

# Dialectical-belief Features in Design Education for Artisans

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**Abstract:** This study aims to create a model of a design education that fits the beliefs and creative cognition characteristics of traditional artisans. We conducted two experiments in a design training program, the first experiment was investigating the in-depth cognitive levels during the use of the imaginative approach. The second experiment was capturing and utilizing stimuli during extreme levels of cognitive fixedness. We discovered that the employment of widely used design methods for training was incompatible with traditional artisans, who tend to hold strong, genuine beliefs. In addition, to open up to a greater imaginative approach, we model a design education curriculum that fits the beliefs and creative cognition characteristics of traditional artisans to activate deeper in-depth cognitive levels. This feature of dialectical-belief respects and utilizes their prior knowledge and intrinsically may diminish their reluctance to open up to other cultures or values. Dialectical beliefs unwittingly facilitate two-way criticism for resolving the dissonance of beliefs. The dialectical delivers a curiosity of unfamiliarity of another belief while at the same time allowing for the retention of prior knowledge without harm.

**Key words:** *Design Education Curriculums, Artisans, Imaginative Approach, Creative Cognition*

## 1. Introduction

Implementation by developing countries of technical assistance programs (e.g., design training) to improve artisans' skills and creativity levels is not new. Apparently, such programs were unsuccessful at introducing an unconventional design domain to inspire artisans to develop progressive ideas [1]. Differences in the nature of creative cognition, which influence artisans' design thinking processes, may have contributed to program failure. A conventional mindset was evident from gaps associated with in-depth cognitive levels of artisans and designers during the early stages of concept generation [2].

Numerous published studies have described how stereotypical or conventional thought may lead to decreased creativity [3,4,5,6]. To date, most creativity studies have focused on stimuli, rather than barriers [7,8,9]. Limited attention has been given to exploration of potential hidden in barriers [10]. Current conventional design education curricula avoid perceptual barriers; thus, traditional artisans appear trapped by a general fixation and commitment to a particular set of unchangeable design decisions [8]. Therefore, the traditional viewpoint has been investigated in this study because it has been regarded as a perceptual barrier to be accommodated as a feature in design education curriculums for artisans.

### 1.1 Design Education Model for Artisans

Because we recognized that conventional design education is incompatible with the mindset of traditional artisans who tend to hold strong and genuine beliefs, we have aimed to create a model of design education content that fits with their beliefs and creative characteristics. In the future, therefore, artisans should demonstrate

enhanced creative abilities and production of more desirable products. To facilitate development of this model, we studied gaps in the creative process of design training for traditional artisans. We identified the gaps by focusing on in-depth cognitive levels during the early stage of idea generation. Instead of introducing traditional artisans to a conventional design process, we offered an improved knowledge acquisition feature in the design education model. This feature respects and utilizes artisans' prior knowledge, and it intrinsically may diminish their reluctance to open up to other cultures or values.

Design education is a recent phenomenon that follows the traditions of Western models; it is a rational method for identifying and solving design problems. Master craftspersons are not literate in design, although they possess artistic skills. The modern education system has strengthened the barrier between professionally qualified designers and traditional craftspersons; thus, it is practically and rationally difficult for these two groups of people to stand on the same platform.

Few studies have focused on curriculum design for craftspeople; in fact, the generic assumption is that education needs to solve two major problems—meeting market demand and preserving traditional values. Understanding the market involves providing information about the gap between users' affective preferences and needs; it is directed toward finding the goal of product design through the problem-driven phase. However, conceptualizing new ideas for products cannot be obtained simply by understanding the market; this process is a phase stemming from an inspiration or inner sense [11]. In general, preserving traditional values appears to be a complimentary action rather than a cognitive issue that reflects an artisan's beliefs and motivation. Therefore, we determined that capturing the gaps in users' affective preferences and accommodating traditional values were related to implicit impressions or in-depth cognitive levels. In other words, we did not perceive these gaps as explicit issues.

## **1.2 Dialectical-belief Feature**

The incorporation of the dialectical is a novel approach to design education curriculum that permits two-way criticism. Belief is a source of commitment that an individual holds strongly, be it tradition, habit, or value; dialectical belief is a psychological state characterized by curiosity arousal or apprehension regarding the existence of another belief. Dialectical beliefs unwittingly facilitate two-way criticism for resolving dissonance. It delivers curiosity for the unfamiliarity of another belief system. Traditional artisans are the targets of design education curriculums, which are designed to affect in-depth cognition and facilitate experiencing the dialectical state during idea generation. During idea generation, artisans are challenged to employ their prior knowledge to run into extreme exposure of conservatism, which unconsciously makes them wonder about their objectivity and the suitability of their values. Whenever the challenge of extreme exposure is presented, feelings of uncertainty may be manifested as intentions to seek another value or custom that presumably would be suitable.

