Conceptual Model of Design Process in Architectural Education

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Abstract: In this paper the designing products of BA Sophomore students of architecture in Tehran University as an instance of objective model for accessing conceptual model of design process were investigated. The result of the case study indicated that mutation in objective of design process enhanced student creativity and in subjective of design process as we move away from perception to verification of design process, the role of the unconscious becomes less significant while that of the conscious become more significant. To this end the instructors' concern on the quality of improving the novice learners' designing ability and considering the suggested model in order to evaluate the designing improvement is quite necessary and indispensible.

Key words: Architectural education · Conceptal Model · Novice · Design Process

INTRODUCTION

Recognition the steps to be taken in forming a creative idea in architecture are among the questions that so many architecture instructors and art teachers always have in their mind. Some experts believe that creative design process is so complicated a phenomenon that its components are inseparable and their introduction seems impossible [1]. Based on the classification in authentic books on creative thinking, the mental models of creativity process are introduced: As we move away from the old models of creativity process and get closer to the new ones, the role of the unconscious becomes less significant while that of the conscious becomes more significant. That is to say the creativity process especially creating new ideas can be controlled and directed as to Plesk (1996) [2] model which was introduced under the title of directional creativity. Based on his thorough investigation, Weisberg (1999) [3] concluded that there is no convincing evidence to prove that the unconscious processes have a critical and significant role in creativity. Moreover, there is less evidence indicating that the sudden mutations (inspiration and intuition) are extremely important. Therefore, creativity can be encouraged through necessary preparation.

Some experts differentiate between creativity and innovation at theoretical level. To them creativity is creating new and valuable ideas while innovation means the application of such ideas. However, most of the models and especially the new ones present creativity as both creating and applying new ideas. So the value of the ideas depends to a large extent on their practicality.

With regard to the first steps of the models in creativity process there is a problem whose origin is the feeling made through the interaction of the senses with the environment. Then the mind acts on such information and creates new concepts which are finally put into practice. This was in fact an emphasis on the ideas given by Aristotle, Weisberg and Drucker on the origin of creativity and feeling input resulting from the interaction with the environment.

In the old models of creativity, creativity process is introduced as a linear and cause- effect phenomenon, while in the new models (Koberg & Bagnall, Fritz and especially Amabile and Plesk), the creativity process is presented as circular and nonlinear phenomenon [4]. In other words creativity process is like an infinite circle. Although the models presenting creativity as a circle are very helpful in the formation of creativity and its role in our life, the drawback is that such models are limited to one circle in which the cause-effect relationship is one-sided.

In this study the subjective model of creation based on Wallace Model was proposed after defining creation; then it was put into action by suggesting some designing practice in order to turn the subjective model into objective one and finally some effective components as conceptual model of design process were introduced.

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MATERIALS AND METHODS

Creativity: In the domain of humanities the terms are complicated, ambiguous and hard to define. Therefore; giving various definitions for "creativity" paves the way for mastering its different aspects and expounding the pertinent intricacies. Ghiselin (1952) [5] believes that creativity is the process of evolution that happens in our mental life. In this definition creativity is regarded as process, hence synonymous with evolution. The main criticism leveled at the above definition is that creativity and evolution are not synonymous as any creativity causes evolution but not vice versa.

Frankel (1955) [6] asserts that creativity can be tangible effect, intangible thought or a service offered by somebody to others which make life meaningful. In this definition the outcome of creativity is emphasized.

To creativity is a driving force which makes humans step beyond their passive nature to reach their goals and freedom. What can be inferred from that in his definition, Fromm believes that all people are potentially creative and the origin of this creativity is willing to reach freedom and goals. However, some people do not put their potentialities into action due to many reasons. Guilford (1959) [7] defines creativity as divergent thought to find solutions to a problem. In his definition Guilford emphasizes source and origin of creativity (a specific problem), a kind of creative output (solution), the features of creative output (novelty), a kind of thought (divergent) and finally a solution.

Maslow (1962) [8] considers creativity as an outstanding characteristic of self-flourishing people. Such people are noble innovators; even though their creation is not always a work of art. From his point of view, all humans are potentially creative. Creativity is not limited to a specific area and creative output includes variety of subjects. Maslow also appreciates different kinds and levels of creation.

