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EMBEDDING KAZAKH CULTURAL HERITAGE IN INDUSTRIAL DESIGN EDUCATION FOR SUSTAINABLE PRACTICES

Lyazzat Nurkusheva[1], Aibota Ashimova[2]
[1,2]International Educational Corporation
(Kazakh Leading Academy of Architecture and Civil Engineering)
(Almaty, Kazakhstan)

Abstract. Contemporary industrial design education increasingly emphasizes interdisciplinarity and cultural contextualization; however, in practice, cultural content often remains symbolic and detached from constructive, systemic design decision-making. This results in a persistent curricular gap between cultural–semantic and system–constructive approaches, leading either to technically stable but culturally neutral artefacts or to culturally expressive yet structurally decorative solutions. The present study continues research on interdisciplinary design pedagogy and the integration of cultural heritage into sustainable design education. The *purpose* of this research is to develop and analyze a reproducible educational model that enables the operational integration of cultural meaning into constructive, functional, and experiential dimensions of industrial design. The *objectives* include identifying mechanisms of interdisciplinary interaction between ethnodesign and ecosystem-oriented industrial design, examining how cultural codes are translated into form-generation and structural logic, and assessing sustainability as an educational outcome of this integration. The study employs a design-based educational case study methodology. The research is based on a 15-week studio intervention (PTP 08) implemented in Kazakhstan, integrating two compulsory courses: ED 4226 Ethnodesign and EPD 4319 Ecosystem in Industrial Design. Empirical data comprise student design artefacts developed across two assessment phases, as well as exhibition documentation analyzed as an external communicative and experiential test. The *findings* demonstrate that the integrated educational model facilitates a transition from symbolic cultural references to functional embedding and experiential transformation.

Keywords: industrial design education; multidisciplinary integration; ethnodesign; ecosystem approach; cultural heritage; design-based educational case study; studio-based learning; systems

thinking; user experience; semantic readability; constructive logic; assembly and disassembly; sustainable design education; reuse and circularity; exhibition as public validation.

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Introduction

Contemporary industrial design operates within a field where stable typologies and fixed professional roles are progressively displaced by fluid constellations of interdependent factors. Environmental constraints reconfigure material logics and product life-cycle thinking; accelerated technological evolution disrupts linear project workflows; and global markets simultaneously intensify cultural homogenisation while amplifying demands for social and cultural accountability in design practice (Papanek, pp. 23–35; Manzini, pp. 1–15). Under these conditions, industrial design can no longer be meaningfully approached as an autonomous discipline focused primarily on form or function. Rather, it emerges as an ecological assemblage in which artefacts, users, environments, technologies, and cultural frameworks co-condition one another.

Despite this shift, design education often continues to reproduce disciplinary compartmentalisation, thereby sustaining cognitive models increasingly misaligned with contemporary professional realities (Fleischmann, pp. 2–5). Recent scholarship in design pedagogy highlights the limitations of isolated curricular structures and argues for integrative educational architectures grounded in systemic reasoning and cross-disciplinary negotiation (Brosens et al., pp. 1–4). Within this perspective, the designer is reconceptualized not as a carrier of discrete skills, but as a mediator navigating between material systems, cultural narratives, and situated user practices.

Notwithstanding the frequently articulated commitment to interdisciplinarity, many industrial design programs retain a structural rupture between system-oriented constructive thinking and culturally oriented semantic inquiry. Courses addressing geometry, structure, and manufacturing constraints typically evolve independently of those that engage cultural context, identity formation, and meaning-making (Cross, pp. 17–25). This bifurcation tends to generate two polarized design outcomes: artefacts that are structurally robust yet semantically neutral, and, conversely, projects that are symbolically saturated but materially and functionally superficial. In both cases, cultural references function predominantly as visual signifiers rather than as operative agents shaping form logic, material selection, or usage scenarios. As a result,

cultural codes within industrial design education remain emblematic rather than performative (Hao & Misri, pp. 3–5).

From the standpoint of user experience, such stratification undermines the possibility of sustained meaning-making, as significance not embedded within functional or behavioural logic cannot be durably enacted through use (Norman, pp. 8–15). Meaning, when detached from action, dissipates at the moment of interaction.

Contemporary research in design pedagogy underscores that resilient design cognition is cultivated through situated practice rather than declarative transmission of principles. Experiential learning theory conceptualises knowledge as emerging from iterative cycles of action, reflection, and re-engagement, positioning studio-based work as a central apparatus for shaping design reasoning (Kolb, pp. 21–38). In a comparable manner, cultural identity in design is not transferred as a repository of predefined symbols but is constituted through projective action, wherein meaning is continuously negotiated with material constraints, functional demands, and user scenarios. The concept of reflection-in-action further emphasises that understanding and resolution co-evolve within the act of designing, rather than unfolding sequentially (Schön, pp. 49–69). However, in the absence of operative mechanisms linking semantic and constructive domains, the cultural dimension of education remains largely declarative, while sustainability is reduced to a matter of technological optimisation or material choice. This reduction is corroborated by studies in sustainable education and cultural heritage, which point to the marginalisation of cultural agency within ostensibly sustainable design frameworks (Orphanidou et al., pp. 4–7). The Kazakhstani context is characterised by the coexistence of a rich ethno-cultural legacy and an accelerated integration into global economic and educational systems. For design education, this conjunction produces a condition in which the potential for meaningful cultural integration is accompanied by a heightened risk of superficial appropriation. In this sense, Kazakhstan constitutes a representative milieu for examining how cultural and systemic approaches may be interwoven within industrial design pedagogy (UNESCO, pp. 12–18; Manzini, pp. 35–45).

