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EFFECTS OF FIXATION ON DESIGN EDUCATION

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Abstract

Gestalt researchers argue that associations create cognitive obstacles on the creative problem solving processes and that problem-solvers should free themselves from associations and evaluate the problem at hand from different perspectives. These cognitive obstacles are evaluated under the subject of "fixation". Experimental studies reveal that fixation has adverse effects on cognitive processes such as recollection, problem solving and creative idea generation. Fixation in the context of design problem solving can arise when designers are fixated on the solutions of similar problems encountered in the past to the problem at hand instead of searching for novel and creative solutions. Therefore, one of the primary objectives of design education is to raise the students' awareness on the effects of being fixated on past solutions through analogies built on surface similarities or invisible assumptions. This study deals with the effects of fixation on the design processes in the context of architectural design education.

Keywords: Design education, Fixation

INTRODUCTION

Design is a complex cognitive process. Designers, resort to various strategies in order to cope with the complex nature of the design process, one of which is analogical reasoning [1]. Analogical reasoning, is built on the assumption that if certain aspects of two or more phenomenon are similar to each other, then other aspects of these phenomenon are also likely to be similar [2]. Designers often apply knowledge originating from their past experiences to tackle the design problems at hand. Knowledge from past design problems whether related to the solutions or solution methods of previously encountered design problems, plays an role in setting up the conceptual framework to be used in solving the design problems at hand [1].

However, establishing analogies between the problem at hand and past design solutions or experiences is a process full of traps. First and foremost, analogies between the design problem at hand and a past design problem can easily be arbitrary. With enough effort, it is possible to build analogies between any two phenomenon. Naturally, there may be significant differences between even identical looking problems and these differences may be overlooked in the design process due to incorrect invisible assumptions based on the established analogies [2]. When designers go by superficial similarities between the problem at hand with precedents and construe similarities that don't exist in reality, then the use of past experiences will have a negative effect on the design process and make it even more difficult to solve the problem [3].

Eastman's studies on design research, show that designers initially develop an idea for the solution or partial solution of a design problem before trying to establishing abstract relationships to formulate the design problem. Eastman states that this is due to the fact that designers prefer a "solution-oriented" approach rather than a "problem-oriented" approach [4]. This approach is quite suitable for working with ill-defined design problems. However, in a "solution-oriented" approach, problem solvers maybe more inclined to be effected by existing design solutions.

Past experiences and solutions act as a starting point for the solution of newly encountered problems and can facilitate establishing the theoretical framework to be used in the solution [5]. However, at times this influence can simply be too great and as a result designers can be over-effected by previous solutions. Consequently, when faced with a new problem the designer can be inclined to use the solution of a previously encountered similar problem, instead of searching for new and novel solutions that satisfy functional requirements [6].

DESIGN FIXATION

Gestalt researchers argue that, association of ideas creates mental barriers on the creative problem solving processes. In order to obtain novel solutions, the problem solver should be free from the influences of associations and evaluate the problem at hand from different points of view [7]. Such mental barriers are evaluated under the "fixation effect".

In a problem solving experiment, Duncker (1945) had provided the test subjects with matches, a candle and a box containing thumbtacks. Subjects were asked to fix a candle on the wall using the matchsticks and thumbtacks. In order to solve the problem subjects had to empty the box of thumbtacks, light the candle, fix the candle to the box with candle drops and then attach the box to the wall with the thumbtacks. The majority of the subjects had difficulty in reaching the solution as they assumed that the function of the box was solely to keep the materials in. When the experiment was repeated by emptying the thumbtacks out of the box, it was observed that the subjects had more easily reached the solution. In this experiment, Duncker demonstrated that taking the objects for their obvious visible function or in other words "functional fixedness" can create mental barriers in the problem solving process [8].

Luchins and Luchins (1942), in their classic "water jar experiment", asked the test subjects to solve a number of questions which involve obtaining a certain amount of water by using a set of three jars with different sizes. First few water quantities could be solved by applying the same method. Test subjects applied the same method to solve all the given problems although latter problems could be solved with much simpler methods. Luchins explained this phenomenon with the term "Einstellung" or "mental set". Being fixated on a certain solution method can make it difficult to search for alternate and possibly more effective solution methods [9],[7].

Experimental studies on design fixation by Jansson and Smith (1991) show that, visual examples presented to students can also give rise to fixative effects on their designs. Student groups who were provided with visual examples produced designs which adopted one or more aspects of the examples. Even when were warned not to adopt the presented examples in their designs, students still unconsciously adopted certain weak aspects of the provided examples [10].

