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DESIGN BEHAVIORS

# Creative, Inventive, and Visual Approaches to Design Problem Solving

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There is no more difficult challenge in design education than trying to help someone become a creative problem solver. Why is creative thinking such a difficult thing to imbue in students? Why are truly innovative conceptual ideas so difficult to come by? First and foremost, creative thinking violates the rules of critical and analytical problem solving. It denies the rules of logic. Second, the vast majority of students have been trained through their education to either distrust or set aside both their reveries and dreams. The pragmatics and practicalities of “making a living” circumscribe our freedom of thought and especially our trust in intuition or “feelings.” Certainty is of preeminent value.

## Thinking about creative thinking

**Design problem solving** is often practiced and frequently taught as a logical, methodical process that one uses in order to arrive at an appropriate solution to a client’s problem. Clarity in thought is a prerequisite to clarity of solution. But are clarity and appropriateness enough? In actual professional practice, they are certainly safer than an untested, unproven idea. The conceptual stage of design problem solving is often short-circuited. Many faculty members have difficulty instructing students in how to think creatively. Pedagogical models and instructional methods are few. Many practitioners recognize the requirement for rational justifications of decisions.

For designers, the problem becomes, *how do we integrate an intuitive and instinctive cognitive process into an analytical and intellectual construct?* Thinking visually is one possible way, cutting loose the strictures of aural and written syntax and semantics, giving way to visual imaging where boundaries are less defined, structures less rigid.

Whether we are creative or not depends to a large extent on how in touch we are with our intuitive processing mechanisms, on how willing we are to strip away old conventions, old structures, and on our individual cognitive style.

The ability to be inventive is often confused with being creative. Inventive skill is the ability to recombine two or more items in an unusual way. In much of the literature on creative thinking, being creative is said to require redefining the way we see things in the world. Thomas Kuhn’s, “**fundamental alteration of perspective**” is an apt description (Kuhn, 1970). There is a subtle difference there, in definitions, but a grand one in the results. Someone who is creative changes the way we look at and think about the world, not as in the case of inventive, the way we see particular things. In the first instance, being inventive, the solution comes out of the recombination of two or more

unrelated elements. A creative act resonates beyond that immediate configuration. True creative thinking, although everyone is capable of it, is not a common occurrence. Within the context of graphic design education and practice a case can be made that most educators and practitioners are functioning in the realm of invention.

That is not to say that being inventive is a lesser achievement. Being inventive is not easy – but there are techniques one can use to come up with unique combinations of elements, methodological aids, and being creative calls on different resources. Being creative calls on the ability of the mind to transform symbols, to let go of logic and rational thought processes, to process information divergently and produce something new. Inventive thinking does not necessarily dissociate itself from the rational and the use of logic.

It is quite possible to teach students to be inventive, give them techniques that draw on “**metaphorical or analogical**” manipulations in Morton Hunt’s terms (Hunt, 1982) or on other cognitive assists. However, many faculty, often unaware or unsure of the origin of their own creative and inventive resources, often find themselves perplexed in helping students overcome the hurdles to these types of thinking.

Design Instructors can only hope to open students up to finding their own creative vision and the thinking processes that make it possible. The ability to think creatively is innate. We all have it or at least start out with it, but unfortunately most students, most people, have it pounded out of them by the end of grade school. For some, it becomes an uncomfortable activity in which to engage, either because they are unwilling to confront the potential for failure, an outcome that is a greater possibility in creative activities, or because they dread the possibility of appearing foolish in their outcomes. Creative thinking is a high-risk activity.

### **Creative is as creative does**

When it comes to creative thinking, there is little difference between novice and Inexperienced designers. **When it comes to solutions, the novice may be more exuberant and less apt to come up with workable ones, but the experienced designer is just as prone to reliance on formulas that have proven workable in the past and that provide appropriate results.** Either can be creative or prosaic in their thinking. The solutions of either encompass the whole range of possibilities and may be creative and inappropriate, creative and effective, uncreative and effective, or uncreative and inappropriate.

An experienced designer may find it easier than the novice to come up with solutions that are Inventive as well as effective and appropriate. Reuse of inventive problem solving methods over a period of time will embed them in the designer s cognitive problem-solving repertoire and the actions of using them become an implicit activity. The implicit nature of their use often leads to the erroneous assumption that the results are creative rather than inventive and the erroneous conclusion that the experienced designer is functioning on a more creative level than the novice.

Morton Hunt discusses the concept of routine and skilled performance (Hunt, 1982) and makes the observation that an expert piano player having practiced an activity enough times, commands and displays implicit control over routine and skilled performance at the unconscious level when performing. **Implicit Inventive thinking** does not necessarily imply a more creative thinker. In the sense that the thinking process has become more implicit, for example with the experienced designer as with the expert pianist, one could say that it has become more intuitive, but in reality it has become a routine and skilled performance occurring at the unconscious level.

