Building Capacity for Evidence-Based Knowledge Through Participatory Action Research

Community-Engaged Architecture Design Studio

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Abstract: In the ever-changing urban landscape, shaped by intricate interactions of social, economic, environmental, and cultural forces, the role of citizens in shaping their cities has become increasingly vital. Urban development today is a consequence of decisions made by individuals, institutions, and governments over time. Recognizing the significance of citizen participation in city planning, authorities and professionals have embraced community engagement to foster a sense of belonging and promote sustainable, inclusive solutions. This evolving urban paradigm calls for new roles for citizens and professionals alike. Urban designers, architects, and planning institutions are being challenged to meet the growing demand for community-engaged design approaches. Consequently, there is a pressing need to educate future graduates in a transdisciplinary framework, equipping them with the skills required to address real-life urban challenges effectively. Despite commendable recent efforts, academia's response to these challenges, particularly in the context of the design studio's relevance to real-world scenarios and engagement of all stakeholders in the design process, remains constrained. Doubts arise regarding the preparedness of students, who are the future professionals expected to navigate the intricate urban landscapes of today. This paper emphasizes the significance of community-engaged design studios by reflecting on a transdisciplinary pedagogic approach. This approach, developed, implemented, and critically assessed at the Department of Architecture, University of Cyprus over the past years, studies the collaborative dynamics between academia, local governments, professionals, and citizens. It fosters synergies within the quadruple helix framework and promotes the co-creation of knowledge. Furthermore, it seeks to accumulate evidence-based knowledge through successive cycles of participatory action research (PAR) and a commitment to continual reflection and enhancement. This pedagogical approach's impact on students' development of transferable soft skills, motivation, and attitudes toward complex societal issues and their future professional roles has been continuously evaluated through qualitative methods. The repetitive nature of these research investigations, connecting findings with teaching methodologies and the co-creation framework, holds the promise of establishing a formidable knowledge foundation. The knowledge accumulated through these research cycles can serve as a catalyst for reevaluating and enriching the current academic curriculum, infusing it with insights gained through these processes. These insights, in turn, can significantly augment the development of students' skills, making them better equipped to tackle the complexities of modern urban contexts. Evidence-based knowledge generat-

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ed through these iterative research investigations may transcend the realm of academia to become a dynamic force that shapes the future of urban development and sustainability.
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1. Empowering Urban Transformation Through Co-creation: A Community-Engaged Approach in Architecture Design Studios

Citizen participation in urban development processes is gradually acknowledged as a fundamental aspect of contemporary city planning, with far-reaching implications for the quality of life, social cohesion, and sustainable development. Actively involving citizens in the development and transformation of their neighbourhoods and communities fosters a sense of ownership and belonging, which in turn spurs residents to take a proactive interest in the preservation and enhancement of their surroundings. It plays a pivotal role in weaving stronger social bonds and nurturing a shared sense of responsibility, culminating in the creation of safer and more vibrant communities.

Beyond its role in enhancing social cohesion, citizen participation significantly amplifies inclusivity. In the diverse tapestry of urban populations, composed of individuals from varied backgrounds, experiences, and demographics, citizen involvement ensures that a wide spectrum of unique needs and perspectives finds a voice in the decision-making process and that the urban environment is thoughtfully shaped to accommodate the multifaceted requirements of its diverse inhabitants. The collaborative involvement of a wide array of stakeholders – citizens, local authorities, and professionals – aligns with the global aim of making cities and human settlements inclusive, safe, resilient, and sustainable, as outlined in Sustainable Development Goal 11 (SDG) (UN, 2015). The integration of diverse forms of knowledge in real-life contexts and urban decision-making processes is vital for generating innovative solutions to complex challenges, fostering community cohesion, ensuring inclusive and sustainable development, and addressing social inequality (Lund, 2018; Lorne, 2017).

The need for citizens and professionals to assume new roles is increasingly evident, while the capabilities and responsibilities of urban designers, architects, and public planning institutions in meeting the growing demand for community-engaged design approaches are frequently questioned (Charalambous, 2018). Architects and spatial practitioners have long grappled with a legacy of modernist thinking that framed their roles as objective and neutral experts. This perspective often severed the intrinsic connections between architecture and spatial design and their political and social implications, isolating them from the intricate web of interdependencies that bind them to the broader societal fabric (Standring, 2021).

This viewpoint leaves a significant mark on architectural education, emphasizing the acquisition of technical skills necessary to produce professionals ready to fit seamlessly into the neoliberal job market. Notable pedagogical models acknowledge the limitations of this traditional approach and the inherent risks of disentangling spatial disciplines from their socio-political contexts. By neglecting the understanding of the built environment as a dynamic force that shapes and reflects the values, needs, and aspirations of the communities it serves, professionals may miss opportunities to make meaningful and positive contributions to society.