## **2. Aim**

The aim of this study has been the construction of a design education model that fits artisans' beliefs and delivers a curiosity for the unfamiliar—a prerequisite for unconventional thinking. In this study, we conducted two experiments involving in-depth cognitive levels at the early stage and later stage of idea generation.

### 3. Method

We conducted two experiments at different stages for the proposed design training program:

- a. The first experiment was conducted at the early stage of idea generation.

We investigated in-depth cognitive levels reflected by the use of imagination in the early stage of idea generation. In this study, we used a concept network method based on the associative concept dictionary to extract verbalized thoughts. The framework consisted of the steps listed below (Fig. 1).

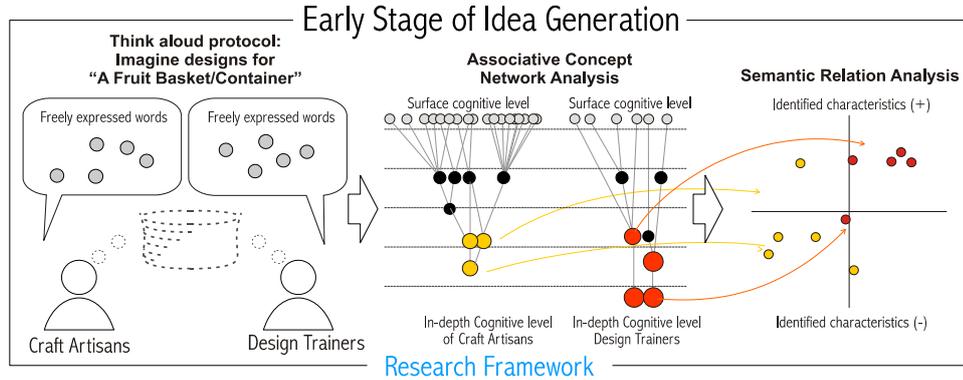


Figure 1. Design Training Experiment 1 (identifying stimuli within in-depth cognitive levels)

- b. The second experiment was conducted at the later stage of idea generation.

This experiment involved capturing and utilizing stimuli during extreme levels of cognitive fixedness. We conducted an experiment in which we offered design training (in-studio design and creativity training), and we observed later stages of idea generation as artisans developed new ideas regarding traditional wooden sandals. During the first stage, design trainers challenged artisans to generate extreme ideas based on their prior conceptions and knowledge. Artisans' conceptual sketches and frequently verbalized thoughts related to unfamiliarity or skepticism were examined later to obtain stimulating keywords. During the second stage, the artisans redeveloped previous ideas by employing these stimulating keywords. Finally, the design trainers evaluated transformations that occurred during idea generation (Fig. 2).

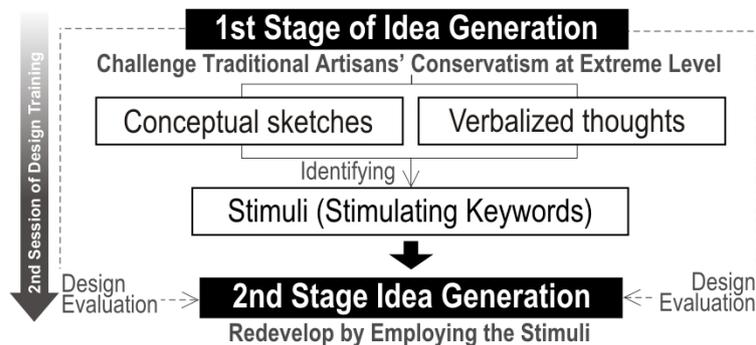


Figure 2. Design Training Experiment 2 (utilizing stimuli during extreme levels of cognitive fixedness)

The results of our experiments enabled identification and enhancement of stimuli associated with in-depth cognitive levels in the early and later stages of idea generation; subsequently, a design education model for artisans was constructed.

## **3.1 Experiments**

### **3.1 Experiment 1: Identifying the Stimuli for In-depth Cognitive Levels**

Cognition has been recognized as a major factor in the creative process. “Implicit impression” refers to that which is not explicitly recognized or verbalized [12]. Thus, it is referred to as the in-depth cognitive level [13,14,15]. It establishes rich metaphorical concepts that become key features of cognition during the creative design process. We employed an associative concept network analysis as a computational model to reproduce latent links that exist among expressions associated with an individual’s mental state. Further, we used the University of South Florida Free Association Norms database (USF-FAN) in this research [16].