Defining what creative thinking is or deciding whether something is a creative solution is not always easy or straightforward. What may in fact be a creative leap, a perspective defining moment for one particular individual, does not mean that other individuals or the society at large will see it as such. It is quite possible that it could be perceived as a mundane development by others, of value only in the very circumscribed world of the particular individual. This does not deny the creative validity of that particular act for that specific Individual. Society's acceptance of whether it has creative value only comes from, in Bruce Archer's terms, "**an agreed consensus of informed opinion**" (Archer, 1965). And even that is subject to change over time and in different contexts.

### **Creative and critical thinking**

**Critical thinking, the ability to logically and rationally analyze and reason has little to add to efforts at thinking creatively.** It plays a part in the design process, both before and after the ideation phase. But it constricts the free flow of thought and imagination required in the creative act. By its very nature critical thinking functions in a linear and algorithmic fashion whereas creative thinking requires the use of heuristics. The two are at odds, and the integration of truly creative thinking into the design process or a design methodology is not something all designers are capable of doing effectively. Some designers are not especially good at thinking inductively, and others have great difficulty integrating an essentially nonstructured component into the design process.

Critical thinking can be helpful in attempts at inventive thinking. The choice of particular morphological matrices and the elements in them, the decision to attempt forced connections, etc. can benefit from prior intellectual parsing. Indeed, the determination of solution effectiveness and appropriateness requires critical analysis and judgment.

Creative thinking requires the individual to roam a broad cognitive space, engaging the subjective, drawing from affective domains, extending percepts, and addressing instincts and insights in a generative manner. **Critical thinking, the sphere of logical propositions, compels the individual to navigate a restricted terrain, focus on the objective, restrict the emotional, delineate boundaries, and formulate strategies.** Most institutions of higher education recognize and address the need for under-graduate students to be critical thinkers. The same concern for and effort to develop creative thinking is generally a lower priority.

### **Creative and visual thinking**

*Is visual thinking creative thinking?* It can be, but is not necessarily so. Visual thinking lends itself to the type of freely associational cognitive processing associated with creative thinking that allows original ideas to arise. Unbound by the structural rules governing written and verbal discourse or logic and discipline, visual Images need not progress or be manifested in a preordained rational order. They are freer to come and go in consciousness, combine and recombine more easily in ways that defy logic. For many Individuals visual images conjure up more connotative and affective connections. Visual images are generally less restrictive and allow access to easier modes of mental transformation.

**Visual thinking** is a natural scaffold on which to initiate inventive thinking. **Modifications, distortions, and unusual combinations of visual images allow the designer to instill multiple meanings and introduce aesthetic or emotive content** Increasing the density of aesthetic and emotive content increases the number of connotative connections that are possible. Not only are the viewers/users/receivers confronted with an image, but they are also faced with deciphering the meaning of the modifications imposed upon it. The Increase in aesthetic and emotive density imbues the object with connotative content, something less concrete and less decipherable in its entirety for the viewer, something much more likely to be interpreted as creative or inventive in nature since it is less familiar or possesses unexpected characteristics.

Visual thinking can also be done in a critical way. Conscious and Intellectual choice of means for modifying, deconstructing, reconstructing, combining or recombining visual imagery can lead to unexpected results. Logical analysis and discriminating selection of acceptable solutions based on rational criteria and deductive measures can lead to appropriate and effective choices. Is it creative? No. Is it inventive? Yes. We confront a new artifact. It is unlikely we redefine our perspective

### **Conceptual thinking**

**Conceptual thinking, the process of conceiving an idea in the mind can have as its generator any of the cognitive problem solving processes, creative thinking, inventive thinking, visual thinking, or even intellectual reasoning.** The terminology “conceptual thinking” is perhaps a misnomer, In that any of the processes discussed in this piece can be used to generate concepts, To say that conceptual thinking is used to generate concepts is essentially self-referential redundancy.

The end result of any of these processes, when it is a conceptual solution, needs to be evaluated in a critical way using criteria that reflect the objectives and requirements of the problem at hand.

### **Getting critical**

There are several differences in the roles of critical and creative, inventive, or visual thinking in the design process or within a design methodology being employed in the development of visual communications. Critical thinking, logical analysis, and rational decision making are the primary cognitive schemes in the beginning of the problem solving process as the designer identifies the problem, defines objectives and requirements, determines constraints, and sets out to discover the nature of the problem. This same mode continues as the designer collects and analyzes relevant research information impacting on the project.

Upon entering the ideation stage of the project the designer may call upon creative thinking processes or inventive cognitive mechanisms. This is largely determined by the contextual construct of the problem and the designer’s freedom to act, and is constrained by both the designer’s willingness and ability to act in either creative or inventive ways as opposed to in a didactic manner.

Visual thinking may take place in the ideation stage of the project when solutions are being determined but most often is employed in the more restrictive formal investigation of alternatives after content and vehicle have been established and an acceptable conceptual direction has been developed.

After ideation, an evaluation stage begins in which critical thinking again becomes predominant as intellectual decisions are made on the most appropriate and effective solution to pursue. Such thinking obviously continues through the production and implementation phases of the project and in any final evaluation of the finished project.