Koestler (1967) [9] in his definition emphasizes creation of existence out of nonexistence in the form of subjective and objectives. In other words, he defines creativity as something which did not exist previously either subjectively or objectively. Kaiser (1968) [10] putting emphasis on creative outcome recognizes creativity as utilization of mental capabilities for producing an idea or a concept. In this definition subjectivity of the process of creativity and creative outcome is emphasized. Also Stein (1974) [11] emphasizing the process of creativity and creative outcome defines creativity as the process of doing something new in an appropriate time which can be

accepted and supported by a group of people. Arieti (1976) [12] emphasizing the fact that the origin of creativity is unconscious mind, states that creativity is the magic synthesis of preliminary or illogical forces of the mind. He has been approving not only creativity as a process but also creative output under the title of applying ideas.

Bazerman (1994) [13] defines creativity as a subjective process in which various creative outputs are taken into account as well. Based on his definition, creativity is a subjective process which leads to the emergence of a new idea, concept, commodity or discovery. Professor Amabile, an authority on creativity, in his own definition lays stress on level of creativity and environment. To him, creativity means generating new and invaluable ideas by one or a group of people working together. In his other definition, creativity consists of three components of skill, creative thought and intrinsic motivation. He believes that all three components of creativity especially intrinsic motivation are strongly affected by the environment. In the definition given by Koontz and O' Donnell (1988) [14] three major outputs of creativity were valued. To them creativity means offering a new product or a new service or innovating a new method.

Csikszentmihalyi (1990) [15] a researcher on creativity puts emphasis on the importance of forming and accepting creativity. He believes that creativity means any action, idea or a new product that makes a specific area turn into a new area provided that the idea, the product or the action be confirmed in that area. His point of view is that creativity is affected by person, related scientific domain and the area of related activity. Luthans (1995) [16] sees creativity as combination of various solutions in a new method offered by different people or groups. This definition distinguishes creative output and recognizes creativity as a kind of problem solving; moreover, it presents creativity at individual and group levels. Woodman, Sawyer, emphasizing variety of creative outputs and their specific features, define creativity as creation of a process, a procedure, an idea, a service or a new and an invaluable product by people at complicated works. Bartel and Martin (1994) explain that creativity is a subjective process which aims at making an idea, a concept, a product or a new discovery. In this definition subjectivity of creativity and creative output is emphasized. Oldham and Cummings (1996) [17] put emphasis on creative output and creative features. In their definition creativity includes products, ideas and procedures which are new and valuable. Lussier (1997) [18] in his definition views creativity as a kind of creative thought and a creative outcome. In his opinion creativity

Table 1: Dimensions and aspects of creativity (Authors)

Researchers	Origin	Process	Output	Thinking	Problem solving	Creative person	Environment	Number of Significant dimensions
Ghiselin (1952)		×						1
Frankel (1955)			×					1
Fromm (1955)	×		×			×		3
Guilford (1959)	×		×	×	×			4
Maslow (1962)			×			×		2
Koestler (1968)			×					1
Kaiser (1968)		×	×					2
úStein (1974)		×	×					2
Arieti (1976)	×							1
Atric (1977)		×	×					2
Ackoff & Vergara (1981)	×		×		×			3
Bazerman (1986)		×	×					2
øAmabile(1988)			×				×	2
Koontz & O' Donnell (1988)			×					1
Kao (1989)		×	×					2
Sternberg (1989)			×			×		2
Handy (1990)			×	×				2
Csikszentmihalyi (1990)			×				×	2
Cook (1992)			×					1
Weisberg (1992)			×					1
Woodman,Sawyer and Griffin (1993)		×	×					2
Martin Bartel (1994)			×					1
Luthans (1995)			×		×			2
Oldham & Cummings(1996)			×					1
Lussier (1997)			×	×				2
Frequency	4	7	23	3	3	3	2	45
Percent	16%	28%	92%	12%	12%	12%	8%	

is a method of thought that leads to the emergence of new ideas. Based on the definitions given on creativity, the significant aspects and dimensions which were emphasized within the above mentioned definitions are as follows:

In all the above definitions, creative output and creativity process were mainly emphasized. Perhaps this is due to the fact that the mentioned aspects are more observable and can be easily examined when compared with other aspects of creativity. Concerning frequency of the dimensions of creativity, there are some aspects which are more frequent than others which in turn indicates to some extent that the dimensions and aspects of creativity have been the areas of researches done as yet. In all the definitions, seven aspects or dimensions of creativity were emphasized. Therefore, it can be concluded that creativity is a multi-dimensional, multi-faceted and a monolithic phenomenon (Fig. 1). So examining and clarifying each of the related aspects and dimensions of this phenomenon is just like illuminating and shining in a darkness through which creativity is presented as a product of an educational process.
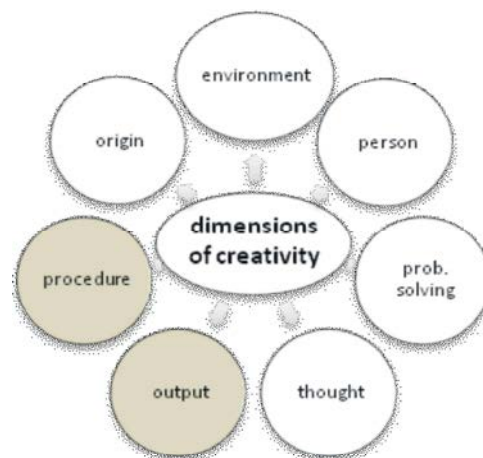

Fig. 1: Dimension and Aspect of Creativity

Subjective Steps of Design Process: Wallace's model is the basis for the other models. In the other models different terms are used. However, other models are in fact the extension of Wallace's model and have been improved in his (Wallace's) framework. The utilized processes in all models indicate that the creativity procedure includes
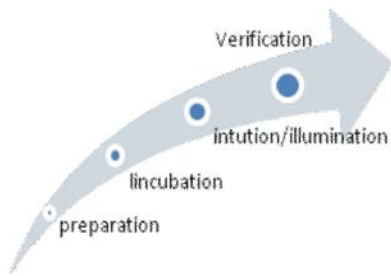
Fig. 2: Wallace's model in the process of creativity

both unconscious mind (intuitive thought) and conscious mind (analytic thought). These two mental procedures are inseparable meanwhile they are present in all steps of creativity, however the significance of the roles of each in any step is different. According to Amabile, it is wrongly believed that only unconscious mind (Incubation, illumination, Intuition) indicates creativity [19].

Preparation: "Preparation" is the first step in the creativity process which comes just after the emergence of the first insight in the artist's mind. In this step the architect who has a general image of his construct in his mind tries to prepare himself for the application of his first insight using any method and instrument. The creator in this step is busy studying, note taking, discussing, asking questions, collecting information and doing research [20]. In fact this step is a thorough investigation of the facilities and capabilities of the first ideas. An architect may ponder smoothly all day long and take notes out of his thoughts in order to create a design at a proper time.

Incubation: Based on the findings in psychology, the unconscious mind follows conscious mind. The incubation period at this process is a step in which the unconscious mind comes to sit in lieu of the conscious mind and the achievements are continued from the previous stages. Preparation and incubation period are logically different and are originated from various sources. However, no one can imagine a physical distance between them. In this step the architect directs his design process, implicit beliefs and mental precedent of the design process before moving through the design formation. The mind of a designer in the incubation period is the helmsman of his mind which if accompanied by teacher's appropriate guidance, can complete the conscious part of designing process.

Illumination: This step is the apex of the designing process in which the designer considering the facilities and limitations of designing comes to an appropriate

conclusion in which all the existing realities and designing ideals have been considered. In other words in the designing process, the time when the designer finds a new solution to the questions in his mind can be called the moment of enlightenment provided that the solution is a abstract one. There are two completely different approaches on intuition. Some experts call it a voluntary step and some others call it involuntary step. Many designers like Housman (1936) consider their works as a result of an ambiguity intuition believe in involuntary nature of intuition and also there is another group in contrary who introduce intuition as a conscious act.