It is imperative to educate future graduates, equipping them with the skills required to enact solutions that align with the objectives of sustainable development in real-life contexts. The incorporation of architectural design studios within a co-creation framework, contextualized in real-world scenarios, has undergone extensive exploration, practical implementation, and critical evaluation. Recent "live" architecture design studios attempt to overcome a conventional emphasis on technical prowess and neutrality and embark on a

transformation towards a more comprehensive understanding of the field's broader societal role (Harriss *et al.*, 2014). Diverse approaches and methodologies have been adopted to facilitate this integration, including community design (Salama, 2013), architecture live projects (Anderson & Priest, 2012; Harris & Widder, 2014), and design-to-build initiatives (Stonorov, 2017). These community-engaged pedagogical endeavours actively involve citizens in the collaborative creation process, leading to a redefinition of spatial practitioners' roles. Moreover, they introduce a paradigm where democracy becomes an integral part of daily existence, offering an inclusive, lived experience (Sara & Jones, 2018).

It is important to acknowledge these significant efforts aimed at redefining the nature of architecture and, by extension, the fundamental tenets of architectural education. This emerging paradigm envisions architecture as a manifestation of "spatial agency" (Awan *et al.*, 2011; Lorne, 2017). Under this framework, architecture transcends its conventional portrayal as a static discipline, instead assuming the role of a dynamic, cooperative, and politically engaged process that actively shapes the built environment. It evolves into a vibrant arena of continuous negotiations, fostering the exchange of knowledge and insights. This progressive viewpoint on architecture advocates for a profound sense of collaboration and inclusiveness within the discipline, ushering in a new era where architectural practice is intrinsically linked to the multifaceted dimensions of human life and society.

This evolution entails an educational paradigm that not only imparts technical skills but also nurtures critical thinking, social consciousness, and an acute awareness of the ethical and political dimensions of architecture and spatial design. Architectural education could be the catalyst for this shift, producing graduates who are not just technically proficient but also advocates of a more socially responsible and ethically attuned built environment. Architecture students thus become active agents in shaping the political and social landscape, engaging with communities, and addressing the multifaceted challenges of our era. This transformation is essential to ensure that the architectural and spatial design professions remain relevant and responsive to the complex and ever-evolving needs of society (Salama, 2016).

A compelling need thus arises to re-evaluate the pedagogical approaches that can effectively tackle these multifaceted challenges. The challenge lies in bridging academia and society, reformulating architectural studio frameworks, and fostering effective interaction between research, pedagogy, and urban context agents. This ongoing opportunity prompts a reevaluation of current educational tools, methods, and policies across all educational levels (Charalambous, 2018).

2. The Co-Creation Design Studio at UCY

2.1. *Fostering Co-creation and Community Engagement*

The above are addressed through a community-engaged architecture design studio (the Co-creation Studio), designed, implemented, and critically assessed at the Department of Architecture, University of Cyprus, over the past years. The Co-creation Studio described in the following sections builds on a transdisciplinary[2] pedagogical approach (Salama, 2016), informed by the theoretical foundation and methodologies of participatory design practices and Urban Living Labs (Menny *et al.*, 2018). It serves as an experimental platform where the conceptualization of architecture as spatial agency is not just discussed, but actively applied and evaluated. The studio format is designed to expose students to real-world complexities,

2. An approach to research that involves the integration of knowledge from diverse disciplines and engagement with stakeholders outside of academia to address complex and multifaceted problems.

fostering collaboration with local communities, stakeholders, public officials, and practicing architects and planners. Through participatory and co-creation workshops and processes students are challenged to step outside the comfort of traditional design studios and dive into the unpredictable and uncertain reality of the urban environment.

This shift encourages the critical production of knowledge, enabling students to be exposed to the concept of the urban commons, with a specific focus on the design and implementation of neighborhood public spaces situated in suburban areas, in order to question their own preconceived notions about their roles and the contextual aspects of their work. By participating in these real-world initiatives, students are provided with valuable opportunities to apply their skills and knowledge in community-driven projects, gaining a deeper understanding of the urban environment's intricate dynamics and their potential roles within it.

What distinguishes the format of this studio in relation to the discussion in the previous section is its' twofold aim: to explore the collaborative dynamics between academia, local governments, professionals, and citizens, to foster synergies and to promote the co-creation of knowledge on the one hand, as well as to amass a growing body of evidence-based knowledge by way of successive cycles of participatory action research (PAR) and a commitment to continual reflection and enhancement.

The first aim has been addressed and discussed in a number of recent articles; this paper focuses on the potential of the design studio's methodology to establish a co-created evidence-based knowledge foundation that provides vital insights on the impact of the proposed pedagogical approach on students' skills, attitudes and development.

2.2. *Co-creating Evidence-Based Knowledge Through Participatory Action Research*

Evidence-based urban planning and design play a crucial role in addressing the intricate challenges of contemporary cities and offering sustainable, well-informed solutions. This approach relies on research and empirical evidence to guide the urban design process, enhancing its effectiveness and responsiveness to the ever-evolving urban landscape (Karimi, 2023).

