MODELS OF DESIGN THINKING APPLICATIONS IN HIGHER EDUCATION: INTERNATIONAL PRACTICES AND IMPLICATIONS FOR VIETNAM

CÁC MÔ HÌNH ỨNG DỤNG TƯ DUY THIẾT KẾ TRONG GIẢNG DẠY ĐẠI HỌC: KINH NGHIỆM QUỐC TẾ VÀ HÀM Ý CHO VIỆT NAM

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Abstract - Design thinking is increasingly used in higher education, yet diverse applications are often reduced to a single process or toolkit, making context-sensitive implementation difficult. This study aims to systematize major application orientations and derive implications for Vietnamese higher education. It combines structured document analysis with comparative case analysis, drawing on 16 sources and four cases: Stanford d.school, HPI D-School Potsdam, Aalto Design Factory, and SUTD. Cases were coded across nine dimensions: four were used to identify application orientations and five to describe implementation characteristics. The analysis integrates three orientations: design thinking as explicit learning content or competence, as a mode of organizing learning activities, and as a tool for redesigning learning experiences. Five recurring implementation features were also identified: authentic open-ended problems, educator facilitation capability, iterative feedback, assessment aligned with learning goals and stages, and institutional support. The study recommends selective pilots, faculty capability development, and evidence-based scaling in Vietnam.

Key words - Design thinking; higher education; teaching innovation; project-based learning; international practices.

Tóm tắt - Tư duy thiết kế ngày càng phổ biến trong giáo dục đại học, nhưng các ứng dụng đa dạng thường bị giản lược thành một quy trình/bộ công cụ duy nhất, khó triển khai theo bối cảnh. Nghiên cứu hệ thống hóa các hướng ứng dụng chính, rút ra hàm ý cho giáo dục đại học Việt Nam. Phương pháp gồm phân tích tài liệu có cấu trúc kết hợp phân tích trường hợp so sánh, dựa trên 16 nguồn và bốn trường hợp: Stanford d.school, HPI D-School Potsdam, Aalto Design Factory, SUTD. Chín chiều mã hóa gồm bốn chiều nhận diện hướng ứng dụng và năm chiều mô tả triển khai. Kết quả tích hợp ba hướng: nội dung/năng lực tường minh, phương thức tổ chức học tập, và công cụ thiết kế lại trải nghiệm học tập. Năm đặc điểm triển khai lặp lại gồm: bài toán thực tiễn mở, năng lực điều phối của người dạy, phản hồi lặp lại, đánh giá theo mục tiêu và giai đoạn, hỗ trợ cấp tổ chức. Nghiên cứu đề xuất thí điểm chọn lọc, phát triển năng lực giảng viên và nhân rộng dựa trên bằng chứng.

Từ khóa - Tư duy thiết kế; giáo dục đại học; đổi mới giảng dạy; học tập dự án; kinh nghiệm quốc tế.

1. Introduction

In the context of higher education shifting from a focus on knowledge transmission to competence development, learner-centered approaches that are connected to real-world problems and encourage experimentation have received increasing attention. Design thinking is well aligned with this trend, as it emphasizes understanding people and contexts, properly defining problems, developing multiple solutions, prototyping, testing, and improvement. In education, design thinking is viewed not only as a creative process but also as a way of organizing learning activities and as a mindset that helps learners address complex problems [1], [2].

The scope of design thinking applications in higher education has expanded from design, architecture, and engineering to business, management, entrepreneurship, teacher education, healthcare, the social sciences, and digital technology. In business and management education, design thinking is regarded as an approach capable of connecting disciplinary knowledge with human-centered innovation, integrative thinking, and real-world problem solving [1], [2]. However, introducing design thinking into higher education does not mean that every course must teach the same five-step process. The level of integration should vary according to learning objectives, the openness of tasks, learners' autonomy, and instructors' facilitation capacity.