The aim of this article is to demonstrate how the integration of the courses ED 4226 Ethnodesign and EPD 4319 Ecosystem in Industrial Design can be articulated as a unified pedagogical mechanism capable of translating cultural meaning from a symbolic register into constructive, functional, and experiential dimensions of designed artefacts. The central research question is: Which elements of educational architecture enable an operational transition from cultural codes to geometry, structure, materiality, and usage scenarios without reducing culture to a decorative motif? The object of analysis is a specific studio intervention conducted within the PTP 08 module, while the empirical material comprises student design artefacts and their public exhibition, considered as a mode of external validation of educational outcomes (Schön, pp. 49–69; Cross, pp. 17–25; Hao & Misri, pp. 3–5). The scholarly contribution of this work does not lie in proposing a new universal design theory, but rather in articulating a reproducible model of interdisciplinary interlacing, wherein each discipline assumes a functionally distinct role: ethnodesign generates semantic orientation and user-related valence, while ecosystem-oriented industrial design ensures structural coherence and life-cycle feasibility. This configuration enables a more precise distinction between parallel instruction and genuine integration, understood here as a managed translation process occurring within a

single project cycle. The article proceeds as follows: Section 2 outlines the case study methodology and curricular framework; Section 3 discusses the theoretical foundations linking cultural heritage, UX legibility, and sustainability; Section 4 presents the analysis of project artefacts and the exhibition format; and Section 5 formulates conclusions and prospects for the application of the proposed model within industrial design education (Fleischmann, pp. 2–5; Brosens et al., pp. 1–4; Design-Based Research Collective, pp. 5–7).

Methods

The present study adopts a design-based educational case study format, since its object of inquiry is not an abstract pedagogical model but a concrete educational intervention implemented within a studio-based learning environment. Unlike conventional empirical research oriented toward statistical generalisability, this approach enables the observation and interpretation of design thinking as a process unfolding over time through situated action, material production, and reflective negotiation that emerge during the act of designing. The design-based case study framework captures educational innovation in its operative state, understood as a configuration of project briefs, artefacts, and translational shifts between the semantic and constructive dimensions of design solutions. In this respect, the study follows the logic of design-based research, where the design intervention functions simultaneously as both the subject and the instrument of inquiry into the educational process (Design-Based Research Collective, pp. 5–8; Yin, pp. 15–20).

The empirical corpus comprised three interrelated layers of data. First, Rating 1 conceptual materials, including associative mappings, cultural–functional diagrams, and clausura-based exploratory proposals. Second, Rating 2 outcomes, consisting of physical models, technical drawing packages, and visualisations. Third, exhibition documentation, encompassing photographic records of the exhibition, observations of audience–object interaction, and short commentaries documented in field notes.

The analytical procedure consisted of a qualitative interpretation of design artefacts, in which each project was examined along three interdependent axes.

The first axis was constructive–geometric, addressing structural logic, assembly principles, and material behaviour. The second axis was semantic–user-oriented, focusing on how cultural codes are embedded within usage scenarios and rendered legible through action rather than representation. As the Design-Based Research Collective emphasises, educational interventions must be studied in naturalistic settings, where learning unfolds through iterative, reflective engagement. This approach aligns with Yin's (Yin, pp. 44–50) criteria for robust case study design, emphasising contextual depth and exploratory scope over statistical generalizability.

The third axis concerned sustainability as practice, referring to the specific operations that render the object reusable, repairable, disassemblable, and behaviourally resilient. Crucially, the analysis did not privilege the presence of isolated attributes. Instead, emphasis was placed on the existence of translational operations between axes, that is, moments in which meaning does not overlay form but precipitates constructive decisions. Cultural logic was therefore considered operative only when it functioned as a generative cause of geometry, structure, or material organisation, rather than as a symbolic afterlayer (Cross, pp. 17–25; Schön, pp. 49–69; Hao & Misri, pp. 3–5; Orphanidou et al., pp. 4–7). Within the context of design education, such a research design is methodologically

grounded. As Donald Schön argues, professional design knowledge does not crystallise as a set of pre-established rules but emerges through reflection-in-action, where problem framing and solution development co-evolve in real time (Schön, pp. 49–69). Similarly, Nigel Cross emphasises that design operates through its own epistemology, often described as a designerly way of knowing, in which knowledge is inseparable from projective action and material experimentation (Cross, pp. 17–25).

Employing a design-based case study thus allows studio projects to be treated not as illustrative outcomes of teaching, but as empirical evidence of how an educational model operates in practice. In this sense, the study is exploratory and demonstrative rather than confirmatory. Its aim is not to construct a universal pedagogical theory, but to identify and articulate a reproducible mechanism of disciplinary integration within industrial design education. Comparable approaches are widely used in research on design pedagogy and interdisciplinary educational practices (Gashoot et al., pp. 2–5). The studio was organised as a fifteen-week instructional cycle comprising two interdependent assessment stages. During Rating 1, conducted in Weeks 1 to 8, students carried out associative analyses, cultural and functional mapping, and clausura-based conceptual explorations. The objective of this phase was to identify the potential for translating cultural and semantic positions into formative and structural principles. Rating 2, conducted in Weeks 9 to 15, focused on material and constructive verification. This phase included the production of physical models, technical drawing sets, and visual representations. Its primary task was to test the structural viability and internal coherence of the proposed solutions in terms of form, material behaviour, and assembly logic. Both stages were considered mandatory and mutually constitutive. Outcomes from the first phase informed the second, while the second phase enabled critical reassessment and refinement of the initial semantic premises. Within the study, student artefacts were treated as empirical data reflecting the effects of the integrated educational model. These data included conceptual sketches and clausuras, physical models, drawing packages, visual materials, and exhibition objects, along with documentation of the public presentation of the projects. Material outcomes of studio work were thus employed not as illustrative examples but as the primary analytical substrate for evaluating the effectiveness of interdisciplinary interlacing in industrial design education. The exhibition itself was interpreted not as a sociological measure of satisfaction, but as a communicative test. The key question was whether the objects could maintain coherence between semantic intent and constructive logic outside the pedagogical environment, under conditions of autonomous viewing, interpretation, and interaction (Norman, pp. 8–15; Zhou et al., pp. 6–9).