A complete understanding of this theory (consciousness of intuition) needs special attention which in often cases has been disregarded due to inappropriate judgments. This theory claims that humans are capable of being intuition in artistic procedures through some strategies. for instance had some rotten apples on his desk, was taking exercise before writing his notes and was just playing jazz loudly. These are all the strategies used by contemporary artists for making the ground for intuition in creating an art work. The strategies can be effective only when the previous stages are passed successfully [20].

Verification: "Verification" and review is the final step in creative design. Successful passage through intuition step is a must for creativity which is completed in "Verification" step. What have been prepared at previous stages are in fact raw materials which are completed based on the related science and technical knowledge in order to be able to answer the concerned questions in designing [20]. As an example, an architect may find an answer to a question in designing but if he doesn't examine it carefully he cannot make sure whether it's right or wrong. Many important and effective events in designing happen when the architect tries to put his ideas into practice. At the verification stage, modeling the designing idea is an effective step in connecting the objective work of art and an architect's mental procedures.

Objective Steps of Design Process: Attempts to understanding and promote creative thinking in design generally focus on a number of techniques and procedures. Rosenman and Gero (1994) [21] suggested four objective methods by which creative design might occur: combination, mutation, analogy and first principle (Fig. 3). Another creative design method with similar potential has since been added to the list: emergence, which is widely accepted, is a useful objective model of creative design [22].
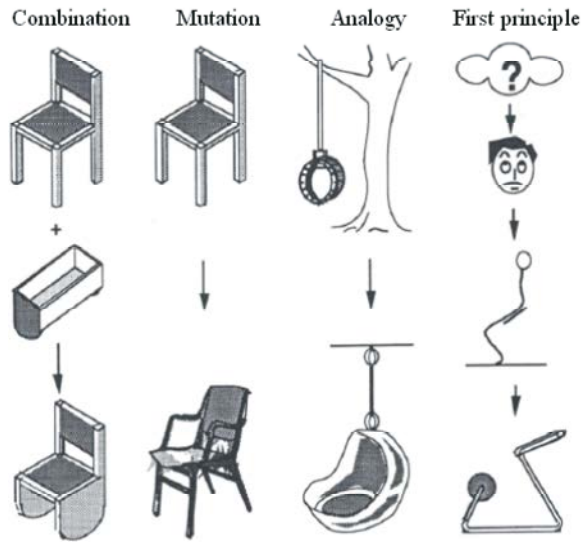
Fig. 3: Demonstration of the procedures of designing a chair (Rosenman and Gero)
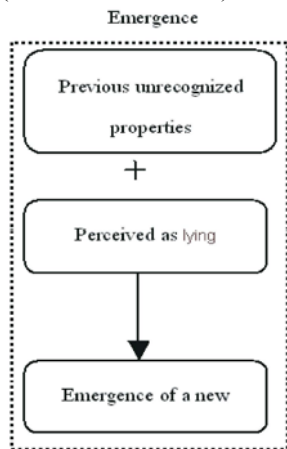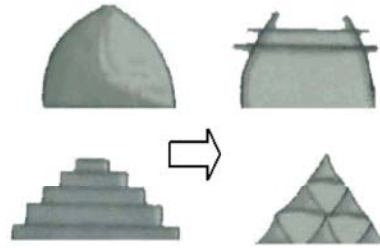

Fig. 4: Demonstration the procedure of designing "Emergence" (Authors)

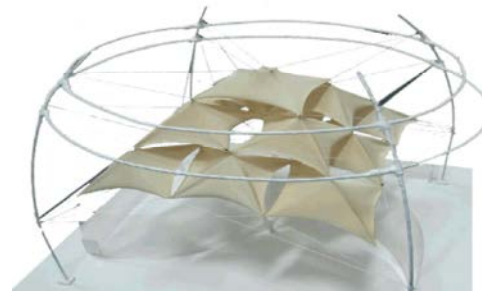Associating dome and ziggurat forms in construction

Fig. 5: Combining dome and ziggurat forms
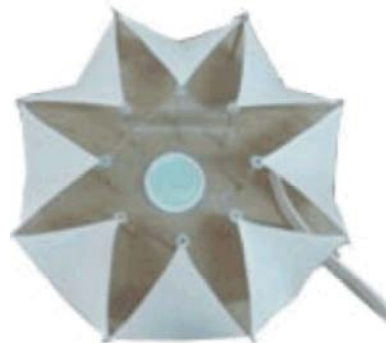

Fig. 6: Modelling combination of dome and ziggurat

Fig. 7: Mutation by using glass in the ceiling to create encloses form

Fig. 3 shows a practical exercise of designing a chair in Gero and Rosenman (1993) [21] studies which reflects objective steps of creativity.