A review of international cases shows that higher education institutions are implementing design thinking at very different levels. Some institutions offer separate courses or programs in which students learn directly about design thinking; others integrate the logic of design thinking into projects, assignments, and disciplinary activities; while other models use design thinking as a tool for instructors or institutions to redesign learning experiences. This diversity raises two research issues. First, it is necessary to systematize application orientations rather than equating design thinking with a set of tools or a five-step sequence. Second, it is necessary to identify recurring implementation characteristics across cases in order to derive lessons that can be adapted for Vietnamese higher education.

In Vietnam, existing publications have documented experiments with design thinking in various higher education contexts, ranging from courses at Vietnam National University, Hanoi, to teacher education [3], [4]. However, the available evidence remains mainly at the level of individual courses, disciplinary groups, or specific

cases; it is not yet sufficient to draw conclusions about the extent of systematic integration at the institutional level. Therefore, the value of international experience lies not in copying a specific model, but in identifying organizational logic, resources, and support mechanisms that can be adapted to domestic conditions. On that basis, this article addresses two questions: (1) what are the main orientations through which design thinking is being implemented in international higher education; and (2) what lessons can be applied to Vietnamese higher education. The study does not treat the three application orientations as entirely new categories, but rather inherits and integrates distinctions that have appeared in Panke [1] and Koh et al. [5]. The contribution of this article lies in operationalizing these three orientations into a multi-level analytical framework, comparing four cases across nine implementation dimensions, and linking application types with organizational characteristics that are meaningful for adaptability in Vietnam.

2. Research methods

This study employed structured document analysis combined with comparative case analysis. Since the objective was to develop an analytical framework from typical cases, the study was not designed as a systematic review and did not aim to cover all publications on design thinking in higher education. Academic literature was reviewed through Google Scholar and journal publishing portals using combinations of "design thinking" with "higher education", "university", "teaching", "learning", the names of the four selected institutions, and "Vietnam"; official documents were retrieved from the institutions' own websites. The review was updated until September 2026. The body of evidence used directly in this article consisted of 16 sources: seven academic publications/ monographs and nine official documents. From 28 documents initially screened by title and abstract, 20 documents were read in full before the final body of evidence was determined. Documents were included when they clearly described at least one of the following aspects: objectives/level of integration, the role of learners or educators, activity structure, feedback-assessment, supporting resources, or scaling mechanisms. Documents that only introduced general concepts or contained overlapping information were excluded from the analysis.

Four cases were purposively selected for in-depth analysis: Stanford d.school in the United States, HPI D-School Potsdam in Germany, Aalto Design Factory in Finland, and the Singapore University of Technology and Design - SUTD in Singapore. The selection was based on three criteria: relatively complete descriptions of implementation structures; representation of different levels of integration; and the availability of sufficient academic or institutional documents for comparison. These cases respectively illustrate an interdisciplinary studio model and design capability development; a supplementary program associated with coach development; a co-creation ecosystem linked to corporate projects; and integration into the core curriculum. The work on education by Koh et al. was also used to further clarify the approach of educators as designers [5].

The nine coding dimensions were divided into two groups with different analytical functions. Group A included four dimensions: implementation objective, level of integration, direct users of design thinking, and activity structure. This group was used to answer what design thinking was used for, by whom, and at what level; cross-case comparison along these four dimensions served as the basis for identifying the three application orientations presented in Section 3.1. Group B included five dimensions: the role of instructors/coaches, the degree of connection with real-world problems, feedback and assessment mechanisms, supporting resources, and scalability. This group was not used to classify models, but to describe how implementation took place and to identify recurring characteristics across cases, serving as the basis for Section 3.3. The three-orientation framework was therefore not derived through a scoring mechanism across the nine dimensions, but from patterns of similarity and difference in the case comparisons; the rule for assigning the dominant application orientation to each case is presented after Table 1. Coding was conducted independently by three members of the author team using the nine-dimension matrix; points of disagreement were discussed until consensus was reached. Official documents from educational institutions were used mainly to identify program structures and implementation approaches; claims regarding outcomes or educational value were interpreted cautiously only when supported by academic publications or convergent evidence from multiple sources, in order to reduce the positive self-presentation bias of institutional documents.