#### **3.1.1 Participants**

Four artisans (master craftspeople) and four designers (graduates of industrial design program) were selected as participants.

#### **3.1.2 Procedure**

Participants were instructed to imagine designing a fruit basket/container and then to freely verbalize their thoughts. We transcribed the sorted verbal data that consisted solely of nouns, adjectives, adverbs, and verbs into English. Furthermore, the data was visualized by the use of Pajek 2.05 based on 2-D layers in the Y-direction. The data was analyzed according to the concept network method based on the USF Free Association and Norms dictionary. Next, we identified the concept network by analyzing semantic relationships.

#### **3.1.3 Analysis and Discussion**

Figure 3 displays graphs that demonstrates differences that have existed between artisans’ and designers’ associative concept networks. The graph was generated using Fruchterman Reingold algorithm. The graph reveals that most of the associated words were at the surface level within the score category of 0.000. This surface cognitive level consisted of closely associated words or explicit words extracted from verbalized thoughts. The high score indicated that some nodes had more connections with other nodes that contained remotely associative words (polysemous). Thus, Figure 3 clearly depicts the significant differences that existed between the artisans’ and designers’ in-depth cognitive levels. Artisans’ highly weighted associative words were focused on technical or operationally related issues that resided in the designers’ lower layer (i.e., layer focused on issues pertaining to the presence of surroundings).

Based on the extracted words identified by concept network analysis, we observed that artisans tended to focus more intently on the appearance and technical aspects of the fruit basket/container. They observed features such as shape, body, curve, waist, and length, as well as actions such as reduce, replace, and so on. We categorized these features and actions as characteristics of Operation and Shape. The results also revealed that designers tended to focus on the presence of the fruit basket/container. They offered the following associated words: silverware, Tupperware, dish, norm, public, booth, fresh, match, carrot, apple, and so on. We identified these features as characteristics of Scene and Appeal. We categorized approximately 10% of artisans’ highly weighted associative concepts/words as “low Object-Oriented.” We categorized 20% of designers’ highly weighted associative concepts/words as “highly Surroundings-concerned.” Our results revealed that artisans generated 0.7% words at in-depth cognitive levels. In contrast, we discovered that designers generated 28.6% words at in-depth levels of cognition during their imaginative approaches (0.0500–0.1000 of Out Degree Centrality range).

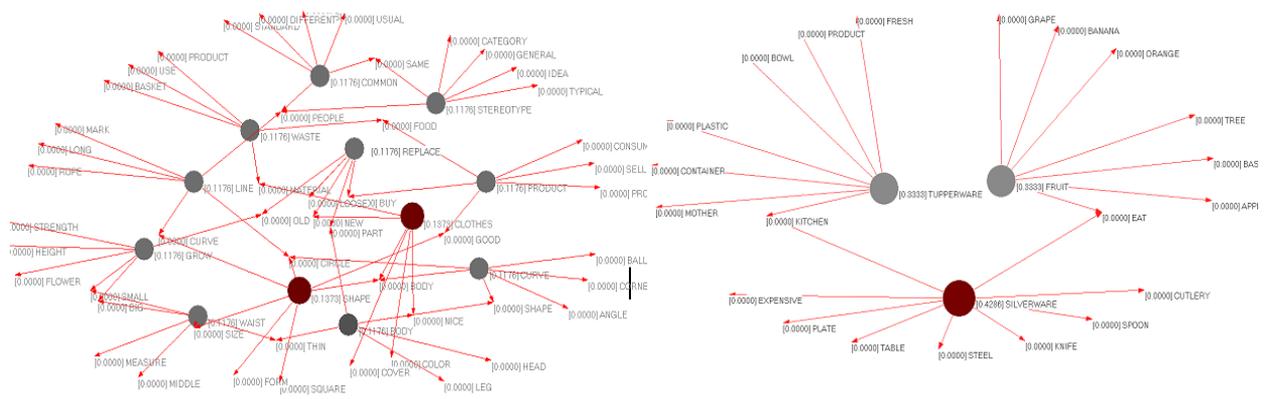


Figure 3. A reduction of associative concept networks was generated using Fruchterman Reingold algorithm. Artisans' associative concepts (left) and Designers' associative concepts (right) showing Out-Degree Centrality Score that represent difference characteristic of the in-depth cognitive levels.