Discussion

In contemporary discourse on design education, multidisciplinarity is frequently presented as a universal response to the growing complexity of the professional environment. Curricula are expanded by including courses on sustainability, cultural studies, digital technologies, and user experience. However, both empirical and theoretical research indicate that the mere coexistence of heterogeneous subjects does not, in itself, ensure the formation of integrated design thinking. The challenge of interdisciplinarity in design education manifests not in declarations, but in the architectures of transition between disciplines. When courses operate in parallel, students are exposed to multiple, and often incompatible, regimes of justification. In one module,

design decisions are legitimised through construction; in another, through cultural meaning; in a third, through sustainability articulated as an abstract imperative. Without an embedded translational mechanism, these regimes do not converge into a coherent mode of project reasoning. Instead, they remain a collection of detached evaluative criteria. In terms of curriculum reform, this situation resembles a pattern of incremental, course-by-course updates, in which systemic coherence is not itself treated as a designed object (Brosens et al., pp. 1–4; Fleischmann, pp. 2–5).

Within such configurations, students are positioned as assemblers of fragments, expected to synthesise engineering, cultural, and user-oriented knowledge independently, without an explicitly articulated integrative framework. As a result, synthesis either fails to occur or remains intuitive, tacit, and difficult to reproduce or transfer. This tension is particularly acute in the Kazakhstani context, where educational models increasingly aim at interdisciplinary integration but often lack systemic mechanisms for implementation (Nurkusheva & Ashimova, pp. 294–299)

Fleischmann notes that this condition is largely the result of educational inertia inherited from industrial-era models, in which knowledge was organised along rigid disciplinary boundaries (Fleischmann, pp. 2–5). Under contemporary conditions, where design increasingly operates as an intermediary between complex systems, such pedagogical logic no longer corresponds to professional practice. The parallelisation of disciplines creates an appearance of complexity, yet it does not cultivate systemic reasoning. In this context, a critical distinction emerges between multidisciplinary presence and multidisciplinary interaction. In the former, disciplines coexist without influencing one another. In the latter, they perform differentiated yet interdependent functions within a shared project process. It is this second understanding that underpins the case examined in this study, where ethnodesign and ecosystem-oriented industrial design do not duplicate content, but instead structurally complement one another(Figure 1).

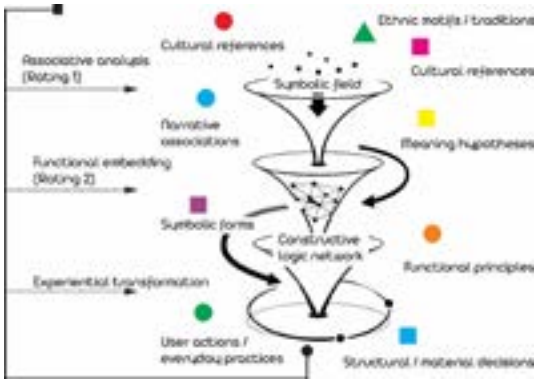

Figure 1. From symbolic reference to operational integration of cultural heritage in design education.

One of the most problematic dimensions of interdisciplinary design education concerns the integration of cultural heritage. Despite increasing attention to local identity and tradition, educational practice often reduces cultural elements to visual quotations that serve representational rather than projective purposes. In such cases, cultural codes remain confined to form or ornamentation and do not affect the logic of construction, material behaviour, or use. Hao and Misri propose a conceptual framework that analytically differentiates levels of integration of intangible cultural heritage within design practice (Hao & Misri, pp. 3–5). What they term symbolic reconstruction refers to the reproduction of cultural motifs within the visual language of an object. Functional embedding describes a condition in which cultural principles begin to influence form organisation, structural logic, and functional configuration. Experiential transformation denotes a further shift, in which cultural meaning is encountered by the user through interaction with the object itself. An examination of existing educational

practices suggests that most remain confined to the first level. This limitation stems less from a lack of cultural content than from the absence of methodological instruments capable of translating meaning into operational design parameters. When cultural interpretation and constructive design are assigned to separate disciplines, such translation becomes structurally difficult. This process echoes similar trajectories documented in the SILKNOW project, where traditional crafts were reinterpreted through digital frameworks to activate both heritage and contemporary practice (Alba Pagán et al., pp. 26–30).

In the case under consideration, ethnodesign was embedded in the project process from the outset as a source of semantic hypotheses subject to verification through construction and material experimentation. This positioning enabled a deliberate progression from symbolic reconstruction toward functional embedding and, subsequently, toward experiential transformation. Cultural heritage thus ceases to function as a static repository of images and instead becomes a dynamic resource for design thinking, actively shaping decisions across semantic, constructive, and experiential dimensions.