Similarly, co-created evidence-based knowledge represents a powerful synergy between community engagement and the urban planning and design process. It is the product of a collaborative effort between citizens, professionals, and public authorities to generate insights that inform urban decision-making. The concept of co-creation emphasizes inclusivity and active involvement, acknowledging that urban challenges are best addressed by those who experience them daily. One of the core features of co-created evidence-based knowledge is the democratization of the decision-making process. Citizens are no longer passive recipients of urban policies but actively participate in shaping their urban environments. By participating in data collection, analysis, and interpretation, citizens contribute to a shared knowledge base that goes beyond traditional expert-driven approaches (Vohland *et al.*, 2021).

Co-created evidence is grounded in the belief that those who live and work in a particular urban context possess invaluable contextual knowledge. This knowledge encompasses the nuances of daily life, including transportation patterns, social interactions, environmental conditions, and other factors that affect urban living. When citizens become active contributors to evidence generation, urban planning and design solutions are more likely to address their actual needs, preferences, and concerns. This knowledge reflects the real-life challenges and opportunities that residents encounter, providing a more accurate and holistic understanding of the urban context. It can reveal unique perspectives that might not be apparent through traditional data collection methods, enriching the evidence base with context-specific insights.

In practice, co-created evidence-based knowledge is not without its challenges. The nature of co-creation can be experimental and iterative, making it challenging to quantify the long-term impact of certain initiatives. However, the accumulation of evidence over time can help build a case for the effectiveness and sustainability of co-created solutions. To leverage the full potential of co-created evidence-based knowledge, collaborative platforms such as Urban Living Labs (ULLs) have been established, providing structured environments for co-creation, research, and testing of innovative urban interventions. They offer a controlled setting for experimentation, data collection, and evaluation (Mahmoud *et al.*, 2021).

Following a similar conceptual framework, Co-creation design studios, such as the one detailed in this paper, have a primary objective of fostering the co-creation of knowledge within the context of real-life scenarios. The studio is dedicated to accumulating a substantial body of evidence-based knowledge, offering invaluable insights into the effects of the proposed pedagogical approach on participants. This is achieved through a series of iterative cycles of participatory action research (PAR) and continuous reflection and refinement. Through a systematic process of participatory action research (PAR), students, educators, and other stakeholders collaboratively collect, analyze, and interpret data derived from their experiences within these design studios. This data-driven approach can serve as a rich source of evidence, shedding light on the multifaceted impacts of the pedagogical approach. It can provide a comprehensive understanding of how students' skills evolve, how their attitudes shift, and how their overall development progresses during and after their engagement in co-creation design studios.

The commitment to continuous reflection and enhancement is a cornerstone of the Co-creation design studio; it acknowledges the evolving nature of urban contexts and the dynamic needs of society. Thus, the studio is designed to adapt and refine its approach based on the evidence generated from previous cycles. This iterative process ensures that the pedagogical approach remains responsive, relevant, and effective in addressing contemporary urban challenges.

The studio is designed to assess its impact on the development of students' transferable soft skills, their motivation, their perspectives on complex real-life societal issues, and their evolving understanding of their future professional roles; more specifically, to explore the specific effects of this pedagogical approach, a comprehensive examination is conducted to explore how it shapes the participating students in several critical dimensions:

- Enhancing Professional Skills: The studio's influence on students' confidence and transversal skills, vital for their future roles in architecture and urban planning/design, is a primary focus. This assessment occurs within the context of an ever-changing socioeconomic, political, and environmental landscape, driven by persistent neoliberal policies. The studio's role in equipping students with the necessary competencies to thrive in this complex reality is closely scrutinized.
- Developing Positionality: Students' awareness of their agency and social role within co-creation processes is another pivotal aspect under continuous examination. The studio aims to empower students to recognize the influence they hold and understand the implications of their actions and decisions when participating in collaborative endeavors. Their evolving positionality within these processes is a key component of the evaluation.
- Fostering Critical Thinking: The capacity for reflexivity and critical thinking is cultivated throughout the studio experience. Students are encouraged to question assumptions, analyze outcomes, and engage in reflective practices that underpin their decision-making processes. This aspect is rigorously monitored and assessed.

These evaluations are carried out through the application of qualitative research methods across various phases of the design studio, allowing for an in-depth exploration of the students' experiences, perceptions, and personal and professional growth. By employing a range of qualitative techniques, such as interviews, surveys, and observations, the studio gathers context-specific data that provides valuable information on the multifaceted impacts of the pedagogical approach. The subsequent sections provide a detailed account of the methodology employed and the outcomes of these assessments, highlighting the transformative journey of the participating students as they navigate the complex terrain of the design process.

3. Research Methodology

The proposed framework, rooted in Participatory Action Research, serves as a structural backbone for cultivating collaborative learning partnerships and crafting pedagogical and assessment tools that uphold the principles of 'transformative learning values and ethics' (Pine & Urie, 2017). Educators adopting a stance of 'self-reflective teaching' with a focus on progress and transformation (Tran, 2009) are guided by action research, capable of unveiling inconvenient truths (Kemmis, 2006) while propelled by a commitment to advancement and change (McTaggart, 1997). Its cyclical pattern, encompassing planning, action, observation, and reflection, underscores the demand for adaptability, responsiveness, and the indispensable collection of evidence to inform the path forward.

