


translations

In this Issue

Design Thinking:
Understanding How
Designers Think and Work
and
Design Expertise



Researchers have been studying how designers design since the 1960s. This issue of *Translations* centers on two books that explore what research reveals about the knowledge, processes, and methods of successful designers. The first book, *Design Thinking: Understanding How Designers Think and Work*, was written by Nigel Cross, a prominent design teacher and design researcher. Organized around a series of in-depth case studies, the book offers insights about design based on observation and investigation of practice. The second book, *Design Expertise*, was written by noted design scholars Bryan Lawson and Kees Dorst. *Design Expertise* examines the knowledge, skills, and experiences that contribute to designing well. Additional sources are cited below. Copies of *Design Thinking* and *Design Expertise* are available through major literary providers.

ADDITIONAL SOURCES

Cassim, Fatima. "Hands On, Hearts On, Minds On: Design Thinking within an Education Context." *International Journal of Art & Design Education* 32.2 (2013): 190–202.

Costa, Arthur L., and Bena Kallick (eds). *Learning and Leading with Habits of Mind: 16 Essential Characteristics for Success*. Alexandria, VA: Association for Supervision and Curriculum Development, 2008.

Johansson-Sköldberg, Ulla, Jill Woodilla, and Mehves Çetinkaya. "Design Thinking: Past, Present, and Possible Futures." *Creativity and Innovation Management* 22.2 (2013): 121–146.

ABOUT THE ARTS EDUCATION COLLABORATIVE TRANSLATIONS SERIES

The Arts Education Collaborative is committed to strengthening education by making the arts central to learning through collaboration, research, and advocacy. To that end, the Translations Series provides arts educators with highlights of prominent research pieces in education and practical ways in which that research can be realized in their classroom, school, district, or arts and culture environment. Copies of the entire Translations Series can be found online at www.artsedcollaborative.org.

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WHAT THE RESEARCH SAYS

WHAT IS DESIGN THINKING?

There is no commonly accepted definition of design thinking. In fact, many authors avoid offering a definition due to concerns that it might oversimplify the concept.

At its most basic, design thinking has typically referred to what individual designers understand about design and how they go about the work of designing.

Recently there has been a great deal of interest in translating the ways that designers think into principles for use by non-designers. Proponents of design thinking in organizational management, for example, characterize design thinking as an iterative, user-centered approach that promotes creativity and innovation. Design thinking now encompasses not only the design of things, but also activities, services, systems, and environments.

WHAT ARE THE CORE ELEMENTS OF DESIGN THINKING?

Design research has identified several areas that are critical for understanding how designers think. While these elements are listed here individually in a particular order, design scholars and practitioners emphasize that, in real-world design situations, the elements are often highly interdependent and the sequence of activities is dynamic. It should also be remembered that a diverse array of professionals who work across a variety of fields may be considered designers; elements of design thinking vary depending on the specific context in which a designer works.

ILL-DEFINED PROBLEMS

Design thinking is especially well suited to tackling nebulous situations in which problems are ill defined or poorly formulated, important information is unavailable or confusing, decision makers hold conflicting perspectives about the problem or potential solutions, or elements are related in complex ways that make it difficult to determine how changes in one area might affect the system as a whole. Projects in which problems are less structured at the start require interpretation by the designer and are generally thought to allow for a higher degree of innovation. In fact, research shows that creative thinkers may reformulate a given task to make it more problematic, deliberately treating the situation as less structured and thereby creating opportunities for more innovative approaches.

FRAMING AND REFRAMING

To cope with highly complex problems, designers gather critical information and structure that data into new frames, which afford a fresh perspective on the design situation. A design project typically begins with a written or verbal brief, in which the client frames the scope of the problem and possible solutions; in some cases, the client may make incorrect assumptions or become fixated on a particular outcome. Experienced designers often seek to foster a more holistic understanding of the design situation; they use a broad systems approach to identify important elements related to the problem and engage stakeholders in dialogue that explores their self-identity, aspirations, and values at a more abstract level. By adopting a new frame, designers selectively view the design situation from a particular standpoint, setting its boundaries, choosing which aspects of the situation to attend to, identifying themes that help make sense of the situation within a deeper context, and imposing a structure that suggests directions that may help formulate a solution.