As demonstrated by the highest ODC score achieved at the in-depth cognitive levels that corresponded to remote association, we discovered that designers tended to use more highly weighted associative concepts or polysemous words (Fig. 4). We relied on the Associative Gradient Theory to explore these results. This theory suggests that more closely associated or “stereotypical” representations may lead to reduced creativity. Thus, if artisans and designers make greater numbers of associations, then they have a greater probability of achieving creative solutions because remote associations (i.e., highly weighted associative concepts) are best suited for the creation of these solutions [3,4,5]. Yamamoto et al. (2009) argued that the polysemy of a design idea could be correlated significantly with its originality [17]. Therefore, we believe that deeper access to artisans' and designers' in-depth cognitive levels promotes greater probabilities of achieving creative solutions.

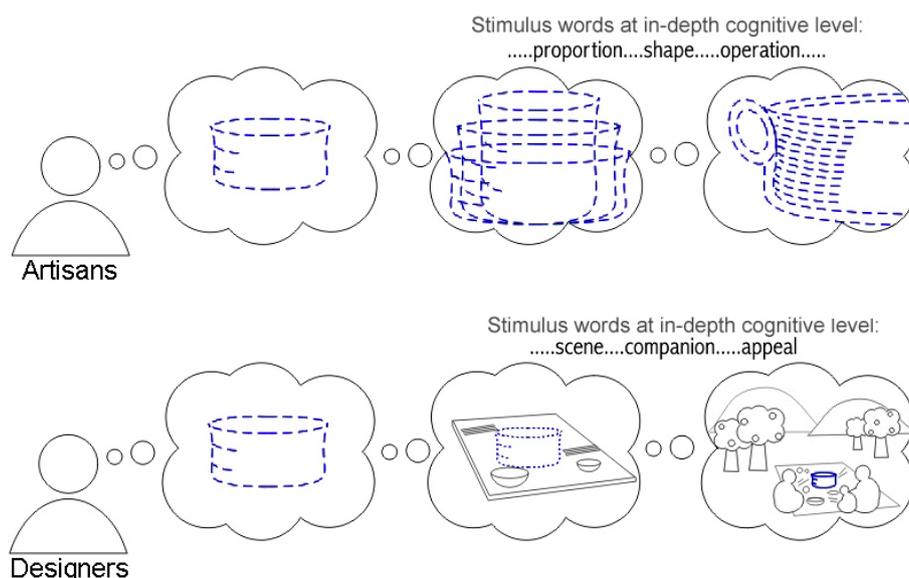


Figure 4. Artisans' and designers' imaginative approaches

Based on our findings, we suggest that the roles of closely and remotely associated concepts at in-depth cognitive levels during the early stage of idea generation differ for artisans and designers during their observations

and definitions of design problems. Artisans' in-depth cognitive levels have fewer polysemous features. Therefore, artisans tend to express concerns related to more tangible issues, such as Shape and Operation. In comparison, designers' in-depth cognitive levels possess more polysemous features. For this reason, they may express concerns related to intangible issues, such as users' affective preferences (i.e., Scene and Appeal).

## **3.2 Experiment 2: Identifying the Stimuli within In-depth Cognitive Levels**

### **3.2.1 Participants**

The subjects consisted of 15 males who were traditional wooden sandal artisans; their ages ranged from 27 to 51 years. They are respected as master craftspeople who possess special skills and artistry. Two designers served as design trainers and guided this experiment.

### **3.2.2 Procedure**

The experiment was conducted over a 20-day period (eight hours per day). An outline of the procedure and discussion of the second session (Design Exercise) are provided below:

- a. First session: Design Basics lecture
  - Design Principles (balance, proportion, etc.)
  - Creativity Icebreaker games for habituation
- b. Second session: Design Exercise
  - From preliminary ideas to idea development (Third session: 1:1 workshop prototyping)
  - Foam modeling, upper strap variations, and finishing

During the second session (Design Exercise), we employed the following steps:

1. First stage of idea generation:
  - Escalating artisans' extreme conservatism
  - Identifying stimuli in artisans' conceptual sketches and verbalized thoughts
2. Second stage of idea generation:
  - Redeveloping previous concepts by employing obtained stimuli (i.e., stimulating keywords)
  - Evaluating transformations that occurred during idea generation and reviewing unconventional aspects

### **3.2.3 Analysis and Discussion**

#### **A. First Stage of Idea Generation**

The artisans were encouraged to achieve extreme levels of conservatism to generate their best ideas. They were instructed to generate ideas in the usual manner, but at extreme levels. Rather than requesting that they act unconventionally, they were challenged to engage in their traditional and conservative ways at extreme levels. We observed that they elaborated their prior conceptions and knowledge in designs that contained meticulous curvature forms, complex decorative shapes, and linear yet repetitive patterns. We realized that the artisans believed that these conservative ideas fulfilled fundamental conceptions of appropriate sandal shapes regarding "continuity" and "appropriateness." The sandal's shape must be continuously streamlined, and the design must perform well as a finished sandal. In contrast, artisans' verbalized thoughts revealed their unfamiliar or skeptical feelings generated by extreme cognitive fixedness. Some examples of artisans' expressions of unfamiliar or

skeptical feelings include “seems like it might be so painful to wear,” “seems like it might break easily,” and “it’s an odd upside-down sandal.” We omitted less relevant verbalizations, sorted artisans’ relevant and frequently verbalized thoughts, and transcribed them into English. We designated “painful,” “broken,” and “upside-down” as stimulating keywords (stimuli). These terms were associative words that artisans produced after reflection that corresponded to the in-depth cognitive levels.