The methodology, as depicted in Figure 1, unfolds through four distinct phases: the establishment of the co-creation framework, its execution, the concurrent processes of evaluation and assessment, and the crucial phases of reflection and re-design. The implementation phase is characterized by its fluid, nonlinear nature, subject to adjustments, and embraces activities like co-assessment and understanding (co-identification), co-creation (co-development and co-selection), co-design and execution. Evaluation and assessment run in parallel with implementation, encompassing both the co-evaluation of the process itself and an assessment of its influence on students. This assessment entails an exploration of their skill development, motivation, their evolving perspective regarding their future professional roles, and the quality of the resulting design work.

The data collection process encompasses information gathered from multiple sources, including the active participation of educators-researchers, input from students, and insights from other participants, notably citizens (Figure 2). Students actively engage in focus group discussions, scheduled at specific points in the process, to capture their sentiments, thoughts, and informal viewpoints as the process unfolds. They are also tasked with completing targeted questionnaires, usually administered both before and after the instructional phase via Google Forms. These questionnaires incorporate a mix of open-ended inquiries and Likert scale questions, focusing on aspects such as motivation, experiential insights, their roles in the process, self-reflection on design outcomes, skill development, and overall learning outcomes.

In addition to questionnaires, students and other participants are engaged in open-ended interviews, where they are encouraged to share their holistic experiences, impressions of the design results, personal gains, recommendations for future enhancements, as well as other thoughts and ideas. Throughout the entire process, the educator-researcher plays an active role in observing the ongoing activities, capturing students' and participants' spontaneous behaviors, and maintaining a reflective diary. This diary helps in documenting observations and reflections on the work as well as the outputs generated by the students.

The observation and reflection process is structured around four key axes:

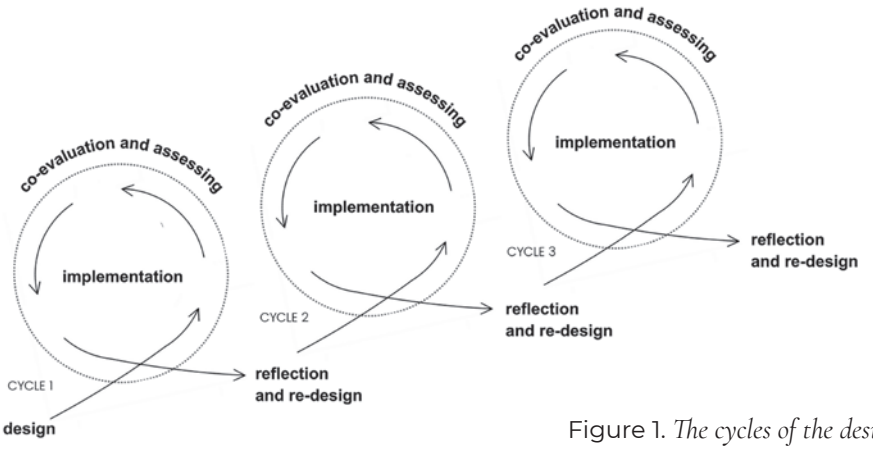

Figure 1. *The cycles of the design studio's methodology.*

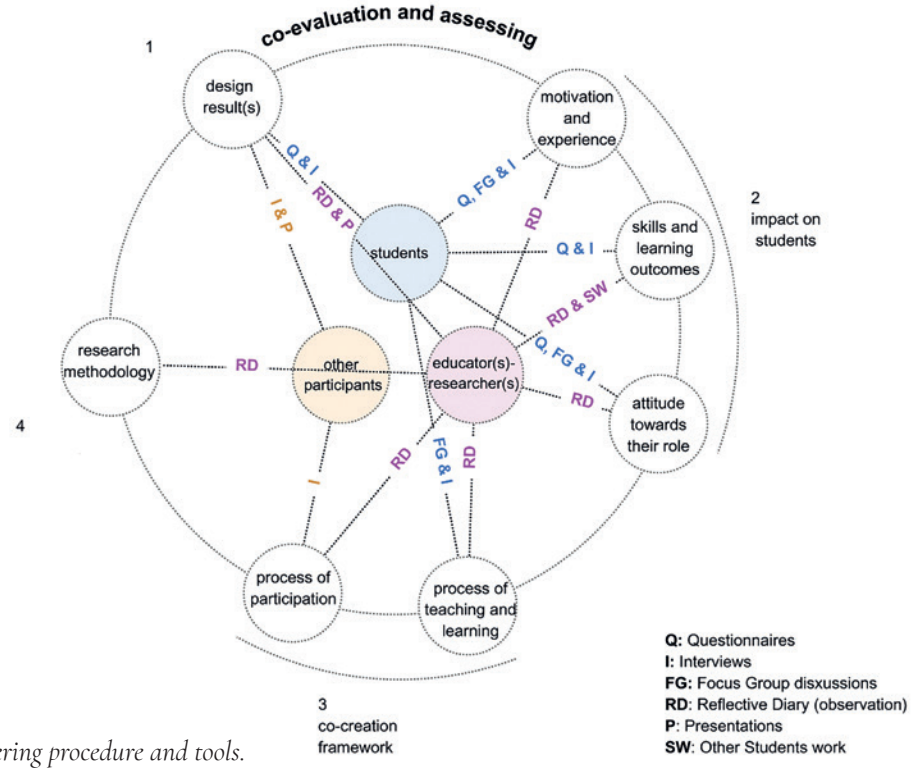

Figure 2. *Data gathering procedure and tools.*

- Assessing the impact of the co-creation process on the final design results.
- Evaluating the effects of the co-creation process on the students.
- Analyzing the co-creation pedagogical framework as a comprehensive process encompassing participation, teaching, and learning.
- Scrutinizing the research methodology employed to ensure its effectiveness and relevance.

This multifaceted approach to data collection and analysis aims at yielding insights into the entire co-creation process, its effects on the various stakeholders involved, and the overall effectiveness of the pedagogical framework. The structure of data gathering is based on the factors/indicators summarized in Table 1. The data collection tools and the overall procedure described earlier exhibit flexibility, allowing them to be tailored to the specific requirements of each semester, learning objective, and studio capacity. Furthermore, the circular reflection process ensures that these tools remain open to adaptation and enhancement as needed from year to year. The qualitative analysis approach serves the purpose of aggregating and examining data gathered from each year. This analysis seeks to identify recurring patterns or

Table 1. *Data gathering structure.*

1. impact on the design result	**2. impact on students**			**3. co-creation framework**		**4. research methodology**
	motivation and experience	skills and learning outcomes	attitude towards their role	participation	teaching & learning	
– responsiveness to the needs identified, – inclusivity according to the users identified, – relationship to the site, – functionality, sustainability, and efficiency. (A Handbook for Live Projects, 2013; Gibbs *et al.*, 2020; NTNU Live Studio: Handbook, 2015)	– excitement and pleasure, – commitment and responsibility, – confidence, – opinions about the usefulness of the process. (Huitt, 2011; Savic & Kashef, 2013)	– development of transferable soft skills (critical thinking, management skills, social skills), – development of subject specific skills and – new knowledge. (A Handbook for Live Projects, 2013; Gibbs *et al.*, 2020; NTNU Live Studio: Handbook, 2015; Savic & Kashef, 2013)	– behavior to/ relationship with other participants, – decision making, – thoughts regarding the profession's and the professional's role.	– inclusivity and participants, balance, – transparency and access, – commitment and interest, – trust and sense of community, – levels of participation. (A Handbook for Live Projects, 2013; Arbter *et al.*, 2007; Delli Priscoli, 2003; Gibbs *et al.*, 2020; Haufe *et al.*, 2017; Leyden *et al.*, 2017; NTNU Live Studio: Handbook, 2015; Sanoff, 1988; Simonsen and Hertzum, 2012; Stratigea, 2016)	– learning experience (learning activities), – challenging and interesting curriculum, – clear and valid assessment methods, – activities that encourage the active role of students. (NTNU Live Studio: Handbook, 2015; The Cyprus Agency of Quality Assurance and Accreditation in Higher Education (CYQAA))	– feasibility of the methodology, – effectiveness of the data gathering tools and structure, – sample size, – ethics, – researcher's role. (Morrow, 2014; Rehm & Gadenne, 2013; Walter, 2009)

trends within the sample concerning the four axes and their respective subcategories. Additionally, it aims to uncover potential connections between the first two axes, which focus on the impact on the design outcome and students, and the third axis dealing with the co-creation framework. After three years of implementation, the analysis extends its scope to verify initial assumptions and to detect any consistent patterns that emerge across different years, within each axis and subcategory.

4. Co-creating Knowledge

Over the course of this three-year research endeavor, several insights have gradually emerged concerning the co-creation framework as a multifaceted process encompassing participation, teaching, and learning. These findings have informed iterative improvements implemented in subsequent years. It is important to note that the outcomes from the 2023 phase are still in progress and have yet to be finalized. Table 2 highlights some of the key findings achieved thus far.

The proposed co-creation framework has demonstrated an impact on both the design outcomes and the students involved. The practice of engaging with a wide array of diverse individuals within each neighborhood has significantly enriched the exploration of inclusive design concepts. This approach has resulted in housing concepts that are closely aligned with the site's specific context. Additionally, a comprehensive understanding of budgetary and construction schedules has fostered the creation of more pragmatic and effective designs. It's important to note that the focus and frequency of co-creative activities, particularly on public space in 2022 and schoolyard intervention in 2023, have influenced the resulting designs based on identified needs and participant recommendations. However, they had a limited effect on housing proposals.

