban revitalization, ecological restoration, or the creation of smart communities. These practical challenges require that students gain hands-on experience and develop problem-solving skills through real-world projects. Furthermore, the user-centered nature of design compels students to stay attuned to societal trends and user needs, translating theoretical concepts into tangible, impactful solutions.

Knowledge production in environmental design is continuously evolving. As societal needs change and new technologies emerge, the knowledge base in design fields must constantly adapt. For instance, innovations such as building information modeling (BIM) and parametric design are transforming design workflows and methodologies. This ever-evolving landscape calls for environmental design education to be flexible, preparing students to embrace new technologies and adapt to emerging industry demands.

The characteristics of knowledge production in environmental design necessitate a rethinking of educational approaches in response to the transition towards Mode 2. By combining theoretical and practical knowledge, promoting interdisciplinary collaboration, and encouraging continuous learning and adaptation, environmental design programs can better align with societal needs and enhance students' employability and career development [6].

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

3.1. The Concept and Essential Components of Employability

Employability refers to an individual's capacity to secure, maintain, and progress in their career by combining knowledge, skills, attitudes, and the ability to coordinate external resources. For environmental design students, employability plays a critical role in their competitiveness for entering the workforce and their ability to adapt to industry changes, ensuring continued professional growth. With the shift in knowledge production modes, employability has evolved to encompass a broad range of competencies, moving beyond traditional professional skills.

The foundation of employability lies in strong professional knowledge and technical expertise [7]. For environmental design students, this includes essential academic knowledge in areas such as design theory, spatial planning, and sustainable design, alongside proficiency in design software tools like AutoCAD, SketchUp, and Revit. While these skills are fundamental for specific job roles, they must be complemented with interdisciplinary knowledge from fields like ecology, information technology, and sociology to address complex, real-world design challenges.

Innovation is another critical component of employability. In the context of Mode 2 knowledge production, environmental design projects increasingly require open-ended

problem-solving. Students need to demonstrate creativity in analyzing issues, formulating solutions, and applying designs. Innovation is fostered through design thinking education and is further refined by hands-on project experiences. This creativity is seen in developing distinctive and practical design solutions that respond to societal needs, user behaviors, and environmental factors.

Interdisciplinary collaboration is essential for environmental design students' employability. Modern design projects often require coordination among architects, engineers, ecologists, and policymakers. To succeed in these environments, students must understand the language and logic of various disciplines and be capable of effective communication and collaboration. Cultivating these skills requires educational strategies that provide opportunities for interdisciplinary collaboration through course design and real-world projects, emphasizing teamwork and task-sharing.

Practical application skills are also crucial for employability. As an applied field, environmental design necessitates that students translate theoretical knowledge into practical solutions, managing the entire process from initial concept development to detailed design and implementation. Building these skills involves not just classroom learning but also active engagement in real projects, internships, and industry collaborations to gain hands-on experience.

Employability includes professional attitudes and soft skills, such as responsibility, stress management, self-directed learning, and effective communication with clients and colleagues. These non-technical skills are vital for career development and performance in the workplace. Given Mode 2's emphasis on social responsibility and teamwork, environmental design students must also develop strong professional ethics and a user-focused mindset.

Employability is a multifaceted concept. For environmental design students, it encompasses professional knowledge and technical proficiency, innovation, interdisciplinary collaboration, practical skills, and soft skills. These competencies must be developed through an integrated approach to curriculum, teaching, and hands-on activities to enhance students' competitiveness and adaptability in the job market [8].

3.2. The Impact of Knowledge Production Mode Transformation on Employability

The transition from Mode 1, which is theory-based and discipline-specific, to Mode 2, which emphasizes interdisciplinary and practice-based approaches, significantly reshapes the employability expectations for environmental design students. Mode 2 prioritizes the societal relevance and practical application of knowledge, urging students to integrate theory with real-world problem-solving through collaborative efforts and innovation. In this framework, employability must evolve from focusing on singular skills to encompassing a broad range of competencies.