Our intention was to capture stimuli that activated artisans’ prior knowledge and conceptions of beautiful sandals. A current design of extreme beauty might include a plain hyper-flat shape that is immensely minimalistic. In contrast, the artisans believed that a design of extreme beauty would include a meticulous, exaggerated shape.

### B. Second Stage of Idea Generation

Csikszentmihalyi (1996) has stated that creativity is the process by which a symbolic domain in the culture is changed. We challenged artisans to redevelop their previous ideas (extreme conservatism) by the use of stimulating keywords (*painful*, *broken*, and *upside-down*). During the second stage of idea generation, artisans tended to maintain a moderately fundamental comprehension of sandal (i.e., “continuity” and “appropriateness”). Although they still felt awkward, they did not express reluctance or rejection. In all likelihood, the stimuli (i.e., stimulating keywords) were derived from their subconscious minds. Thus, they were willing to experiment. Their search for the beauty in the keywords released them from their strict fundamental comprehension of continuity and appropriateness.

Artisans’ conceptual sketches during the first stage of idea generation revealed that they had taken a completely different direction. The features of extreme conservatism were complex-decorative. In contrast, the features of extreme unconventionalism were minimum-attribute. However, during the second stage of idea generation, evaluations by design trainers revealed that artisans’ conceptual sketches had become increasingly unconventional. They yielded some potential accents that looked promising for realization. The artisans became a bit more flexible in heel size, composition, direction, and orientation. In fact, they did feel awkward as they distorted the basic structure of the sandal. (See Figures 5 and 6.)

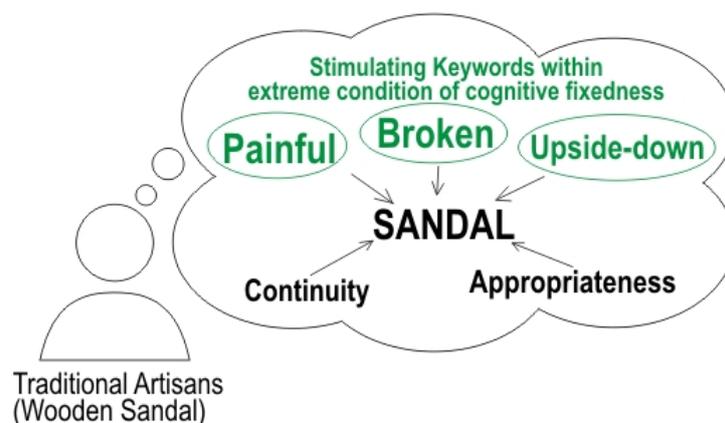


Figure 5. The conflict that exists between fundamental comprehension and stimuli contained in extreme levels of cognitive fixedness