The transition from symbolic to operational modes of cultural integration inevitably foregrounds the question of user experience. Cultural meaning in design does not exist as an autonomous layer; it is activated through the user's interaction with an artefact. When meaning is not supported by functional logic and cannot be apprehended in use, it remains external to experience and fails to become operative. Research by Zhou and colleagues on user experience within virtual platforms of industrial heritage demonstrates that cultural identity exerts a significant influence on perception only when combined with functional clarity and narrative coherence (Zhou et al., pp. 6–9). These components form an interdependent system, within which the weakening of one element diminishes the effectiveness of the others. Cultural reference alone does not guarantee engagement; it requires alignment with action and intelligibility.

Transposed into the context of industrial design, this logic allows user experience to be understood as a mediating layer between cultural meaning and constructive resolution. Ethnodesign that is not anchored in constructive clarity loses user-related valence, while a structurally coherent object devoid of semantic orientation becomes culturally neutral. It is only through their combined operation that a design outcome can emerge in which form, function, and meaning are experienced as a unified whole. In the case presented in this study, the ecosystem-oriented approach to design created the conditions for a mediating role for user experience. Cultural scenarios developed within the ethnodesign component were verified through geometry, material behaviour, and assembly logic. This process rendered meaning inseparable from action, rather than an additional interpretive layer. As a result, user experience functioned as the space in which cultural and systemic modes of thinking converged rather than competed (Figure 2).

Within the discourse of design education, sustainability is frequently invoked as a normative category that rarely translates into concrete design decisions. In such cases, it is reduced to selecting

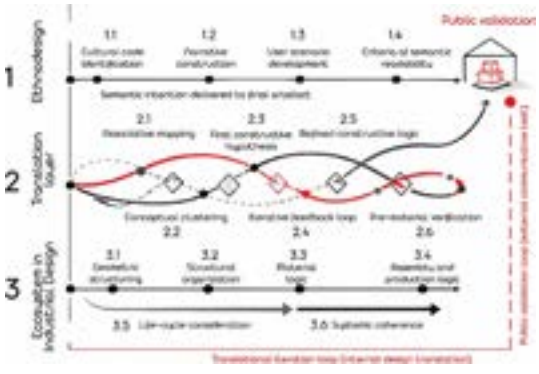

Figure 2. Weaving model of the two disciplines across the 15-week project cycle.

environmentally labelled materials or to declaratory references to recycling, without engaging the deeper mechanisms of design thinking that shape how objects are conceived, produced, and used.

Classical work by Victor Papanek emphasises that sustainability should be understood primarily as an ethical and systemic condition embedded within the design process itself, rather than as an additive attribute of a finished artefact (Papanek, pp. 23–35). Ezio Manzini extends this argument by pointing out that sustainable solutions emerge from situated practices, in which design engages directly with material constraints, real users, and concrete use scenarios (Manzini, pp. 35–50).

In the educational case presented here, sustainability emerges as the outcome of a coordinated interaction between the semantic and systemic layers of design thinking. It is articulated not only through material choice, but also through principles of assembly and disassembly, opportunities for reuse, and the cultivation of responsible user behaviour. This approach aligns with contemporary perspectives on sustainable education, which frame knowledge formation as a process grounded in experience and action rather than in the declarative transmission of principles (Orphanidou et al., pp. 4–7). From this perspective, sustainability in industrial design education can be understood not as a discrete topic or curricular module, but as an educational result that emerges from a structurally organised form of interdisciplinary interaction. Sustainable thinking, in this sense, is not the formal content of the curriculum, but a consequence of its educational architecture and the relationships it establishes between meaning, construction, and use (Table 1).

Results

Within the integrated educational model outlined in the preceding sections, a series of student projects was realised and subsequently presented in a public exhibition. In total, seven design objects were developed by undergraduate Industrial Design students over a 15-week instructional cycle. The projects addressed everyday object design, with a particular emphasis on furniture and interior elements intended for routine use rather than speculative or purely conceptual applications.

A defining characteristic across all projects was the deliberate, consistent selection of material. Each object was constructed from packaging waste and recyclable paper-based materials, including cardboard boxes, packaging sheets, and multilayer board. Material was approached not as a secondary constraint or an ethical add-on, but as an active design variable that directly shaped structural logic, formal geometry, and assembly strategies. In this sense, material choice operated as a generative condition rather than a limiting factor.

The outcomes of the studio were articulated through a public exhibition titled “7 Styles. A New Life for Packaging”, which relocated the educational process beyond the classroom and situated it within a public communicative context. The exhibition format combined physical artefacts with visual documentation and explanatory elements that articulated both conceptual premises and constructive decisions. As a result, the final outcome was not merely a collection of individual objects, but a coherent exhibition statement that externalised the logic of the integrated educational model.

Analysis of the constructive dimension revealed that the ecosystem-oriented approach to industrial design exerted a decisive influence on form generation and structural organisation. Across all projects, geometric configurations were directly informed by the physical properties of the chosen materials, particularly their planar character, anisotropy, and limited

Table 1 – Translational matrix: meaning → construction → sustainability outcomes.