Erkan Yazıcı conducted an experimental on the effects of spatial experiences on the designs of freshman architectural design students. Spatial experiences are shaped by education, cultural and social environment. An individual's past personal spatial experiences can change the way that an individual perceives space. The extent of this change depends on the strength of an individual's ties with a particular space and the way it was initially perceived. In time, these experiences may generate personal definitions for spaces. These personal definitions may be associated with images, sounds, fragrances and textures. It was demonstrated that visual information in the memory associated with spaces can manifest fixative effects on the design processes of students [11].

Design fixation can also arise from invisible assumptions that are limiting and erroneous. In order to bring out creative ideas the designers have to overcome the said invisible assumptions. The most annoying issue about the invisible assumptions is that by definition such assumptions are hidden from the consciousness of the individual and are almost invisible. One of the most frequent examples given for the invisible assumptions is the classical 9 dots problem. In this problem, it is asked that the 9 dots given in the shape of a square is to be joined by 4 straight lines without lifting the pen. When people are met with this problem for the first time, generally due to the invisible assumptions and rules they have assumed in their minds, they limit the approaches that they could use for the solution. That the lines are to start and finish with the dots given in the problem or that the solution should not extend outside of the square can be shown as an example of invisible assumptions. The solution is contrary to both of the assumptions [12].

Cognitive illusions are largely due to erroneous operations of the explicit memory. This may happen when certain aspects of the information to be recollected is missing or cannot be recalled from the explicit memory. In this case, the missing information can be completed through the process of inference, which can easily result in faulty memories and cognitive illusions. Information in the long term memory can be stored for many years and are recalled and transferred to short term memory when needed. However, information and experiences in the long term memory, can change over time

or can be transformed into new information by combining with new information. Long term memory, has two main components, namely, implicit memory and explicit memory. Explicit memory stores information about personal events and the knowledge of the world which can be consciously and intentionally remember and described explicitly with words. Explicit memory consists of two components, namely, episodic and semantic memory. Information related to previous personal experiences and events, in other words, biographical information is stored in the episodic memory, whereas, information related to the knowledge of the world, ideas and concepts are stored in the semantic memory. Implicit memory stores information which cannot be consciously recalled or explicated, such as information related to motor skills. Recall of information stored in the implicit memory is generally automatic and does not require a conscious effort [2].

Indirect research on implicit memory processes, such as word completion studies, show that implicit memory can also create the grounds for mental barriers. Although implicit memory processes facilitates the recall of recently acquired information, but it can have negative effects on the problem solving performance when the recently acquired information is similar to the information required but inappropriate for the problem at hand [12]. As an example, having recently seen the word ANALOGY can facilitate the task of finding the missing letters in the word A _ _ L _ G Y. However, it has negative effects on the the task of finding the missing letters in the word A _ L _ _ G Y (ALLERGY) [13].

FIXATION AND DESIGN EDUCATION

Although past spatial experiences are invaluable for expanding a designer's design vocabulary, a firm attachment to these definitions or preconceptions can curb a designer's ability to come up with new and innovative design solutions. One of the primary aims of the first year architectural design education is to dissolve students' tendencies to use these preconceptions and fixed definitions in their designs. Therefore, design methods that promote alternative and flexible thinking as well as encourage students to reflect on their own design processes are used in the first year of architectural education, in order to reduce the adverse effects of stereotyped ideas and preconceptions [14].

John Ruskin was one of the frontier educators who argued that students must be dissociated from prejudices and preconceptions at the very beginning of design education. According to Ruskin, pure, innocent and transparent gaze of a child or in other words "the innocent eye", in time leaves its place to the learned traditions of the society. The loss of the "innocent eye" makes it harder to understand the nature as it is. The drawing education model developed by Ruskin begins the evenly shading of squares. Representation of lighting, shading, colors and compositions are taken on in the advanced stages. Ruskin and the painters who adopted his model for drawing education inspired the development of non-representational abstract designs and the Bauhaus movement of the 20th Century [15].

Architectural education model of the Bauhaus, underlined that design students must set themselves free from all preconceptions and definitions imposed by the society in order to create novel design solutions [16]. Accordingly, students were encouraged to search for new and innovative ways of solving design problems instead of using existing conventional solution methods.

Contemporary models of design education focus on the cognitive aspects of students' design processes. The primary focus is on the explication and communication of the students' decision making processes. Through the explication of the design processes, it is intended for the students to better understand their own design decision-making processes. Rather than trying to dissociate from all preconceptions and past experiences, it is important for students to be aware of how they are effected by their past experiences and preconceptions in their design processes.

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