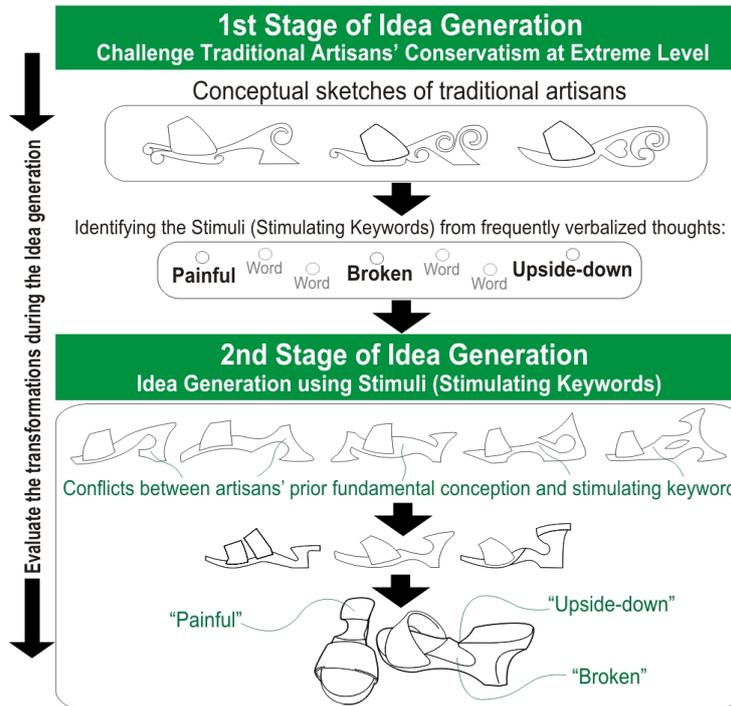


Figure 6. Design Experiments

Finally, we realized that artisans apparently were motivated to experiment with unconventional creative activities and transform their fundamental comprehension when they engaged in extreme levels of conservatism. They were motivated to become flexible when they recognized that their fundamental conceptions were contradicted by their frequently verbalized thoughts that reflected opposing expressions. During the second stage of idea generation, they were introduced to their own stimuli obtained during their exposure to extreme levels of conservatism. They became more spontaneous and allowed ideas to flow beyond fundamental comprehensions. Ultimately, this experiment demonstrated that, in all likelihood, when artisans' conservatism is pushed to extreme levels, they will become more unconventional in their creative activities (Fig. 7).

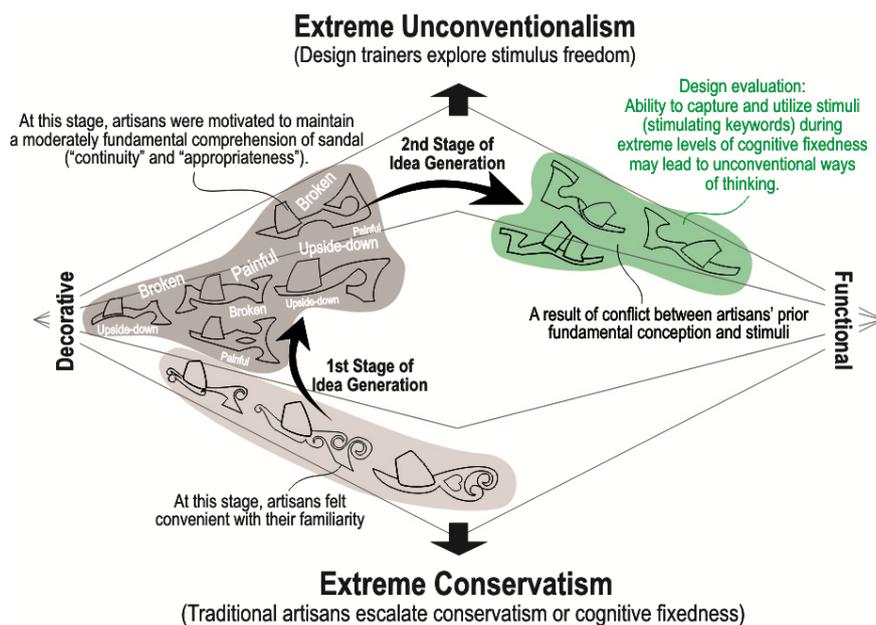


Figure 7. Artisans' idea transformations in the Experiment 2

This study makes substantial contributions to our understanding of the ways that stimuli can inhibit or encourage artisans' cognitive fixedness. Conservative artisans who gain the ability to capture and utilize these stimuli may demonstrate increasingly unconventional ways of thinking. Several years after the completion of this design training, the upside-down wooden sandal, known as the Extreme Wooden Sandal, became popular and entered the international market (see, Fig. 8).