GENERATIVE REASONING

Designers are solution focused. They work by generating ideas about partial solutions, which are then analyzed to yield further insights about the problem and to generate additional ideas, forming a repeating cycle of learning about both the problem and potential solutions until a satisfactory resolution is reached. This generative approach is particularly appropriate given the ill-defined nature of many design problems; conjecturing about possible solutions and incrementally improving upon those ideas may be the best way forward in complex situations where the problem can be only partially understood at first. Understanding of the problem and solution is said to “co-evolve” through design thinking. As Bryan Lawson and Kees Dorst conclude in *Design Expertise*: “Creative design then is not a matter of first fixing the problem and afterwards performing a ‘creative leap’ to a solution. Creative design seems more to be a matter of developing and evolving together both the formulation of a problem and ideas for a solution, with a constant shuttling to-and-fro between the problem and the solution.... Design thus involves a period of exploration in which problem and solution are evolving and very unstable....” (38)

MOVES

Design thinking progresses through a series of iterative propositions, which are commonly referred to as moves. Reviewing the findings of a seminal research study, Nigel Cross describes one expert designer's thought process in the following way: "He works through a series of thinking-actions of moving-seeing-moving; that is, of posing a 'what if?' move, looking at what results (in his sketches), reflecting on the consequences (good or bad), and making another, related move. One move leads to another..." (*Design Thinking*, 25) According to Lawson and Dorst, the moves of expert designers are not guided by systematic sets of rules or theories, but build on design precedents or references that designers gather through experience. Designers draw inspiration from these experiences, looking for precedents that share some common characteristics with the current situation and introducing new ideas from unpredictable sources: "[S]everal precedents may be used and combined. To a designer it does not matter whether a precedent precisely replicates the situation; what matters is that in some way it helps in the progressing of the design process." (*Design Expertise*, 140)

PARALLEL LINES OF THOUGHT

Research suggests that expert designers are able to view the design situation through multiple frames and consider several disparate ideas simultaneously. This way of thinking allows them to consider the design situation from a diverse range of perspectives and more completely understand potential challenges and solutions. Experienced designers tend to be able to cope with uncertainty, patiently searching for opportunities to synthesize the essential characteristics of various solutions into a new configuration rather than feeling compelled to immediately choose between competing alternatives. According to Lawson and Dorst, "It seems probable that highly creative designers may be able to sustain several of these parallel lines of thought and allow them to be incompatible or even apparently irreconcilable for extended periods during the design project." (*Design Expertise*, 60)

WORDS, IMAGES, AND OTHER FORMS OF REPRESENTATION

Externalizing ideas—in the form of verbal and written descriptions, sketches, drawings, models, photographs, diagrams, graphs, data sheets, and other types of representations—facilitates design thinking in a number of important ways. First, these representations document the process, which is helpful for managing the

complexity inherent in pursuing multiple lines of thought simultaneously. Second, such representations facilitate communication among members of the design team and with other stakeholders around a common reference point. Finally, these external representations contribute to the evolution of the designer's thinking, providing different views at different levels of detail to aid reflection and contribute to a deeper level of understanding of the design situation.

Words, images, and other representations aid the "dialogue" that the designer has between the problem and solution. While much of the design literature has focused on the role of visual forms of representation, recent work has taken a broader view; for example, one study examined how an architect who is blind uses different forms of representation in his work process, while another study explored the impact of using sound sketches as part of the design process.

REFLECTION

Researchers have identified two levels of reflection that occur within design thinking. First, reflection is embedded within the cycle of framing the design situation, proposing moves, and representing ideas. Designers repeatedly stand back and evaluate design decisions, choosing which ideas to pursue and which to abandon. Experienced designers are skilled at determining when to suspend judgment on creative ideas and allow them to evolve before subjecting them to criticism. Second, at a broader level, designers reflect on the design process itself—both during the process and afterward. Stepping out of the flow of the design activity to analyze its progress toward intended outcomes allows designers to make adjustments to their overall process and enhance their expertise.

COLLABORATION

A number of design scholars emphasize that design is a social process. Designers work for clients and are frequently called upon to function as part of team with other designers and experts from a wide range of disciplines. Experienced designers are able to integrate the perspectives of multiple stakeholders into a coherent design: "Large projects demand an important aspect of design ability, that of reconciling the variety of interests—technical, financial, social, aesthetic, etc.—that inevitably have to coalesce around a major project. In those cases, designing becomes not just a personal, cognitive process, but a shared, social process." (*Design Thinking*, 19–20)

WHAT THIS MEANS FOR EDUCATORS

Design thinking is significant for educators both as a tool to be applied within their professional practice and as a set of skills to be shared with learners. Educators face a seemingly endless array of complex challenges; design thinking provides an iterative, collaborative approach to developing potential solutions. Design thinking is of particular interest in light of recommendations for educators to reflectively “problematize” their practice, re-examining assumptions and implicit beliefs about accepted ways of working and asking questions that allow for alternative approaches.

Some steps toward problematizing practice include treating situations as more open ended than they might first appear, gaining a more holistic understanding of situations by examining a wide range of information relevant to the problem, and engaging others in dialogue to build understanding from a variety of perspectives.