Case Study of Objectivity in the Temporary Exhibition Design of Architecture

Combination: Creative design can be the result of a combination of existing designing features in a new construct. In the following examples the concepts like Ziggurat and Dome are used in combination in the designer's mind in order to associate the concept of Iranian architecture. The ceiling cover with Ziggurat and Dome is not a new product but their combination in the designer's mind can produce Iranian architecture exhibition as it can be seen in Fig. 5 and 6.

Mutation: Creative design as mutation involves modifying the form of some particular features, of an existing design. Mutation procedure involves recognizing the existing constructive features and modifying them afterwards. In this practice, mutation includes recognition of inefficiency of the last form of fabric cupola which is provided by the student's adding glass at the ceiling. This is an important step in the formation of ideas.

Analogy: Analogy is one of the activities of creative mind which can be followed by curiosity and speed in comprehension and transference. It is the process of seeing, hearing, tasting while looking for similar things simultaneously. This search is not a convergent movement in finding a unique answer but it is rather a
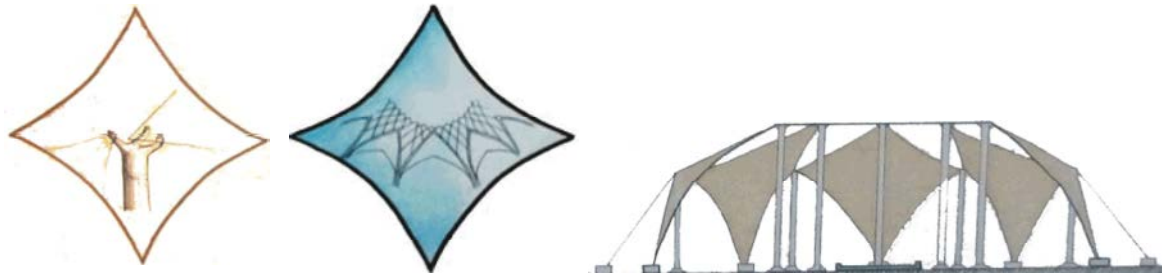
Adaption designation of Muqarnas   Connecting glass and cloth

Fig. 8: Using analogies through fingers in connecting glass and cloth
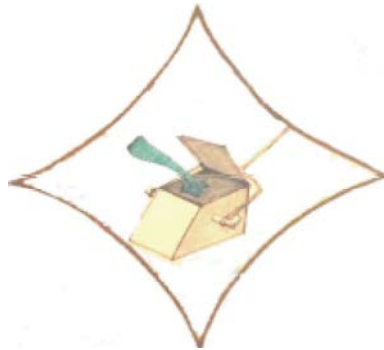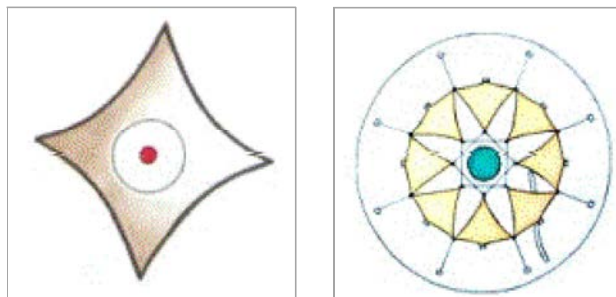

Fig. 9: Appearance of an organic form by human

Fig. 10: Emergence of reflection in water. student in Tehran University (2009)