Firstly, the transformation underscores the critical need for interdisciplinary knowledge integration. In Mode 2, design projects are no longer limited to one discipline. Instead, they require a mix of knowledge from architecture, ecology, engineering, sociology, and more [9]. For example, urban design projects must address concerns such as environmental sustainability, traffic management, and cultural dynamics, demanding that students apply interdisciplinary knowledge to craft comprehensive solutions. Therefore, enhancing students' ability to synthesize knowledge from diverse fields is essential to meeting the requirements of Mode 2 and improving long-term career prospects.

Mode 2 places a heightened focus on practical application. Environmental design projects are generally driven by real-world objectives, necessitating that students have the full spectrum of skills, from needs analysis and concept design to technical implementation and project management. For instance, when designing community spaces, students need to deliver solutions that are aesthetically appealing, functional, and able to address real-world challenges through collaboration with various stakeholders. Fostering these

skills requires providing ample opportunities for industry partnerships, case-based learning, and internships.

Furthermore, innovation becomes even more critical in Mode 2. The fast-paced nature of knowledge production in this model demands that students respond rapidly to shifts in societal and technological contexts, proposing original and impactful design solutions. The increasing prominence of smart and digital technologies, for instance, calls for students to adopt innovative practices like using parametric design tools for space planning or creating sustainable solutions through cutting-edge technologies.

Professional ethics and social responsibility play an essential role in Mode 2 as well. The focus on the societal implications of knowledge production means environmental design students must incorporate ethical principles and user needs into their designs. For instance, urban renewal projects often require students to balance the needs of marginalized groups with the broader community benefits. Ethical awareness and responsibility are fundamental to aligning with the societal values central to Mode 2.

The collaborative and open nature of Mode 2 demands enhanced communication and teamwork skills. Environmental design projects often involve stakeholders from diverse sectors, including government, private industry, academia, and local communities. To succeed, students must communicate effectively and collaborate across disciplines and cultural boundaries. International projects, in particular, require language skills and cross-cultural communication to navigate global contexts.

The shift to Mode 2 necessitates the development of interdisciplinary integration, practical skills, innovation, ethical awareness, and teamwork abilities in environmental design students. These evolving demands reflect the changing expectations of the design industry and provide a roadmap for educational reform. By fostering these competencies, students can better adapt to societal changes and achieve greater professional success and impact [10].

4. The Current Situation and Issues in Developing Employability for Environmental Design Students

Environmental design, as a highly applied field, aims to equip students with the necessary skills to meet societal demands and industry needs. However, current models for fostering employability face several significant challenges that hinder students' smooth transition into the workforce. In many universities, the curriculum remains rooted in traditional academic structures that prioritize theoretical knowledge, with limited emphasis on practical application. While some institutions have introduced training programs and industry partnerships, these efforts often fall short in terms of depth and scope to meet industry standards. Furthermore, the curriculum lags behind emerging trends like green design, smart technologies, and sustainability, leaving students unprepared for technological advancements in the field.

Traditional lecture-based teaching methods dominate most programs, restricting student engagement and creativity. Although project-based learning and workshops have been implemented in some universities, their impact is often diminished due to a lack of thorough evaluation criteria and instructors' limited experience in managing practical projects. Additionally, career services at many institutions tend to focus on basic job-search skills, such as resume building and interview preparation, while neglecting the development of interdisciplinary collaboration, innovation, and project management skills that are crucial for employability.

The scarcity of resources dedicated to practical training further hampers employability development. Environmental design, as a hands-on discipline, requires students to engage with real-world projects, but insufficient investment in practical teaching limits opportunities for students to gain such experiences. Industry-academic collaborations often fail to provide meaningful exposure to current industry trends, which reduces students' practical skills and their adaptability to the job market.

Innovation and soft skills remain significant gaps in current employability training. The design industry increasingly demands creative problem-solving, yet traditional education systems tend to emphasize standardized answers, stifling students' creativity and leaving them ill-prepared for complex and open-ended design challenges. Additionally, students often lack a strong grasp of key principles such as social responsibility, user-centered design, and sustainability, which limits their long-term competitiveness in the industry.

The lack of interdisciplinary collaboration and global exposure poses further challenges. Modern design projects frequently require cooperation across various disciplines, yet many academic programs do not provide enough opportunities for such collaborative experiences. Similarly, limited access to international courses and exchange programs restricts students' exposure to global design trends and practices, which hinders their competitiveness in the international job market.