The students' direct involvement in on-site investigations, face-to-face interactions with participants, and other interactive tasks such as video creation, alongside hands-on 1:1 work during design and build workshops, heightened their enthusiasm, sense of responsibility, and dedication to the co-creation process. This engagement has also boosted their confidence in the applicability of the process. Throughout the experience, students have acquired and improved a wide range of transferable soft skills such as effective communication, leadership, and critical thinking. Moreover, they have gained practical design and construction skills while also developing a profound understanding of co-creation processes and the concept of the urban commons. Exposure to real-life settings and meaningful interactions with various participants has better prepared them to navigate the complexities and constraints of real-world scenarios, and encouraged them to view conflicts as opportunities for productive dialogue. These interactions have allowed students to explore their roles in diverse teams, shifting from passive listeners to active discussants, leaders, and negotiators. Key

Table 2. *Some of the most important outcomes (the outcomes of 2023 remain ongoing and have not been concluded).*

2021 (online-COVID 19)	**2022**	**2023**
1. impact on the design result		
(+) – relatively inclusive design concepts. (-) – only the initial ideas and concepts are affected by the needs identified; – limited relation to the site and limited experiential "interpretations" of it. WHY? – long gaps between co-creative activities; – lack of 'on-site' investigations.	(+) – relatively inclusive design concepts; – great responsiveness to the users' needs; – solid connection between the housing units and the public space. HOUSING (-) – only the initial ideas and concepts are affected by the needs identified. WHY? – greater focus on public space during the co-creative process. PUBLIC SPACE (+) – the design is affected by the needs identified and the participants' suggestions; – investigating concepts of functionality, sustainability, accessibility, safety, inclusivity and flexibility. (-) – low efficiency in terms of materials, cost and scale; – low relation to the site (out of scale concepts). WHY? – unclear budget limitations and construction schedule.	(+) – substantial relation to the site. HOUSING (+) – relatively inclusive design concepts. (-) – only the initial ideas and concepts are affected by the needs identified; – lack of connection between the housing units and the school yard intervention. WHY? – greater focus on the public space during the co-creative process; – housing course is perceived as something separate from the school yard intervention. SCHOOL YARD INTERVENTION (+) – the design is highly affected by the needs identified and the participants' suggestions; – considerable responsivity to functionality, sustainability and efficiency; – significant responsivity to cost issues and construction details. (-) – lack of focus on the relationship with the neighbourhood. WHY? – only students and teachers are involved in the co-creative activities; – students in the school yard intervention course limit their site explorations to the school yard.

2. impact on students			
motivation and experience	(+) – a sense of excitement. (-) – limited commitment and responsibility to the process. WHY? – lack of 'on-site' investigations and unexpected encounters; – lack of face-to face interaction with the users.	(+) – engagement with the process; – responsibility and commitment, especially during the design and build workshop; – excitement with hands-on 1:1 work. (-) – concern about completing the design successfully while staying on schedule WHY? – considerable time was spent on co-creation activities; – designing both housing units and a public space is complex and time-consuming.	(+) – engagement with the process; – responsibility and commitment to the process; – excitement with some co-creative activities (video-pitch making,) and hands-on 1:1 work; – perceiving the process as beneficial to all participants and the common good. SCHOOL YARD INTERVENTION (+) – confidence for the usefulness and success of the design.
skills and learning outcomes	-	(+) – communication, cooperation skills; – know-how and practical skills related to design & build; – challenges and limitations of real-life settings; – co-creation and participation.	(+) – communication, leadership, and critical thinking skills; – know-how and practical skills related to design & build; – challenges and limitations of real-life settings; – conflict as an opportunity for fruitful discussion; – co-creation, participation, and urban commons.
attitude towards their role	(-) – passive listeners; – main decision makers. WHY? – lack of interaction with the users; – low involvement of other stakeholders.	(+) – shift from passive listeners to more active members of the team; – exploration of the multiplicity of the roles of a professional. HOUSING (-) – main decision makers. WHY? – greater focus on the public space during the co-creative process. PUBLIC SPACE (+) – decision making is affected by the co-creative process.	(+) – shift from passive listeners to more active members of the team; – understanding notions such as respect, trust and group work; – exploration of the multiplicity of the roles of a professional; – reflection on the importance of commons in Cypriot society and the role of the architect and citizen; – recognition of the social responsibility of architecture. HOUSING (-) – main decision makers. WHY? – greater focus on the public space during the co-creative process. PUBLIC SPACE (+) – decision making is highly affected by the co-creative process.

concepts such as respect, trust, and teamwork have become integral to their professional development.

However, having two parallel courses, while offering students manageable workloads and clearly defined tasks, created a separation between housing proposals and schoolyard interventions, potentially affecting the students' perception of the utility of their non-implementable housing designs. Lastly, a strong emphasis on co-creative activities related to