Clearly, this is a reductive model of designing, the design process, and design methodology, and in practice the stages do not break down so neatly and concisely. They often overlap, interpenetrate, and coincide. In addition, feedback as one progresses through a project may return the designer to a previous stage in the process.

### **Getting methodical**

**Design methodologies are frameworks for structuring the approach to design problems.** Design methods are specific techniques for generating, evaluating, or locating relevant or useful information that will help in solving the problem John Chris Jones, In his book **Design Methods**, (1992) discusses a number of specific methods, primarily oriented to product design and architecture that may be used as one progresses through a design methodology. Several of these methods for generating ideas, for example brainstorming and removing mental blocks, are appropriate for graphic designers and visual communicators.

The complexity and size of a specific design problem will determine the structure and extent of the methodology employed in solving it. A design methodology can aid in arriving at effective and appropriate solutions by giving some form to the rather amorphous character of the design process. It can also constrain the arena of solutions if the designer is not cognizant of its influence.

Specific ideational methods themselves may help in the generation of ideas, although the solutions will often be of a recombinant or reordered nature, inventive as opposed to creative.

Methodologies run the gamut from open to highly structured and the designer will, theoretically, choose the one that fits the problem most coherently, an open structure for those problems with loose boundaries and room for exploratory solutions, or a highly formalized one for problems for which the risk of error can carry serious consequences. Naturally, as a general rule, the more structured a methodology becomes, the less acceptable error is in the solution, the more constrained the arena for those solutions becomes and more often than not, the more difficult it becomes to generate creative solutions.

*Can we develop a methodological approach to visual thinking?*

*Yes. Can we use methods to instigate visual ideas?* Yes, again.

Morphological charts using visual elements or a combination of visual elements on one axis and language elements on the other are two examples of methods for generating visual ideas. Set several methods for generating visual ideas in a structural framework and we have a methodological structure to encourage visual thinking. *Does it help us to think creatively?* Maybe. *Does it help us to think in an inventive manner?* Yes. Clearly, such techniques can present a range of possible solutions that may not have come about by approaching a problem in an undisciplined manner, and although they impose a structure, they also force the individual using them to think in a divergent manner and to combine elements that might not normally be associated.

The problem with any method, just as with any tool, is that it has built in, most often tacit, biasing characteristics and is capable of circumscribing the perceptual, and thus conceptual space.

### **Conceptual fluency**

**In cultivating the conceptual fluency of students, it first becomes necessary to determine which cognitive processing strategy they are developing: creative thinking, inventive thinking, or visual thinking.** It is possible for someone using any of these processes to generate conceptual solutions. Creative thinking tends to be the most difficult to master, the least likely to occur in a problem solving situation, the hardest to imbue, and the one most likely to lead to truly original ideas. Inventive thinking, couched as it is within a matrix of both transformational and recombinant thinking, is easier to master, capable of generating solutions of some depth, and more methodical, hence simpler to transfer to students and more likely to be used successfully. Thinking visually, which often tends to bridge the creative and Inventive, offers the potential to intersect with creative thought processing when it is not heavily bounded, and access to inventive thinking even in those cases where it is.

As noted at the beginning of this piece, many faculty members, uncertain of how their own creative and inventive processes work, find difficulty in assisting students in becoming adept and original thinkers. The parameters and necessities for developing sophisticated formalists, competent researchers, and professionally oriented designers are reasonably well delineated and attainable and faculty members generally feel more confident in these activities.

**Developing creative and inventive thinkers poses more difficult problems, and often remains unaddressed in any explicit manner.** Discussion or demonstrations of possible avenues of exploring such activity are more often than not absent from the classroom and the discussion that occurs within it.

Relaxing rules, avoiding prejudice, encouraging a multiplicity of ideas, juxtaposing frames of reference, and encouraging a variety of visions are all necessary to successful creative thinking. Inventive thinking adopts a selection of these components and applies them in a more defined problem space. Integrating these elements into the study of design and as components of design problems can only help to make students more creative and inventive.

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### **The fine and the applied**

No difference exists between the creative thinking that occurs in the fine arts and that which occurs in the applied or design arts. Creative thinking in both focuses on resonating beyond the ends and altering the perspective of those who see or use it, those whose lives it touches. Differences of ten do arise in the manifestation of the finished piece, however. Almost all design has a practical end, objective goals, and in achieving that additional role, in fulfilling that additional responsibility, the solution most of ten must mediate the creative vision and settle within the realm of the inventive. Fine art, without that additional responsibility, has the luxury of ignoring reality.

The fact that design begins and ends with a purpose in mind influences to a great extent the freedom with which the designer can address and massage the parameters that exist. Add to that the concerns of other stakeholders in the project, and opportunities for flights of imagination or radical departures from the norm of ten shrink. Paradoxically, this is perhaps the time when truly creative designers can function at their finest. Overcoming such obstacles and producing a solution that is effective, appropriate, and creative is a task not many can succeed at accomplishing. Educators should at least be giving students the tools to try.

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