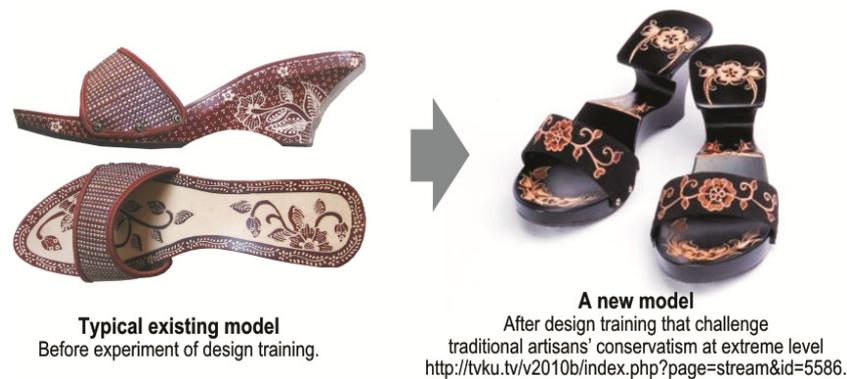


Figure 8. Before and after

#### 4. Analysis and Result of Two Experiments

This study demonstrated that difficulties in accessing conventional thoughts occurred because artisans were asked to focus solely on the object (i.e., designed artifact) during the design training program. In fact, the systematic instructional materials required this focus. When the design trainers provided clear instructions about an intended object to be designed during training, they placed the craft artisans in a status quo mentality in which their perceptual sets were tied to their tendencies to make quick decisions and jump to familiar conclusions. As Gero (2011) argued, two types of fixation are typical for designers: a general notion of fixation and a premature commitment to a particular design solution. Jansson and Smith (1991) argued that showing designers a picture of a potential design solution to a problem prior to a design session could result in fixation. In effect, the picture would act as a precedent, blocking access to other ways of solving the problem. Akin to those problems, providing clear instructions and rigid targets regarding an object to be designed during training was likely to cause artisans to consider their beliefs (traditions, habits, or values). For example, a rigid instruction to imagine designing “a fruit basket” generated very low numbers of abstract and polysemous words; in fact, artisans instantly expressed their premature commitment to technical or operational issues. Therefore, during the concept generation stage that requires intensity of inner-sense or intrinsic motivation to pursue unconventional ideas, we suggest offering looser and somewhat vague guidelines that may help craft artisans adopt broader perspectives. This approach is preferable to providing rigid or clear instructions for the design of a familiar or identifiable object. In the example discussed in this paragraph, the target would be directed to imagine “an object/artifact that would whet the appetites and awaken fresh feelings in family members.”

Ultimately, there were two major problems education raised in every design training session held—market demand and preservation of traditional values. Some experts claim that conceptualizing new ideas for products cannot be obtained simply by understanding the market; this process is an inner-sense driven phase stemming

from an inspiration. The ability to capture the gap between users' affective preferences and their tendency to accommodate traditional values is related to implicit or in-depth cognitive levels rather than explicit issues. Unconventional ways of thinking that could result in greater creativity were experienced by designers and artisans during the Design Training Experiment 2. The trigger for unconventional thought was construction of the design education model, which challenged artisans to experience the escalation of extreme conservatism. At this stage, vaguery regarding instructions and targets deepened their intrinsic motivations and lessened their intensities regarding attainment of goals. In addition, reflection through verbalization captured very important keywords (stimuli). These stimuli were crucial for further stages in addressing the enhancement of cognitive resources. Therefore, the design education model was constructed to modify intrinsic motivations at the in-depth cognitive level (concept generation). Incorporation of the dialectical approach facilitates two-way criticism. A prior belief as a source of a strongly held premature commitment is a main issue to be controlled. Such a belief must be challenged by an extreme level of conservatism to generate questions, arouse curiosity, or apprehend the existence of another belief. Dialectical belief represents a cognitive experience of self-criticism; it enables one to criticize, evaluate, and compare unfamiliar belief systems. The usual design method normally avoids the presence or intensity of intrinsic drive and giving more attention to problem-driven; here, we have created a model that allows complete joy of the inner-sense driven experience at the idea generation stage. To complete a fulfilling sense of resonance, the goal-driven stage (before the reflection stage) has been eliminated. At the reflection stage, in-depth cognition is affected by the dialectical state, as indicated by a personal examination of one's own beliefs. Whenever the total enjoyment of one's beliefs is experienced, feelings of curiosity may be aroused regarding other values or customs (other beliefs).

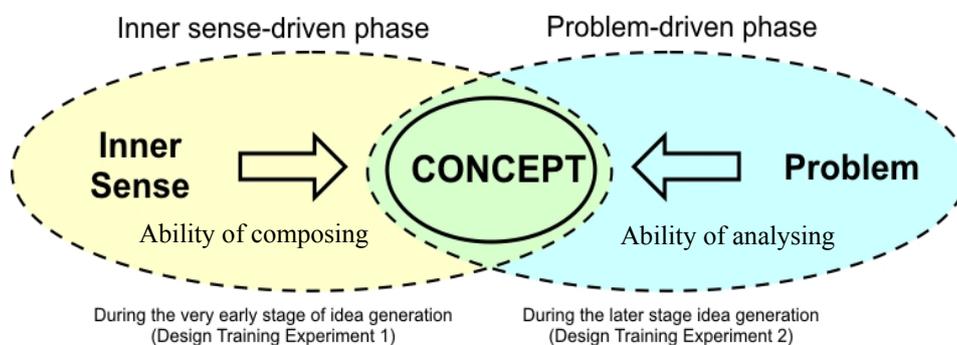


Figure 9. The two phases in concept generation (Taura & Nagai, 2012)