3. Research findings and discussion

3.1. An integrated framework of three orientations for applying design thinking in higher education

Building on distinctions that have appeared in previous studies [1], [5], this study uses Group A of the matrix to identify different patterns in terms of objectives, users, levels of integration, and activity structures. From this comparison, three application orientations are integrated into a common framework: design thinking can be the object or competence that students learn; the organizing logic of activities through which students learn disciplinary content; or a tool for educators and institutions to redesign teaching and learning. This framework does not aim to claim that the three types are entirely new. The orientations are not mutually exclusive, and a university may implement them simultaneously at multiple levels. In this article, "application orientation" refers to the role that design thinking assumes in teaching and learning; "model", as used in the title, refers to how a specific institution organizes implementation, and one model may combine multiple orientations.

The first orientation views design thinking as content or a competence to be taught directly. In this orientation, students learn the principles, tools, and ways of practicing design thinking through courses, workshops, or supplementary programs. Stanford d.school's five-mode

framework, including empathize, define, ideate, prototype, and test, is a common structure for beginners to practice design thinking [6]. Among the four cases, this orientation is most clearly reflected in HPI D-School Potsdam and in SUTD's Freshmore introductory course, discussed in Section 3.2. However, the value of this orientation does not lie in memorizing the steps, but in developing the ability to deal with ambiguity, investigate contexts, generate options, experiment, and learn from feedback.

The second orientation uses design thinking as a method for organizing learning activities. Students may not take a course named Design Thinking, but they are placed in a sequence of tasks with a similar logic: understanding users or contexts, defining problems, developing solutions, creating products or models, receiving feedback, and making improvements. This orientation is particularly suitable for project-based learning, problem-based learning, and courses whose learning outcomes emphasize application. Here, design thinking functions as the "architecture" of the learning experience rather than as an independent body of theoretical content. Among the four cases, Aalto Design Factory is a representative case of this orientation, as discussed in Section 3.2.

The third orientation views design thinking as a tool for educators, programs, or institutions to redesign teaching and learning activities. The direct users are instructors or curriculum design teams. The process begins with understanding learners and bottlenecks in learning, then identifying pedagogical problems, constructing solutions, testing them in classrooms, and making adjustments based on feedback. This orientation extends design thinking from "teaching students" to "designing learning for students". Among the four cases, this orientation is most clearly reflected in Stanford d.school's Teaching and Learning Studio, discussed in Section 3.2. The work of Koh et al. on teachers as designers, combining disciplinary, pedagogical, technological, and learner-related knowledge to create appropriate experiences [5], is used additionally to clarify the conceptual basis of this orientation, rather than as a case for analysis.

3.2. Experiences from representative international cases

United States - Stanford d.school. Stanford d.school offers many courses based on the studio model, where students from different disciplines work in teams and address real-world challenges with frequent feedback from the teaching team [7]. A notable point is that Stanford does not regard the five steps as a fixed formula. Materials on the development of "design abilities" emphasize capacities such as navigating ambiguity, learning from others and contexts, synthesizing information, rapid experimentation, and moving between abstract and concrete levels [8]. At the same time, the Teaching and Learning Studio supports educators in using design thinking to redesign teaching activities and curricula [9]. The Stanford case therefore combines both the second and third orientations: students learn through projects structured according to the logic of design thinking, while educators are also developed as designers of learning experiences.

Germany - HPI D-School Potsdam. HPI D-School Potsdam implements design thinking as a supplementary program running in parallel with students' main fields of study. Students work in English in interdisciplinary teams, address challenges posed by real-world partners, and are accompanied by coaches throughout the project process [10]. A notable feature is that the development of facilitators is institutionalized through the Design Thinking Coach program [11]. This structure illustrates how an educational institution builds facilitation capacity as part of the academic infrastructure for scaling implementation, rather than relying only on individual initiatives. HPI also connects training activities with research and learning materials, creating conditions for implementation to be adjusted based on accumulated experience. In terms of Group A, HPI belongs primarily to the first orientation: design thinking is a competence explicitly taught through a supplementary program. Coach training is classified as an implementation resource (B1, B4), not as the third orientation, because coaches use design thinking to accompany students rather than to redesign the curriculum.