Centralization and convergence

Fig. 11: Emergence of centralization through using a pool. Conceptual model

divergent procedure in which the curious mind looks for any similar thing anywhere in order to present them. Analogy only needs a stimulus to start this procedure [23]. The use of analogical thinking has long been regarded and suggested as the basis for creative design. In this practice the connection between glass and fabric is done with the help of the movements of the fingers.
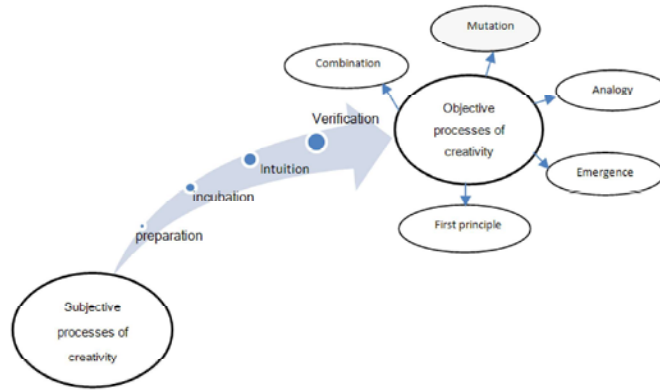
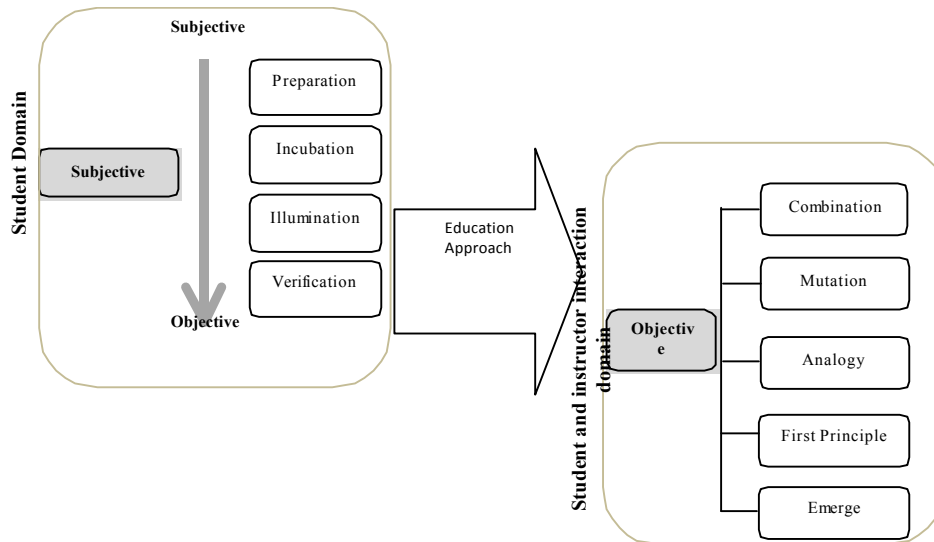Fig. 12: Subjective and objective models of creativity) Authors)

Fig. 13: Conceptual model of the creativity process (Authors)

First Principle: One of the features of creative mind is that by disregarding the side-effects, one can discover the essence part of a work of art and its construct and by deleting the superficial features one can appreciate its constructive concept. Designing the preliminary features is often considered as method of creating a good design. The difficulty of using "first principle" in designing procedure is that the designer should know which features exist in designing and how to use them. In this practice of designing, an organic form and pulling rope by human is used.

Emergence: Emergence is the process in which the previous and new features are tackled altogether [24], although "emergence" behavior and its use is only recognizable by the designer. In the following example the student uses the concept of water reflection in a new concept i.e. "making depth and repeating ceiling form".

(Fig. 12) Indicates subjective processes of creativity which includes "preparation", "incubation", "intuition" and "verification" that turn into objective at verification step and it can be used to lead us to objective steps i.e. "combination", "mutation", "analogy" and design from "first principle". These steps can be taught and observed.

In the following diagram the effective components of design process are shown.

CONCLUSION

The subjective steps of creativity process i.e. "insight", "preparation", "incubation", "intuition" and "verification" were discussed and it was suggested that these steps cannot be taught but in the objective steps of creativity process i.e. "combination", "mutation", "analogy", "first principle" and "emergence" in a form of an instructional and designing practice were studied.

The results indicate that in transference of the subjective into the objective, the students role is reduced, The role of instructor and student interaction is added. The result of the case study indicated that mutation in objective of design process enhanced student creativity and in subjective of design process as we move away from perception to verification of design process, the role of the conscious become more significant.

ACKNOWLEDGEMENT

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