3. co-creation framework

participation	(+) – unlimited, long term and asynchronous access to information (Google Drive, Facebook). (-) – under-representation and lack of inclusivity; – low commitment to the process and gradually decreasing interest; – low levels of participation; – lack of a sense of community and interaction; – lack of spontaneity. WHY? – lack of real benefit and tangible results; – long gaps between co-creative activities; – exclusively online tools (Microsoft Teams, Miro, Google Forms) and lack of face-to face interaction.	(+) – unlimited, long term and asynchronous access to information (Google Drive, Miro, Facebook, Instagram); – participants balance (age, gender, social status); – ease of access with some hybrid activities and a workshop at the Municipality Hall; – motivation and interest/commitment to the process; – different levels of participation; – dynamic interaction, especially during informal activities (with legos). (-) – long gap between design and implementation of the public space; – limited participation of young couples and people; – limited participation during the summer design and build workshop. WHY? – most of the activities took place at the University and not in the neighbourhood/ Municipality; – unclear construction schedule and budget issues.	(+) – unlimited, long term and asynchronous access to information (Miro, Instagram); – ease of access with almost all the activities at the Highschool; – different levels of participation; – dynamic interaction especially during informal activities (with legos and video making); – some interaction after/ in between the co-creative activities to collect data and complete the tasks; – commitment to the process; – a sense of community building; – spontaneity and excitement. (-) – limited inclusivity in the participants group; – no participation during the summer design and build workshop. WHY? – participants are a select group of students, their teacher, and the school director owing to scheduling constraints; – limited information.
teaching & learning	(-) – lack of dynamic and spontaneous discussions between the students and educators; – limited learning activities. WHY? – lack of face-to-face interaction and communication with body language; – limited knowledge on online tools.	(+) – dynamic discussions between the students, educators and participants; – diverse and rich learning activities. (-) – too exacting and challenging curriculum, difficult to respond to. WHY? – considerable time was spent on co-creation activities; – designing both housing units and a public space is complex and time-consuming.	(+) – dynamic discussions between the students, educators and participants; – diverse and rich learning activities; – challenging and interesting curriculum; – doable tasks. (-) – unclear responsibilities during the two parallel courses; – intensive schedule and limited involvement of professionals and users during the summer workshop. WHY? – difficulty in clarifying responsibilities in mixed groups; – need for role organization during construction; – better organisazion and planning needed.

public spaces and school interventions has led to housing decisions that were less influenced by the co-creative process.

In terms of participation, the integration of online and face-to-face tools and procedures has facilitated unlimited, long-term, and asynchronous access to information, improving accessibility and inclusivity. However, due to scheduling constraints, the 2023 participants were limited and specific. Organizing activities within the participants' premises, such as the municipality and high school, and adopting a more informal format, has encouraged spontaneity, dynamic engagement, excitement, and varying levels of participation, ultimately

fostering a sense of community. The presence of a well-structured, tangible result and practical benefits has enhanced commitment to the process, even in between co-creative sessions. Successful co-creation activities have enriched the learning experiences, while face-to-face interactions have fueled dynamic discussions among students, educators, and participants alike.

5. Co-creating Evidence-Based Knowledge

The establishment of a long-term knowledge base founded on credible evidence necessitates a scientific and factual approach, emphasizing scientific research, empirical evidence, and rigorous analytical methods (Karimi, 2023). It is of paramount importance to scrutinize the research methodologies for each year in order to accumulate robust, comprehensive, and reliable knowledge. This knowledge serves as the foundation for the examination of existing educational practices and the development of evidence-based design approaches that can effectively respond to future challenges in a sustainable and inclusive manner.

While the general research methodology involving design, implementation, co-evaluation and assessment, reflection, and re-design has remained consistent over the past three years, several improvements and recommendations have emerged, warranting further clarification and development. The utilization of diverse data collection tools has played a vital role in determining their efficacy under specific conditions. For instance, students have displayed a greater willingness to engage in focus group discussions and informal interviews compared to completing questionnaires or reflective writing tasks. Focus group discussions have proven valuable for eliciting open and spontaneous responses, offering a wealth of informal insights. Questionnaires should be succinct and straightforward, incorporating a combination of Likert scale and open-ended questions. Additionally, gathering feedback from students during the course(s) itself is crucial, as they may forget or become less willing to engage after the course(s) conclude. When collecting data from other participants, it is imperative to seek input from a diverse and balanced group, in order to ensure a wide array of perspectives and viewpoints.

To ensure the methodology's viability and effectiveness, it is essential to align implementation activities with data collection activities for improved scheduling, and to standardize the process, creating an environment in which participants feel authentic and at ease. For data credibility, ongoing evaluation of evidence strength, quality, and applicability is essential (Peavey *et al.*, 2017). Proper documentation of the process is crucial to ensure long-term access to information such as activity dates, review dates, participant numbers, research year, theme, and more. Establishing an open-access database capable of correlating data across years, axes, and subcategories will facilitate the extraction of long-term findings. The axes and subcategories that govern data collection and analysis should be further enriched and defined to develop a framework guiding the selection and utilization of data collection tools, such as open-ended interviews and questionnaires with Likert scale questions.

A comprehensive framework should encompass data collection by participants, researchers-educators, and other involved parties. Furthermore, it may involve a method for future co-evaluation, examining how built solutions are integrated into urban form and users' daily lives over time. In the process of systematizing these approaches, it is imperative to preserve full extracts from each year's data to prevent the loss of complexity and uniqueness inherent in the data. While establishing a co-evaluation and assessment framework to some extent, flexibility must be retained to accommodate spontaneity and unexpected factors characteristic of the co-creation process.