Finland - Aalto Design Factory. Aalto Design Factory approaches design thinking as a platform for co-creation, where students, instructors, researchers, and enterprises jointly use flexible learning spaces, prototyping areas, and shared workspaces. Research on the Design Factory network shows that the value of this model lies in its capacity to connect disciplinary "silos", facilitate interdisciplinary collaboration, and support learning through practical work [12]. Aalto's Product Development Project course lasts several months and brings together engineering, design, and business students to address company-sponsored challenges; teams investigate needs, develop solutions, create prototypes, and demonstrate their results [13]. The Aalto case suggests that facilities should be viewed as one component of the implementation ecosystem, alongside project duration, team autonomy, real-world partners, and the academic community. In terms of Group A, Aalto belongs primarily to the second orientation: the objective of the course is product development for partners, while the sequence of need investigation, prototyping, and demonstration serves as the organizing logic of learning activities.

Singapore - SUTD. SUTD integrates design thinking into the core curriculum through a sequence of projects with decreasing levels of guidance. The Design Thinking Project I course provides an initial foundation, while the curriculum structure helps students progress from tightly organized activities toward a higher level of self-direction [14], [15]. A study of a compulsory introductory design thinking course for approximately 400 first-year students at SUTD - course 3.007 Design Thinking and Innovation, integrated with Design Thinking Project II in the second semester [14] - describes the course as being divided into

ten smaller classes. Each class was led by two instructors from the Engineering and Architecture clusters, under the coordination of two lead instructors, with weekly exchanges among a teaching team of approximately 15 instructors. The study emphasizes five supporting components: an organizational format combining large-scale online lectures with small-group studios, staged individual and group submissions, diverse mentors, access to projects from previous cohorts, and support for teamwork [16]. In this study, instructors primarily served as project mentors and coordinated teaching; instructors' use of design thinking to redesign the course was not described. These descriptions reflect the course structure at the time of the study's publication [16]; the Freshmore curriculum may have been adjusted subsequently. This evidence shows that when design thinking is integrated at the scale of a large program, the alignment of objectives, projects, assessment, and teaching coordination mechanisms needs to be considered simultaneously. In terms of Group A, SUTD belongs to the first orientation in the Freshmore stage, when the main objective of the introductory course is to train students to apply the design process in various contexts [16], and gradually shifts toward the second orientation as project logic is integrated into the core curriculum [14], [15]. Since there is no evidence that instructors use design thinking to redesign teaching, this study does not classify SUTD under the third orientation.

Table 1. *Case comparison matrix (A1–A4: identifying application orientations; B1–B5: describing implementation)*

Analysis dimension	Stanford d.school	HPI D-School	Aalto Design Factory	SUTD
A1. Objective	Design abilities; challenge-based learning	Innovation capability; coach development	Co-creation; product development	Design thinking foundations and design capability
A2. Integration level	Studio/courses + educator development	Supplementary program	Learning ecosystem + courses	Freshmore core curriculum*
A3. Direct users of DT	Students; educators	Students; coaches	Students; educators; enterprises	First-year students
A4. Activity structure	Interdisciplinary studios; authentic projects	Interdisciplinary teams; partner challenges	Long-term projects; prototyping	Projects I–II–III; increasing autonomy
B1. Educator/coach role	Feedback; experience design	Accompanying coach	Facilitator/ project mentor	Coordinated teaching team; diverse mentors (Engineering-Architecture)
B2. Connection with real-world problems	Human-centered challenges	Partner briefs	Company-sponsored projects	Applied interdisciplinary themes
B3. Feedback and assessment	Frequent feedback; ability reflection	Continuous coach feedback	Project milestones; prototypes; demonstration	Staged individual–group submissions; studio feedback; teamwork support
B4. Supporting resources	d.school; toolkits; studio for educators	Coach training; learning materials; network	Space; labs; enterprises	Core curriculum; teaching team; projects from previous cohorts
B5. Scalability	Through educator development	Through coach standardization/training	Through the Design Factory network	Through core integration and large-cohort teaching coordination
Dominant application orientation derived from A1–A4	Orientation 2 + Orientation 3	Orientation 1	Orientation 2	Orientation 1 (Freshmore) → Orientation 2

Source: *Authors' synthesis from Stanford d.school [7]–[9], HPI D-School Potsdam [10], [11], Aalto Design Factory [12], [13], and SUTD [14], [15], [16].*

Freshmore: the common foundation stage for first-year students at SUTD.