The design firm IDEO has created a toolkit specifically to help educators apply design thinking to address challenges in their classrooms, schools, and communities; it is available for download at www.designthinkingforeducators.com.

Project-based learning is a strategy commonly used by educators to help learners develop their design thinking skills. Not surprisingly, many of the core elements of project-based learning are also key considerations when engaging learners in design thinking. Effective project-based learning centers on realistic problems that incorporate intended learning objectives and align with student skills and interests. The complexity of the problem to be explored is an important variable. Problems with a limited number of solutions may be more appropriate for beginning learners, while more experienced design thinkers can be challenged by situations with no clear solutions and minimal contextual information, providing them with the opportunity to engage in generative reasoning and allowing their understanding of the problem and potential solutions to co-evolve. Design teachers recommend strengthening real-world connections by taking field trips, engaging with community experts, and encouraging learners to keep notebooks to record sources of inspiration and ideas that may be useful in the design process.

Project-based learning frequently involves structured group work, which is consistent with the importance of collaboration within design thinking. Project-based learning experts stress the need to help students collaborate effectively, particularly when working with younger learners. Strategies include directly teaching and modeling skills required for collaboration, providing groups with tools to manage their time and task, and continually checking in on groups to facilitate communication and to individually coach team members about ways to work together.

Student assessment is another important consideration for both project-based learning and teaching design thinking. Ongoing assessment strategies should provide students with multiple opportunities for feedback, reflection, and revision. The emphasis should be on assessing the learning that occurs throughout the design process rather than focusing solely on the final product.

While studying the key aspects of design thinking, we were struck by their close alignment with the Habits of Mind presented in the book *Learning and Leading with Habits of Mind: 16 Essential Characteristics*. The Habits of Mind are described as “characteristics of what intelligent people do when they are confronted with problems, the resolutions to which are not immediately apparent.” (15) These types of problems are precisely the kinds of ill-defined problems that design thinking is so well suited to address. Therefore, it follows that many aspects of design thinking correspond closely to the Habits of Mind, which include listening with understanding and empathy, thinking flexibly, thinking about thinking, questioning and posing problems, applying past knowledge to new situations, thinking and communicating with clarity and precision, gathering data through all senses, and taking responsible risks. Educators who are interested in further exploring this area are encouraged to read a previous Translations issue dedicated to the Habits of Mind; see www.artsedcollaborative.org to download.

WHAT THIS MEANS FOR THE ARTS EDUCATION COLLABORATIVE AND ITS CONSTITUENTS

Many aspects of design thinking have long been incorporated within AEC's working methods and as part of our professional learning programs for arts educators. When developing a new program, AEC engages in an iterative process through which ideas are piloted, assessed, and refined. The structure and format of new initiatives are often only loosely sketched out before testing the plans in pilot form. We have found this approach is effective for developing a more nuanced grasp of the challenges encountered by arts educators in their work and for designing programs adapted to those needs. Our understanding of such challenges and potential solutions continues to co-evolve as we engage in a continuing cycle of thinking, acting, and reflecting.

At a programmatic level, AEC engages arts educators and administrators in project-based learning and elements of design thinking through our Leadership Academy and Community of Learners for Arts Education (CLAE) programs. A central component of both programs is the Action Plan, an initiative proposed and directed by a single participant or by a team of individuals from the same school district. Leadership Academy participants plan an initiative related to their professional responsibilities by identifying an issue to address, setting goals and objectives, and working to implement the project. AEC staff meet with each participant and pertinent staff in the school or arts organization to reflect on progress and identify challenges, opportunities, next steps, and required assistance. In CLAE, administrators develop and implement Action Plans in support of arts education in their school or district. The process engages participants in identifying an area for improvement, setting goals for action, collecting data, implementing the plan, and collecting and reporting evidence about impact.

Although aspects of design thinking have been woven into our work, we did not explicitly connect these elements of our practice to the broader framework of design thinking. Viewing our work from this perspective provides an expanded vocabulary and set of concepts to help us reflect upon our current approaches and further incorporate design thinking into our processes and programs. We have begun our reflections by posing several questions of ourselves:

What assumptions do we make that could be re-examined to allow for new approaches?

Where can we find alternate frames that will allow us to view problems and potential solutions from different perspectives?

What forms of representation can we use to more effectively document our processes, communicate among ourselves and with our constituents, and inform our thinking?

How can design thinking support Leadership Academy and CLAE participants as they develop and implement their Action Plan projects?



We strengthen education by making the arts central to learning through collaboration, research, and advocacy.

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Artwork:
Stephanie Armbruster, *Hungry Ghosts VI*. Encaustic on panel, 36 x 48 inches, c. 2012.
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