Level of design decision	Semantic / cultural input (Ethnodesign)	Constructive / systemic translation (Ecosystem in Industrial Design)	Sustainability outcome (operational)
Meaning formation	Cultural code interpreted as a set of values, practices, and user relations rather than visual symbols	Meaning reformulated as design constraints and guiding principles	Sustainability framed as a value-driven design intention, not a post-rationalized feature
Form generation	Cultural references inform proportions, rhythm, modularity, and spatial logic	Geometric structuring derived from material limitations and folding / layering logic	Reduction of material use through form efficiency and structural optimization
Functional logic	User scenarios derived from everyday cultural practices	Functions embedded in structure (load-bearing surfaces, multifunctional elements)	Extended functional lifespan and reduced need for additional components
Material interpretation	Cultural meaning linked to material honesty and tactility	Use of packaging waste as primary constructive material	Material circularity through reuse and recyclability
Assembly principles	Cultural narratives translated into performative actions (assembling, transforming, reusing)	Slot-based, fold-based, and tool-free assembly systems	Energy-efficient production, disassembly, and reconfiguration
User interaction	Meaning experienced through interaction rather than explanation	Structure supports intuitive use and transformation	Responsible user behaviour encouraged through direct engagement
Life-cycle awareness	Cultural perception of temporality, care, and reuse	Design considers transport, storage, reassembly, and after-use	Reduced environmental impact across the product life cycle
Educational outcome	Cultural identity becomes operational design knowledge	Systemic thinking integrated into project decision-making	Sustainability emerges as an educational result, not a declared topic

load-bearing capacity. These constraints prompted the systematic use of folded, ribbed, and modular structures, which allowed for structural stability while minimising material consumption.

Construction principles were developed in close relation to processes of assembly and disassembly. Several projects employed adhesive-free connections based on slots, interlocking elements, and mutual fixation, enabling the objects to be understood as temporary, transformable, or reconfigurable structures. This strategy not only enhanced sustainability in life-cycle terms but also repositioned assembly itself as a component of user engagement rather than a hidden technical operation.

The systemic nature of the design process was further reflected in the treatment of objects as elements within a broader material and spatial ecology. Considerations of transportation, storage, and repeated use were embedded within the constructive logic, a concern of particular relevance when working with packaging-derived materials. Construction thus functioned as a connective medium linking material behaviour, functional intent, and

anticipated usage scenarios, rather than as a purely technical resolution.

Alongside the constructive dimension, a significant outcome of the project concerned the semantic and user-oriented layer shaped within the Ethnodesign course. Cultural codes and ethnic styles selected by students were not applied retrospectively to completed forms, but informed formative decisions from the early stages of design development. In several cases, cultural motifs were translated into structural principles, manifested through rhythmic articulation, modular organisation, or spatial configuration. Cultural reference thereby influenced not only appearance, but also patterns of interaction and use, transforming meaning from a decorative layer into a functional component of the object.

User orientation was articulated through attention to specific everyday practices and use scenarios. Interaction with the objects extended beyond conventional use to include processes of assembly, transformation, or reuse, positioning the user as an active participant in the object's life cycle. Within this framework, cultural meaning was not communicated through explanatory texts but was encountered through action and engagement. Observations of visitor interaction during the exhibition indicated that cultural aspects were perceived not as abstract information, but as intuitively legible through form and behaviour, suggesting a convergence of semantic clarity and constructive coherence.

The exhibition itself constituted the final element of the project cycle and served as an external verification of the educational model. By situating student work in a public setting, it became possible to evaluate not only aesthetic and structural qualities but also the communicative capacity of the objects. Viewed outside the pedagogical context, the projects were required to sustain meaning independently, without reliance on instructional framing. Their ability to remain intelligible and coherent under these conditions attests to the alignment of semantic and systemic dimensions within the design process.

Taken together, the exhibition operated not merely as a presentation format but as an instrument for validating the reproducibility and communicative robustness of the integrated educational model. The findings indicate that the combined application of ethnodesign and ecosystem-oriented industrial design yields outcomes that function both within and beyond the educational environment. This external viability strengthens the pedagogical and methodological significance of the model, positioning it as a transferable framework for industrial design education grounded in material practice, cultural mediation, and systemic reasoning.

Basic provisions

Contemporary industrial design education is developing under conditions in which design can no longer be understood as a local task of form-making. Instead, it increasingly operates as a process of negotiating semantic, systemic, and user-related factors. In this context, design does not function as an aggregate of technical and aesthetic solutions, but as an integrated practice in which artefact, material, user, and cultural environment constitute a mutually dependent configuration. Educational models that rely on the isolated acquisition of discrete disciplinary competencies, therefore, lose their capacity to cultivate an adequate understanding of the complexity inherent in contemporary design practice.

A central methodological premise of this study is the recognition that cultural context in industrial design cannot be treated as external or secondary to the constructive and functional decision-making process. Cultural codes, identities, and narratives acquire design relevance

only when embedded in processes of form generation and actively shape object structure, material logic, and scenarios of use. When cultural content remains detached from these processes, it becomes a symbolic layer that does not contribute to the formation of user experience and remains peripheral to design action. At the same time, systemic and ecosystem-oriented approaches to industrial design cannot operate effectively without attention to the semantic and user-related valence of designed objects. Design practices focused exclusively on geometry, construction, and product life cycles risk producing solutions that are functionally coherent yet culturally neutral. Semantic and systemic dimensions of design should therefore be understood not as competing alternatives, but as complementary components of a unified mode of design thinking in which meaning and structure co-evolve. On this basis, the study advances the position that interdisciplinarity in design education becomes productive only when disciplines are assigned clearly defined functional roles and when mechanisms of interaction are explicitly embedded within the project process. The parallel delivery of courses does not, in itself, generate integration if structural connections between them are absent. Effective interdisciplinarity presupposes that each discipline contributes to a distinct layer of the design solution, collectively establishing a coherent trajectory from meaning to form and function. A further methodological position concerns the understanding of sustainability as an outcome of educational structure rather than as a declarative objective. Sustainable design thinking emerges through engagement with material behaviour, construction logic, assembly processes, and user practices, when ecological and social considerations are encountered as concrete design constraints and opportunities. In this sense, sustainability is enacted through experience and action rather than through formal compliance with normative principles.