Basis for assigning application orientations. The dominant application orientation in the final row of Table 1 was determined from Group A according to two questions: whether design thinking is an explicit learning outcome or a means to achieve a disciplinary/product objective (A1, A4); and whether the direct user of design thinking is the learner or the educator/institution (A2, A3). The first orientation is assigned when design thinking is an explicit learning objective for learners; the second orientation when design thinking structures learning activities to achieve disciplinary or product objectives; and the third orientation when educators or institutions directly use design thinking to redesign teaching and learning. According to this rule, HPI belongs to the first orientation; Aalto belongs to the second orientation; SUTD shifts from the first to the second orientation along the curriculum progression; and Stanford combines the second and third orientations. Thus, each orientation is supported by at least one case. These labels reflect dominant orientations and do not exclude the possibility that an institution may have activities belonging to other orientations.

3.3. Factors commonly associated with systematic implementation of design thinking

Group B of the matrix includes five dimensions concerning the role of educators, real-world context, feedback-assessment, supporting resources, and scalability. These dimensions are not used to determine which application orientation a case belongs to, but to describe how those orientations are organized in practice. Since all four cases have relatively high levels of institutionalization and this study does not include a comparative case of unsuccessful implementation, the five

groups below are interpreted as recurring characteristics or commonly associated factors, not as causal conditions determining implementation quality.

First, learning problems need to be authentic and sufficiently open-ended. Design thinking is valuable when learners have to investigate needs, process incomplete information, and consider multiple criteria, rather than simply find a known answer. Stanford, HPI, and Aalto all use real-world challenges or projects involving stakeholders; this creates the necessary "friction" that requires students to redefine problems before proposing solutions.

Second, educators' facilitation capacity is a prominent recurring characteristic across the cases. Instructors do not merely deliver content; they must know how to ask questions, observe, support teams in working with ambiguity, manage conflict, organize feedback, and recognize when intervention is needed. HPI's development of coaches and Stanford's investment in educator training show that this capacity is treated in the analyzed models as an element that needs to be built systematically, rather than assumed to emerge after a short workshop.

Third, the process must include feedback and iteration. Prototyping is meaningful only when prototypes are used to test assumptions and generate new data for subsequent improvement cycles. If a project has only one final product at the end of the semester and no intermediate feedback milestones, design thinking can easily be reduced to a form of group assignment. The SUTD case shows one way to organize this requirement at scale: individual and group submissions are arranged alternately across design stages, combined with project-specific feedback in small-group studios, in order to maintain the divergent-convergent rhythm of the design process [16].

Fourth, assessment needs to align with learning objectives and learners' developmental stages. SUTD's pathway from guided activities toward higher levels of self-direction [14], [15] suggests that the openness of tasks can be increased gradually according to the stage of learning. Assessment, therefore, should not only grade the final product but also recognize the process of investigation, the quality of reasoning, the ability to learn from feedback, group contributions, and the degree of improvement. At SUTD, assignments serve both as a tool for assessing individual students' outcomes and as a means of reinforcing the course objectives themselves through the alternation of individual and group submissions [16].

Fifth, large-scale implementation is often accompanied by support at the organizational level. The analyzed cases all include one or more elements such as flexible spaces, shared learning materials, coaches/teaching assistants, enterprise connections, appropriate project duration, and mechanisms for educator development. This suggests that as scale increases, resource governance, the quality of facilitators, and the consistency of the learning experience need to be considered simultaneously. However, the current research design does not allow these elements to be claimed as sufficient or decisive conditions.