6. Co-creation Studios: Nurturing Evidence-Based Design for Sustainable Cities

The emerging concept of "architecture as spatial agency" challenges the traditional roles of architects and spatial practitioners. This reconceptualization acknowledges the political, inclusive, and cooperative aspects of producing space, reframing architecture as a dynamic arena for negotiation and mutual knowledge. Within this evolving landscape, professionals and citizens have become more intertwined, and the concept of a neutral expert has been replaced by a collaborative and engaged participant.

Transdisciplinary architecture design studios represent one of the most promising pedagogical approaches that encapsulate this evolving paradigm. These studios have gained momentum, acting as crucibles of innovation and change. They provide students with the opportunity to engage directly with real-world contingencies, facilitating collaboration with communities, local stakeholders, public authorities, architects, and planners. Participatory and co-creation processes, combined with design and build projects, challenge students to step out of the conventional design studio and confront real-world uncertainties. They offer a platform for continuous assessment of the impact of this pedagogical approach on students. This impact encompasses the development of transferable soft skills, increased motivation, a transformation in attitude toward complex societal issues, and an evolution in their perception of their future professional roles, nurturing a generation of professionals capable to embrace the complexities of contemporary urban contexts.

One of the most important aspects of these co-creation studios is their capacity to create an evidence-based knowledge base, continually enriched through successive cycles of participatory action research (PAR) and critical reflection. The ongoing and iterative nature of these research investigations, linking findings with teaching methodologies and the co-creation framework, holds the promise of informing and improving academic curricula. Through the systematic application of participatory action research and a commitment to reflection and refinement, these studios continuously gather evidence on the transformative impact of their pedagogical approach. Designing, implementing, and evaluating a community-engaged and transdisciplinary pedagogical approach for architectural education is critical for the formation of the next generation of architects and urban planners, future policymakers and decision-makers, citizens, and, by extension, the future of cities and urban environments. The co-creation of a shared framework and solid knowledge that can lead to evidence-based urban design allows for expertise, responsiveness, and relevance, generates a greater impact on professionals, civil society, and urban form production, enhances the development of innovative, resource-efficient, and inclusive solutions, and establishes and maintains long-term relationships between academic institutions, governance bodies, and civil society for urban decision making. This can be transformative both for the participants and for the city, developing a sense of ownership and responsibility for their urban living environments. The city can thus be perceived as an agent of change for the University (research and education), while the University can be an agent of change for the city.

The methodology creates a dynamic and adaptable framework that encourages ongoing learning and improvement. It effectively encapsulates the essence of co-creation in a learning environment while emphasizing the significance of assessment and reflection in the pursuit of continuous advancement. The interconnected nature of these phases allows for the seamless integration of evidence-based insights into the learning process.

Nevertheless, it is crucial to acknowledge that such pedagogical approaches embracing situated learning, come with both strengths and limitations. Students are exposed to the complexities of the real world, provided with opportunities to engage with new people, techniques, materials, and a transparent value system. They are encouraged to experiment with "new ways of practicing architecture" (Denicke-Polcher & Khonsari, 2015; Morrow, 2014).

They can also acquire valuable transversal skills, including collaboration, peer learning, communication, negotiation, professionalism, leadership, and critical thinking, through their interactions with various stakeholders (Sara & Jones, 2018). Despite the mainstreaming of concepts like co-creation, community participation, and collaboration in these approaches, several limitations and challenges persist, including among others:

- Changing Student Cohorts: In the context of educational institutions, a new group of students participates each year. This turnover means that the knowledge and experience acquired in one cycle might not be seamlessly passed on to the next group. This dynamic can pose difficulties in building a cumulative body of knowledge and expertise.
- Context Specificity: Each year, these approaches may be applied to different themes and contexts, making it challenging to draw broader generalizations or assess the long-term impact consistently. Context-specific factors play a significant role in determining the effectiveness of the educational approach.
- Student Exposure to the Methodology: The gradual exposure of students to this particular methodology, involving contact with students from various years and the presentation of course materials, can lead to a gradual assimilation of concepts over time. The results of these projects may evolve from year to year based on the level of students' exposure to the methodology.
- Reflective Writing Bias: The use of reflective writing may introduce hindsight bias from the researcher's perspective. Researchers must address concerns related to this bias to ensure the credibility and accuracy of their findings (Rehm & Gadenne, 2013).

In addition to the limitations associated with educational approaches, it is also essential to acknowledge the challenges in building an evidence base that demonstrates the long-term success and feasibility of co-created solutions. Co-creation often involves experimental and innovative methods that may lack established precedents, making it difficult to verify their efficacy (Fanzini *et al.*, 2020). This challenge underscores the need for rigorous evaluation and long-term monitoring of co-created projects to establish a reliable evidence base.

In conclusion, the incorporation of situated learning, co-creation, and community participation in educational approaches offers numerous benefits, but it is equally vital to be mindful of the challenges and constraints that may impact their implementation and long-term impact. A holistic understanding of these limitations is necessary to develop strategies that can enhance the effectiveness of these approaches and provide a more comprehensive educational experience for students.

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