Finally, the study is grounded in the recognition of student design artefacts as legitimate empirical data. Within design education, it is the material outcomes of project work, including models, constructions, usage scenarios, and modes of presentation, that reveal how an educational model operates in practice. The public presentation of these outcomes extends the educational process beyond the classroom and serves as an additional layer of validation, enabling an assessment of whether design solutions remain coherent, intelligible, and meaningful outside the instructional context.

Conclusion

The results of the present study confirm that the deliberate interlacing of ethnodesign and ecosystem-oriented industrial design within a unified instructional protocol enables overcoming a number of structural limitations characteristic of conventional models of design education. Analysis of student projects and of the educational process as a whole demonstrates that interdisciplinary integration becomes productive not through the formal expansion of curricula, but through the clear allocation of functional roles between disciplines and their incorporation into a shared project cycle.

One key finding is confirmation that cultural symbolism in industrial design can be translated from a declarative, primarily visual register into a constructive, operational one. In the examined case, cultural codes did not function as a final representational layer but rather as initial semantic hypotheses, verified through form, material, construction, and scenarios of use. This approach prevented superficial quotation of cultural motifs and ensured their tangible influence on design decisions throughout the project process.

An equally significant conclusion concerns the role of sustainability within the educational context. The findings indicate that sustainability emerges from coordinated interaction between the semantic and systemic layers of design thinking. Engagement with recyclable materials, assembly logic, and possibilities for reuse demonstrated that sustainable reasoning is not acquired through the proclamation of principles, but through situated design practice in which ecological and social considerations become integral components of constructive solutions.

The methodological contribution of the study lies not in the formulation of a new general theory of design, but in articulating a reproducible educational structure that integrates semantic and systemic approaches within industrial design education. In contrast to models based on the parallel teaching of disciplines, the proposed framework demonstrates how interdisciplinarity can be embedded in the project process itself, rather than appended as an external requirement.

The educational value of this model resides in its capacity to support students in systematically navigating the transition from cultural meaning to constructive resolution, thereby fostering integrated design thinking. Within this configuration, ethnodesign serves to establish semantic orientation and user-related framing, while ecosystem-oriented industrial design provides the systemic and constructive realisation of these meanings. Such a distribution of roles renders interdisciplinary interaction both transparent and pedagogically manageable.

In addition, the study contributes to ongoing discussions concerning the nature of empirical data in design education research. Student project artefacts, physical objects, and modes of public presentation are treated not as illustrative outputs, but as analytical material through which the functioning of an educational model and the dynamics of design thinking formation can be examined.

Second, the case was realised within a limited temporal framework and did not include quantitative measures of educational outcomes. Future research may expand the empirical base through comparative case studies, longitudinal investigation, or mixed-method approaches combining qualitative and quantitative analysis.

A promising direction for further research is adapting the proposed model to other disciplinary configurations within design education and examining its applicability in digital and hybrid learning environments. Further attention should also be given to how such models can be integrated at the institutional level into established educational programmes.

Overall, the study demonstrates that interdisciplinary integration in industrial design education acquires substantive meaning only when cultural and systemic dimensions of design are woven into a unified pedagogical structure capable of translating meaning into form, function, and sustainable practice. It is precisely such a structure that enables future designers to engage with complex design challenges in which meaning, construction, and user experience operate not as isolated concerns, but as interdependent components of coherent design thinking.

Authors contribution:

L. Nurkusheva – formation of the theoretical part of the text, work with sources and interpretation of the data obtained. Analysis and systematization of the material, execution of the practical part of the study.

A. Ashimova – defining the research concept, identifying the scope of tasks and developing research methodology. Scientific editing of the main text, abstract text, consulting and scientific guidance.

Вклад авторов:

Л.Т. Нуркушева – формирование теоретической части текста, работа с источниками и интерпретация полученных данных. Анализ и систематизация материала, исполнение практической части исследования.

А.М. Ашимова – определение концепции исследования, выявление круга задач и разработка методологии исследования. Научное редактирование основного текста, текста аннотации, консультирование и научное руководство.

Авторлардың үлесі:

Л.Т. Нуркушева – мәтіннің теориялық бөлігін қалыптастыру, дереккөздермен жұмыс және алынған мәліметтерді интерпретациялау. Материалды талдау және жүйелеу, зерттеудің практикалық бөлігін орындау.

А.М. Ашимова – зерттеу тұжырымдамасын анықтау, міндеттер ауқымын анықтау және зерттеу әдістемесін әзірлеу. Негізгі мәтінді, аңдатпа мәтінін ғылыми редакциялау, кеңес беру және ғылыми жетекшілік ету.