The later stage of idea generation is more difficult for artisans to follow because it requires the ability to synthesize, analyze, and compose simultaneously in order to define and ideate. A gap in abilities to analyze indicates that the solution lies hidden therein. Definition and ideation is related to the process of discovering the hidden solution in the gap. Idea generation proceeds to a new concept by referring to certain existing concepts from the real world or the designer's mind. We believe that artisans experience difficulties at this stage because they feel comfortable with fixation or commitment based on prior knowledge, as demonstrated by their responses to extreme levels of conservatism. Dialectical belief was possible be accessed through conforming their belief (tradition, habit, value) to their reflection from verbalized thought. The responses to extreme levels of conservatism indicated that beliefs might not match fundamental comprehension of ideal artifacts. Further, the keywords from verbalized thoughts were employed as stimuli to further re-define or re-ideate. Up to this stage, re-

define and re-ideate is a dialectical of ideality of their familiar and habit with other unknown-ness or unfamiliarity area. Curiosity might be aroused only if they experience some uncertainty over their prior ideality (Fig. 10).

To successfully access a conceptualization, Master craftsmen who are not literate in design must accentuate the inner sense-driven phase rather the problem-driven phase. Our experiments demonstrated that artisans tended to place greater focus on operational aspects of an artifact (e.g., replace, reduce, etc.) or shape (e.g., waist, body, etc.). This focus represents a mental state trapped in the tangible issues of an artifact that create perceptual barriers and obstruct an imaginative approach. In contrast, artisans were challenged to generate conservative ideas at extreme levels during Design Experiment 2; subsequently, we captured dissonance through verbalization. Keywords or stimuli derived from their conservatism did not match with ideality in fundamental comprehension. The stimuli from this experiment created intangible issues or relevant metaphors, such as Scene and Appeal.

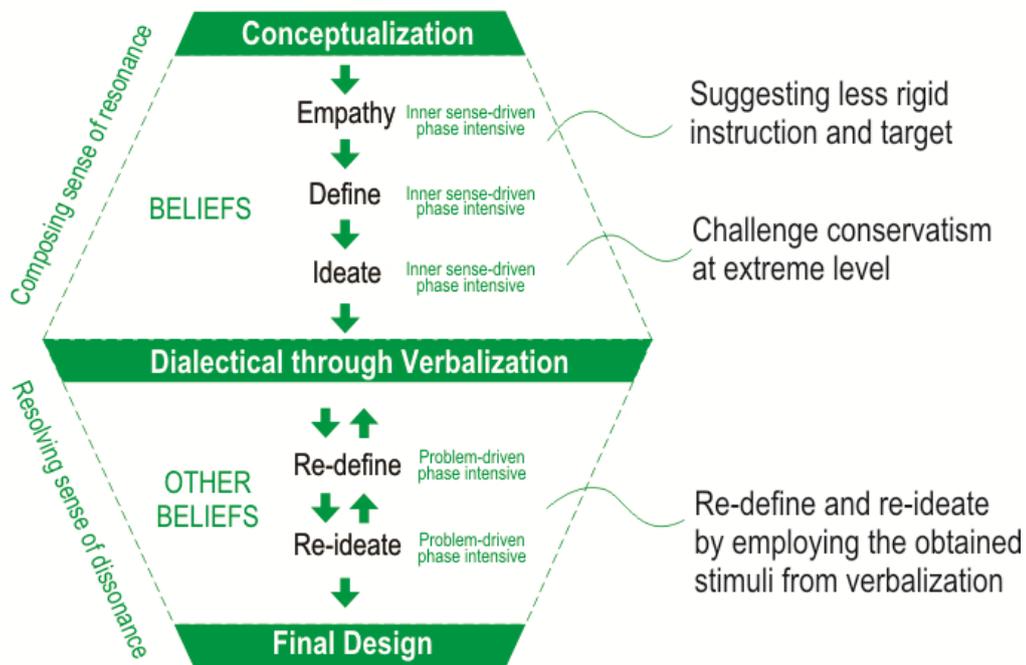


Figure 10. A design education model for Artisans

To produce more intrinsic experiences that access thoughts at the in-depth cognitive level and broaden perspective or creativity, artisans must be positioned to experience the dialectical phase in a familiar way. Dialectical belief is a criticism phase where one begins to doubt his/her premature commitment; consequently, the individual may become curious about different belief systems.

#### 4. Conclusions

This study made a substantial contribution through the creation of a suitable design education model for traditional artisans that respects and utilizes their prior traditional viewpoints. Traditional artisans' in-depth cognition levels may not be transformed instantly so that the individuals experience two-way criticism, but the model appears to provoke curiosity regarding unfamiliar values or customs. This unconventional interest presumably would lead to new experiences reflexively.

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