# Understanding and fostering creativity through nature inspired structures project

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***Abstract*—Creativity is an amazing ability which is associated with human brain. Understanding creativity and how creativity could be utilized in creation is further explored in this review. Creative efforts and values of creativity can contribute largely in assessing creativity. Creativity can be identified as an extraordinary ability which has socio cultural, economic values. This study was conducted among 50 students of Interior Architecture degree program to understand how the nature inspired structural design project have been supportive in stimulating creativity of the design students. For this study qualitative methodology was adopted in collecting and analyzing data. The study is focused on investigating how students could foster their creative thinking ability through making nature inspired model making and prototypes and how the creativity levels could be differed from non-nature inspired theory based structural design project.**

***Keywords—creativity, nature inspirations, prototyping***

## I. INTRODUCTION

*What is creativity ?*

Many philosophers have defined creativity in multiple ways. It can be defined as a procedure which increases the sensitivity or the thoughtfulness to a specific problem or to a sequence or a lost connection in an area of knowledge. According to Boden creativity has been explained as a capability to produce fresh and unique ideas in the process of problem solving [1]. Creativity is an extraordinary ability of human that supports to reach fineness in everyday, regular process of imagination, thinking and implementation. Creative thinking is associated with the improvements of several other transmit atypical thoughts. further it supports in generating insightful judgments , innovations and most importantly understand the reality in an unique way [2]. Creativity is usually associating with the ability of problem solving and this process of problem solving involves with many brain functions and linked with thinking. Creativity can be seen in different forms and creative individuals are having the ability to link their thinking process related to the problems raised to find best and newer solution. According to Christians , creativity can be measured and the measuring tool could be complicated and vary upon the perception , personality, choices and experience of the juror or the observer [3]. However, creativity can be finding in most of the humans and, sometimes it needs stimulations to bring newer ideas, majority needs creative sparks, inspirations and precedents to come up with newer ideas, but some extra ordinary personalities usually produce brand new thoughts, products and innovations and it is often true there are various levels of creativity with in individuals.

As explained by Cohen , creativity involves in producing something new or rare but still suitable and appropriate to the problem that is valued and accepted [4]. Westmeyer has described the creativity as a process which is socially constructed and the ability of showing neuronal functions through the thinking process [5]. According to Cohen social construction is depends on the culture. Culture itself inclusive of traditions, customs, values, believes and more importantly political and economic conditions of the place

based on and technology available in a given group or an individual in a particular time and place [6]. As depicted by Schon creativity requires commitment to the socio-cultural system but it should not be too alien, harmful or dangerous to that context. Further he has explained individuals specialized abilities and cooperate endeavors related to creativity. [7]. Boden has explained creativity as a skill rooted in everyday capabilities such as combination and newer ideas , perception , analogical thinking and reflective self-criticism involves in creativity [8]. Leonara believes that adaptation can support on creativity. Adaptation means limiting the environment that suffocate the creative abilities [4] .Demirkan highlighted once in his research , creativity as a natural component of the design process which occurs between problem and solution [9].

Creativity involves in problem solving and finding better and newer answers for complicated problems which enriches creativity. For problem solving process, needed two types of information, which can be elaborated as internal information and external information. As explained by the many philosophers' creativity can be considered as the major component in the design process.

*Big "C" creativity and little "C" creativity*

Creativity appeared in two forms. Big "C" creativity and little "C" creativity deal with individual creative domains. Big "C" creativity refers to outstanding creative abilities which requires unique abilities, specialized knowledge, personal commitment, enthusiasm and planning validated and appreciated by groups of experts and largely recognized. (Demirkan & Hasirci, 2009b). According to Laura D. high creativity (Big C) is rather rear and it is highly dependent on contextual values such as socio cultural and economic impacts [11]. Little "C" deals with usual abilities relates to creativity which is showcased at individual levels. Further little "C" involves in solving daily matters, facing life challenges in newer ways. In some situations little "C" reveals with spontaneous creativity which doesn't need preparation and commitment [11].

Creativity is inherited in every human being and it may need creative sparks or stimulations to bring it forward and make it activated, but there are gifted personalities who were born with Big "C" [12]. Little "C" Creativity needs divine inspiration an continues motivation. However, classifying persons according to the creative levels rather challenging and it has been argued in many forums. Human mind is heavily associated with memories and links of past. Further it has a storage of recourses which could be utilize when needed and creativity can be identified as a solution-oriented brain process which deals with existing brain resources to find newer solutions. Being creative and to be labeled as creative is two different process. to be nominated as "creative" the particular person needs to have qualities related to big "C" of little "C". Creativity always associates with the power of brainstorming. The process involved in creative product is usually generated through a process which involves in many brain activities.

Creativity and giftedness is ofenly argued topics in various forums. Giftedness is dirrectly relates with outstanding ,interlectual acedemic abilities which could be reflective in with in an individual from childhood. [6]

Reativity cannot sustain alonewith out creative capasity. Creative capacity is the potenial for creativity. It is influenced by following factors.

Inteligence
Mental ability
Opertunities with in the environment
Personality and security

*Creative Thinking Process*

It is important to question how creativity has been established in the thinking proces and how it could be utilised. There are plenty of literture available

for creative thinking process and this thinking process is changing from field to field. Being creative in the field of medicine and being creative in the field of advertising focusses on totaly differernt approches. However all oriented in finding solutions for problems raised and therefore creativeity can be recgnised as an ability to solve problems in newer ways. Ryan believes creativity as an ability to respond in unique ways which is largely inheritant[13]. Moreover , creativity encompasses two types of thinking paterns .