References

Brosens, Lore, et al. "Tackling Curricula Reforms as Design Problems: A Review of Design Curricula Perspectives." *DS 110: Proceedings of the 23rd International Conference on Engineering and Product Design Education (E&PDE 2021),* edited by Hilary Grierson et al., Design Society, 2021, doi:10.35199/epde.2021.38. (In English)

Cross, Nigel. *Designerly Ways of Knowing*. Springer, 2006. (In English)

Design-Based Research Collective. "Design-Based Research: An Emerging Paradigm for Educational Inquiry." *Educational Researcher,* vol. 32, no. 1, 2003, pp. 5–8, doi:10.3102/0013189X032001005. (In English)

Fleischmann, Katja. "Design-Led Innovation and Design Education." *Journal of Learning Design,* vol. 8, no. 3, 2015, pp. 1–12. (In English)

Hao, Lingli, and Izzuddinazwan Bin Misri. "Inheriting and Innovating: A Review of Creative Product Design Research Based on Intangible Cultural Heritage." *Design Insights,* vol. 2, no. 1, 2025, pp. 1–8. (In English)

Kolb, David A. *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall, 1984. (In English)

Manzini, Ezio. *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. MIT Press, 2015. (In English)

Norman, Donald A. *The Design of Everyday Things*. Revised and Expanded Edition, Basic Books, 2013. (In English)

Nurkusheva, Lyazzat, and Aibota Ashimova. "Интеграция мультидисциплинарных знаний в учебные программы по промышленному дизайну." *Central Asian Journal of Art Studies,* vol. 9, no. 4, 2024, pp. 291–305, doi:10.47940/cajas.v9i4.953. (In Russian)

Orphanidou, Yianna, et al. "Cultural Heritage for Sustainable Education Amidst Digitalisation." *Sustainability*, vol. 16, 2024, 1540, doi:10.3390/su16041540. (In English)

Papanek, Victor. *Design for the Real World: Human Ecology and Social Change*. Thames & Hudson, 1985. (In English)

Schön, Donald A. *The Reflective Practitioner: How Professionals Think in Action*. Basic Books, 1983. (In English)

Zhou, Qi, et al. "Exploring User Experience in Virtual Industrial Heritage Platforms: Impact of Cultural Identity, Functional Clarity, Scene Interactivity, and Narrative Quality." *Buildings*, vol. 15, 2025, 253, doi:10.3390/buildings15020253. (In English)

Alba Pagán, Ester, et al. "From Silk to Digital Technologies: A Gateway to New Opportunities for Creative Industries, Traditional Crafts and Designers. The SILKNOW Case." *Sustainability*, vol. 12, no. 19, 2020, 8279, doi:10.3390/su12198279. (In English)

Yin, Robert K. *Case Study Research and Applications: Design and Methods*. 6th ed., SAGE, 2018. (In English)

Нуркушева Ләззат, Ашимова Айбота

Халықаралық білім беру корпорациясы (Қазақ бас сәулет-құрылыс академиясы)
(Алматы, Қазақстан)

ТҰРАҚТЫ ТӘЖІРИБЕЛЕР ҮШІН ӨНЕРКӘСІПТІК ДИЗАЙН БІЛІМІНДЕ ҚАЗАҚ МӘДЕНИ МҰРАСЫН КІРІКТІРУ

Аңдатпа. Қазіргі заманғы өнеркәсіптік дизайн білімінде пәнаралық және мәдени контекстуализация қағидаттары жиі жарияланғанымен, іс жүзінде мәдени мазмұн көбіне символдық деңгейде қалып, конструктивтік және жүйелік жобалау шешімдерінен алшақ қалады. Бұл оқу бағдарламаларында мәдени-семантикалық және жүйелік-конструктивтік тәсілдер арасындағы тұрақты алшақтыққа әкеліп, нәтижесінде техникалық тұрғыдан орнықты, бірақ мәдени бейтарап нысандардың немесе мәдени тұрғыда мәнерлі, алайда құрылымдық жағынан декоративті шешімдердің пайда болуына себеп болады. Аталған зерттеу пәнаралық дизайн педагогикасы мен тұрақты дизайн біліміндегі мәдени мұраны интеграциялау саласындағы ғылыми ізденістерді жалғастырады. Зерттеудің *мақсаты* – мәдени мағынаны өнеркәсіптік дизайнның конструктивтік, функционалдық және тәжірибелік (эксперициялық) өлшемдеріне операциялық түрде енгізуге мүмкіндік беретін қайталанбалы білім беру моделін әзірлеу және талдау. Зерттеу *міндеттеріне* этнодизайн мен экожүйеге бағытталған өнеркәсіптік дизайн арасындағы пәнаралық өзара әрекеттесу тетіктерін анықтау, мәдени кодтардың форманы қалыптастыру мен құрылымдық логикаға трансляциялану тәсілдерін зерделеу, сондай-ақ, осы интеграцияның білім беру нәтижесі ретіндегі тұрақтылығын бағалау кіреді. Зерттеуде дизайнға негізделген педагогикалық кейс-стади әдіснамасы қолданылды. Зерттеудің эмпирикалық базасы Қазақстанда жүзеге асырылған 15 апталық студиялық интервенцияға (PTP 08) негізделген, онда екі міндетті пән интеграцияланды: ED 4226 «Этнодизайн» және EPD 4319 «Өнеркәсіптік дизайндағы экожүйе». Эмпирикалық деректер екі бағалау кезеңі барысында әзірленген студенттердің жобалық артефактілерін, сондай-ақ сыртқы коммуникативтік және эксперициялық сынақ ретінде талданған көрме құжаттамасын қамтиды. Зерттеу *нәтижелері* интеграцияланған білім беру моделінің символдық мәдени сілтемелерден функционалдық кіріктіруге және эксперициялық трансформацияға өтуге мүмкіндік беретінін көрсетеді.