The current approach to fostering employability for environmental design students does not fully meet the needs of society and industry. Outdated curricula, insufficient practical resources, a lack of focus on innovation, and limited opportunities for interdisciplinary and international exposure are key issues. Addressing these challenges requires a comprehensive overhaul of educational philosophies, teaching methods, and resource allocation to better align with the evolving demands of the field and to improve students' adaptability and competitiveness in the workforce.

5. Approaches for Developing Employability in the Context of Knowledge Production Mode Transformation

As the knowledge production model shifts from the theory-driven, discipline-specific Mode 1 to the more practice-focused and interdisciplinary Mode 2, environmental design education must undergo a comprehensive transformation to better align with industry requirements and societal shifts. This change calls for revisions in curriculum design, teaching methods, and resource allocation, all while establishing a cohesive training framework that enhances students' professional competencies and employability.

Revising the curriculum system is crucial for developing a framework that combines interdisciplinary knowledge with a focus on practical application. Given the complexity of the environmental design field, students must acquire knowledge across a variety of disciplines. As such, the curriculum should transcend traditional boundaries, incorporating areas like ecology, information technology, sociology, and others. For example, courses on green design, smart technology applications, and human-computer interaction should be integrated to address industry trends. Additionally, the curriculum should prioritize hands-on learning by incorporating real-world projects, university-industry partnerships, and interdisciplinary workshops, allowing students to gain practical experience and develop problem-solving abilities.

Enhancing practical teaching methods is essential. Universities should form long-term partnerships with businesses, governments, and community organizations to provide students with more opportunities for real-world involvement. Organizing design competitions, industrial training programs, and community-focused projects would allow students to engage directly with industry needs. Moreover, leveraging technologies like virtual reality (VR) and augmented reality (AR) can create simulation platforms for students to practice design processes in virtual settings, enhancing their skills.

Fostering innovation should be central to the entire educational process. As innovation is a key competitive edge in environmental design, it should be nurtured from the start through exercises in design thinking, tool application, and practical project work. Courses that teach parametric design tools, BIM technologies, and other advanced design applications will help students integrate innovation into their designs. Encouraging students to focus on sustainability and social responsibility will ensure their innovative work is aligned with societal needs and provides meaningful solutions.

Promoting interdisciplinary collaboration skills is vital. Modern design projects often require input from various fields, so teaching models should replicate real-world work environments by assigning interdisciplinary team projects. For instance, students from architecture, urban planning, and engineering could collaborate on projects, fostering teamwork skills and encouraging cross-disciplinary dialogue. International exposure is also essential; universities can offer bilingual courses, host international guest speakers, and provide global internship opportunities to expand students' perspectives and enhance cross-cultural communication skills.

It is important to strengthen career support and industry engagement. Universities should create comprehensive career development systems, offering career planning workshops, mock interviews, and industry expert sessions to provide focused guidance. Collaborating with industry partners can create more internship, job, and entrepreneurial opportunities. Additionally, establishing alumni networks can help students learn from past graduates and receive valuable career advice.

Cultivating employability for environmental design students in light of the knowledge production model transformation requires a multifaceted approach. This includes revising the curriculum, diversifying teaching methods, fostering innovation, encouraging interdisciplinary teamwork, and strengthening career support systems. These strategies will not only improve students' adaptability and competitiveness but also provide a blueprint for advancing environmental design education in line with the changes in Mode 2. By adopting systematic, innovative, and practical training methods, universities can better prepare students to meet future industry demands.

6. Conclusion

The transition from the theory-driven Mode 1 of knowledge production to the practice-oriented, interdisciplinary Mode 2 introduces new demands for enhancing the employability of environmental design students. This paper highlights key employability factors such as professional expertise, innovation skills, interdisciplinary teamwork, practical application abilities, and professional ethics, while examining existing challenges like outdated curricula, limited practical resources, and inadequate innovation training.

To address these challenges, the study suggests strategies for refining curricula, expanding practical learning opportunities, fostering innovation, encouraging interdisciplinary collaboration, and improving career support. These strategies provide valuable guidance for educational reforms in universities. The shift in knowledge production models not only presents challenges but also offers opportunities to elevate educational quality and enhance student competitiveness. Future research should focus on integrating new technologies and strengthening university-industry partnerships to continually foster innovation and advancement in environmental design education.

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