3.4. Implications for Vietnamese higher education

Domestic publications show that design thinking has been tested in various higher education contexts, but the evidence remains largely localized. Research at Vietnam National University, Hanoi, recorded experiments in various fields such as psychology, education, physical education, folklore, and information technology [3]; another study proposed applying design thinking in the training of History and Geography Education students at the University of Education [4]. These two bodies of evidence suggest the need for caution when generalizing the level of prevalence at the system level, while also confirming that adapting design thinking to individual courses and educators' capacities is a real issue in the Vietnamese context. On this basis of comparison, Vietnamese higher education can approach design thinking through a staged pathway rather than implementing it across the board. At the course level, implementation should begin with content whose learning outcomes emphasize application, analysis, decision-making, innovation, or problem solving. Instructors may select a suitable topic or project, clearly design milestones for understanding the context, defining the problem, generating solutions, receiving feedback, and making improvements, and then evaluate the results before expanding implementation.

At the level of instructors and faculties/institutes, the greater priority should be the development of design and facilitation capacity. Rather than merely organizing training sessions to introduce tools, institutions need to form core groups of instructors, mechanisms for co-designing courses, peer observation, repositories of cases, and shared rubrics. HPI's experience shows that the coach role can become a scaling mechanism; Stanford's experience shows that faculty development should focus on the capacity to handle ambiguity, provide feedback, and design experiences, not merely on "teaching the correct process".

At the institutional level, the order of investment also needs to be considered. A creative space or prototyping room can be useful, but Aalto shows that facilities are only one part of the ecosystem. Under conditions of limited resources, priorities may follow the sequence of developing people, selecting pilot courses, building partnerships and learning materials, collecting evidence, forming communities of practice, and only then expanding infrastructure and scale. This approach helps avoid investing in a "lab" without projects, facilitators, or mechanisms for regular use.

Finally, scaling needs to be evidence-based. Educational institutions should monitor not only students' satisfaction but also their level of participation, product quality, ability to apply knowledge, attainment of learning outcomes, and instructors' experiences. Feedback data should be used as part of an improvement loop. According to this logic, design thinking is not only an object of teaching innovation but also provides the very method through which institutions can experiment, learn, and adjust innovation in a controlled manner.

4. Conclusion

Building on Panke [1] and Koh et al. [5], this study integrates three orientations for applying design thinking in higher education: (1) as content or a competence to be taught; (2) as a method for organizing learning activities; and (3) as a tool for educators or institutions to redesign learning experiences. The three orientations were identified mainly from the four dimensions in Group A, while the five dimensions in Group B were used to describe implementation characteristics across cases. The dominant application orientation of each case is recorded in the final row of Table 1. The additional contribution of the framework lies in clearly separating these two analytical functions and operationalizing them in the comparison of Stanford d.school, HPI D-School Potsdam, Aalto Design Factory, and SUTD, thereby linking application types with organizational levels and adaptability.

There is no single model suitable for all universities. Across the four cases analyzed, five groups of recurring characteristics emerged: authentic open-ended problems, educators' facilitation capacity, feedback and iteration, assessment aligned with learning objectives and stages, and support at the organizational level. Since the case sample includes only models with relatively high levels of institutionalization, these characteristics should be understood as frequently co-occurring factors rather than as causal relationships or determining conditions.

For Vietnam, the existing evidence supports selective piloting at the course level, alongside faculty capacity development and mechanisms for sharing learning materials, followed by scaling based on data on learning outcomes and implementation experiences. This study has three main limitations: the purposive selection of four prominent cases without cases of unsuccessful implementation; the fact that 9 out of 16 direct sources are official documents self-published by the institutions and mainly serve to describe programs; and the absence of direct measurement of the effectiveness of each application orientation. Although the conclusions have been cross-checked against seven academic publications/monographs, positive presentation bias may still exist. Future studies should validate the analytical framework through action research or multiple-case studies, including cases of implementation difficulties, at Vietnamese higher education institutions.

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