Түйін сөздер: өнеркәсіптік дизайн саласындағы білім; пәнаралық интеграция; этнодизайн; экожүйелік тәсіл; мәдени мұра; дизайнға негізделген білім беру кейс-стадиі; студиялық оқыту; жүйелік ойлау; пайдаланушылық тәжірибе; семантикалық оқылымдылық; конструктивтік логика; жинақтау және бөлшектеу; тұрақты дизайн білімі; қайта пайдалану және циркулярлық; көрме – қоғамдық валидация құралы.

Дәйексөз үшін: Нуркушева, Ляззат, және Айбота Ашимова. «Тұрақты тәжірибелер үшін өнеркәсіптік дизайн білімінде қазақ мәдени мұрасын кіріктіру». *Central Asian Journal of Art Studies,* т. 10, № 4, 2025, с. 232–249, DOI: 10.47940/cajas.v10i4.1157

Алғыс: Авторлар «Central Asian Journal of Art Sdudies» журналының редакторларына мақаланы баспаға дайындауға көмектескені үшін және анонимді рецензенттерге зерттеуге назар аударып, қызығушылық танытқаны үшін алғысын білдіреді.

Авторлар қолжазбаның соңғы нұсқасын оқып, мақұлдады және мүдделер қайшылығы жоқ екендігін мәлімдейді.

Нуркушева Ляззат, Ашимова Айбота

Международная образовательная корпорация (Казахская головная архитектурно-строительная академия) (Алматы, Казахстан)

ВСТРАИВАНИЕ КАЗАХСКОГО КУЛЬТУРНОГО НАСЛЕДИЯ В ПРОМЫШЛЕННЫЙ ДИЗАЙН-ОБРАЗОВАНИЕ ДЛЯ УСТОЙЧИВЫХ ПРАКТИК

Аннотация. Современное образование в области промышленного дизайна всё чаще декларирует междисциплинарность и культурную контекстуализацию; однако на практике культурное содержание нередко остаётся символическим и оторванным от конструктивных и системных проектных решений. Это приводит к устойчивому разрыву учебных программ между культурно-семантическими и системно-конструктивными подходами, в результате чего формируются либо технически устойчивые, но культурно нейтральные объекты, либо культурно выразительные, но структурно декоративные решения. Настоящее исследование продолжает научные разработки в области междисциплинарной дизайн-педагогики и интеграции культурного наследия в устойчивое дизайн-образование. *Цель исследования* заключается в разработке и анализе воспроизводимой образовательной модели, обеспечивающей операционную интеграцию культурного смысла в конструктивные, функциональные и опытные (экспериенциальные) измерения промышленного дизайна. *Задачи исследования* включают выявление механизмов междисциплинарного взаимодействия между этнодизайном и экосистемно-ориентированным промышленным дизайном, анализ способов трансляции культурных кодов в формообразование и структурную логику, а также оценку устойчивости как образовательного результата данной интеграции. В исследовании применяется методология дизайн-ориентированного педагогического кейс-стади. Эмпирическая база исследования основана на 15-недельной студийной интервенции (PTP 08), реализованной в Казахстане посредством интеграции двух обязательных дисциплин: ED 4226 «Этнодизайн» и EPD 4319 «Экосистема в промышленном дизайне». Эмпирические данные включают проектные артефакты студентов, разработанные в рамках двух этапов оценивания, а также документацию выставки, проанализированную как внешний коммуникативный и экспериенциальный тест. Полученные *результаты* демонстрируют, что интегрированная образовательная модель способствует переходу от символических культурных отсылок к функциональному встраиванию и экспериенциальной трансформации.

Ключевые слова: образование в области промышленного дизайна; междисциплинарная интеграция; этнодизайн; экосистемный подход; культурное наследие; дизайн-ориентированное образовательное кейс-стади; студийное обучение; системное мышление; пользовательский опыт; семантическая считываемость; конструктивная логика; сборка и разборка; устойчивое дизайн-образование; повторное использование и циркулярность; выставка как публичная валидация.

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Авторлар туралы мәлімет:

Нуркушева Ләззат Төлеуқызы – сәулет докторы, Халықаралық білім беру корпорациясы (Қазақ бас сәулет-құрылыс академиясы) (Алматы, Қазақстан)

Сведения об авторах:

Нуркушева Ляззат Тулеувна – доктор архитектуры, Международная образовательная корпорация (Казахская головная архитектурно-строительная академия) (Алматы, Казахстан)

Information about the authors:

Nurkusheva Lyazzat Tuleuvna – Doctor of Architecture International Educational Corporation (Kazakh Head Architecture and Construction Academy) (Almaty, Kazakhstan)

ORCID ID: 0000-0003-3262-4777
E-mail: l.nurkusheva2013@gmail.com

Ашимова Айбота Мақсатқызы – Дизайн мектебінің тьюторы, Халықаралық білім беру корпорациясы (Қазақ бас сәулет-құрылыс академиясы) (Алматы, Қазақстан)

Ашимова Айбота Максаткызы – тьютор школы дизайн в Международной образовательной корпорации (Казахская головная архитектурно-строительная академия) (Алматы, Казахстан)

Ashimova Aibota Maksatkyzy – Design Tutor, School of Design, International Educational Corporation (Kazakh Head Architecture and Construction Academy) (Almaty, Kazakhstan)

ORCID ID: 0009-0001-0403-318X
E-mail: ay.ashimova@mail.ru