- Divergent thinking
- Convergent thinking

Divergent thinking is an ability to manipute ideas in a flexible , confidednt , inventive and elobrative manner. Divergent thinking of a learner can make a tremendes impact on the ability to think divergently and reflect their process of imagination [14]. Embeded inheritant creativity will not be usefull any more if it cannot be despalyed or expalined. Reflections of creativity is usually visible and it can be observed through the patterns of creative behaviour. According to Schon reflections of creativity can be observed in two major ways with in the creative process [7].

- Reflection in Action
- Reflection on Action

Creativity does not sustain itself. It has essiential components to support cereativity. As depicted by Simonton [15] there are 3 major elements.

- Product contains creative ideas
- Person who conceived those ideas
- Process thoses persons used to do

To judge the novelty of a product , quantity of creative ideas utilize will be observed. Here , the value of the product will be esablished through the uniqeness and the novelty, but not differently counting by the number of ideas , but value and the significance of the creative idea will be appriciated.

## II. Research Methodology

This is a real-life experimental research conducted among university students who are in their first year first semester. For this study 50 students on Interior Architecture degree program has been selected and the participants were selected according to the convenient sampling method. To maintain the gender balance 25 girls and 25 boys were selected. Mean age of students was 21 years and there was no impact of the study for the non-selected students. To study students learning behavior, approvals has been taken from the respective authorities and the researcher has been conducted a participatory observation in understanding student's creative learning process[16].

Qualitative methodology was adopted in conducting this research. This is a 12 hours workshop conducted in two contexts. Initial nature inspiring process was conducted in a natural context and identifying and transferring inspirations into prototypes was conducted with in the design studio context. At the beginning, researcher demonstrate the task clearly at the classroom and then taken them outside the university where they could experience, observe and collect inspirations derived from nature. For this task the landscaped environment of the university was selected, and students spent first 3 hours at the site in searching inspirations. Students were assigned with a task of identifying unique patterns, structures of nature and as the initial step they have to record them in a way they could understand and express the inspiration. the identification and recording of the source of inspiration happened at the site visit and detailing the recording and transferring the inspiration into a design ideation to create new structures was happened during the studio hours allocated.

The final results of the students have been compared with the non-nature observed structure development project conducted with the previous batch students (n=50). And to understand how nature observation was supportive enough in stimulating creativity, researcher conducted interviews and observations while during the study.

*Data Collection*

Data collection was mainly done through semi structured interviews and observation notes made by the researcher. Students were interviewed during two stages; the first was at the end of the nature inspiration process and the second interview was conducted at the end of prototyping process. The interviews were recorded by the researcher and transcribed for the analysis. Field notes were taken by the researcher in three stages. Stage one is, during the selection of nature inspirations by the students and the second was during the recording process of the nature inspirations. The third was when students were transferring their inspirations into structural design ideations. The researcher has maintained a field diary and students' behavior and the tasks they engaged in were recorded hourly. Furthermore, photographs were taken during the intervals of one hour as a recording medium.

*Data Analysis*

Data analysis was done through six staged thematic analysis [16]. At the initial stage data gathered from the interview one has been sorted and for this, used affinity diagram. Following questions were asked in the interview one.

- Were the nature inspirations supportive in understanding structural patterns?
- How did you identify structural patterns?
- How did you record the nature inspirations?

These questions were asked to understand the observation behavior of the student and to understand their level of understanding on the task given.

The second stage interview was based on following questions.

- Was it easy to realize the structural patterns taught in theory after observing nature?
- How did you transfer the natural structural patterns into physical structures in built form?

## III. RESULTS

The final structure project was assessed by two academics under the following marking criteria.

Understanding structural patterns – 20%

Recording structural patterns – 20%

Transferring structural patterns in to new physical form – 60%

Those results were compared with the non-nature observed structures development project conducted with the previous batch. 22% of students were able to identify newer structural patterns of the nature. 37% of students combined existing structural patterns with new natural patterns and created new, unique patterns, 26% students have been directly transferred the natural patterns into structural patterns, and 15% of students generate new structural patterns by combining many natural patterns together in one.

65% of students have scored above 60% for the task given and 10% students have scored not more than 50% and 3% students scored 45% and 15% students have scored up to 70 and 7% students have scored up to 80% for the given task which was significant. Students 'perception upon learning has been measured by the questioner conducted. It generated 5 main themes as "inspirational", "deep understanding", "see through the hidden anatomy", "being sensitive to nature" and "new dimension in learning". All those themes are reflecting positive attitude upon nature observation and how it has been supportive in stimulating students' creativity in a form of activity.

When comparing these results with non-nature inspired structural design project students 56% of students have been scored up to 45% and 35% students scored up to 55% and 6% students scored up to 60% and 3% students scored up to 65%. it was significant that students who went through nature inspired structural design process have been come out with novel structural patterns than non-nature inspired structural design process.

The thematic analysis conducted among non-nature inspired structural group of students generated following themes; “difficulty to get new patterns”, “stuck in middle”, “no new patterns available”, “difference between drawing and creation”.

## IV. DISCUSSION

Creativity needs stimulants. When it comes to group of students divergent and convergent thinking levels will have varied each other. In the discipline of architectural learning, facilitators have to keep the creative motivation up and constant. The conventional architectural pedagogy will not be enough in catering this aspect. The studio and learning culture need to be restructured to get the maximum creative outcome of the students. This exercise done, by stepping out from the conventional design studio by giving students more opportunity to explore and understand which directly supports in fostering creative thinking abilities among them. Theory based education and student centric self-learning are two different extremes, however in architectural studies these two components have to keep in perfect balance in carving next generation designers. This study has shown that nature inspirations has broaden up the creative thinking ability of the students significantly higher than typical theory-based learning. This paper will be supportive in future studies on amending the architectural pedagogy according to the current learning needs of the students.

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