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Calibrated Design Thinking - between Randomness & Structured Approaches in Architectural Design Pedagogy

Eko Nursanty, Wawan Destiawan
University of 17 Agustus 1945 (UNTAG)
Semarang, Indonesia (Author)
Department of Architecture

Honorata Ratna Dwi Putranti
University of 17 Agustus 1945 (UNTAG)
Semarang, Indonesia (Author)
Department of Economical and Bussiness

Abstract:- Education has been the backbone of society for millennia. It improves, liberates, and strengthens society's character. Architectural pedagogy is complicated, and it necessitates bringing forth the learners' subjectivity of thought. A good pedagogy methodology will aid in the creation of a collaborative classroom environment and a friendly relationship between the educator and the student. This study explores the preferences of architectural design students in carrying out the process of design creation in various random and controlled alternatives or commonly called the black box and glass box way of thinking. With the help of digital-based applications and tools and enabling additional artificial intelligence implemented in creating a work both randomly and controlled. The research is qualitative methods. The population is several students who take part in the final assignment of the Architecture study program who have completed the final project and can summarize the stages of the creative process that have taken place. The results showed that random and random processes that alternate with systematic and controlled thought processes can have their own space and play a complementary role in design. Most students will explore randomness and be able to use it to produce an excellent design. Overall, students have a particular preference for more structured solutions. The study found that the spontaneous, unstructured ability of what is often called the Blackbox method is precisely what is needed and plays an important role in the design needed to solve problems in the field.

Keywords:- *Creative thinking, Randomness, Design and architecture.*

I. INTRODUCTION

In architectural design education, learning as an interactive process is critical. This study tries to elucidate the architectural design process, which has been described as accommodating, unique, collaborative, and convergent (Belmonte et al. 2014a) The point of the study is to analyze the effect of study style preferences on students in architectural study programs who are participating in the design process. It is well known that at various stages of the design process, there are statistically significant disparities in the performance outcomes of students with various learning styles. Also, it is well known that at the end of the design process, all students with various learning styles increased their performance ratings, with the growth of learners' assimilation taking precedence over students of the opposite type. The ability to integrate is another talent that helps students succeed in the design process (Dym et al. 2005).

Using *randomness* in design is often a consideration and has been analyzed by many researchers, usually done through case studies. Randomness or random thinking can help design students in the early stages of the process or can even be present in the result for visual satisfaction. (Verbeeck, 2006, p. 73). In the visual world, *randomness* refers to elements that do not seem to follow intentional patterns or sequences. An example that often emerges from a system of pure randomness is artists throwing paint on canvas for their artwork. Random in pedagogy architecture is a monograph about works of art that avoids or exceeds the normal physical attributes of our everyday environment, but also incorporates a lot of visual information that a particular group has understood (Belmonte et al. 2014b).

This paper is an empirical study of the design process in architecture study students in a more concrete where the purpose of research is to determine the extent to which students conduct random exploration in a design room or studio. They exploit randomness, prefer randomness to controlled results, and can gain "unique" designs through a process that is only partially random.

II. MATERIAL AND MEHOD

This research is qualitative research based on research questions on the relationship between creative thinking and pedagogy process of architectural study program. Factors that also affect it such as people, places, and cultures. Collecting data is carried out through interviews with students of the final project studio exam regarding the output of the design presented before the board of examiners.

The study was conducted on 28 architecture students in the city of Semarang. Data collection is done using two stages, namely filling a list of questions to get an overview of trends. The next data collection as interviews conducted in the guidance process for 2 (two) months and a logbook of guidance results before being declared eligible to conduct the final assignment exam as a condition of graduation of a Bachelor of Architecture.

In-depth interviews are also conducted during special guidance of students with guidance lecturers and with

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special course lecturers who have expertise in several fields that help strengthen the concept for the development of existing creativity. In general, this research method is carried out to achieve the research objectives depicted in the diagram process in figure 1 as follows:

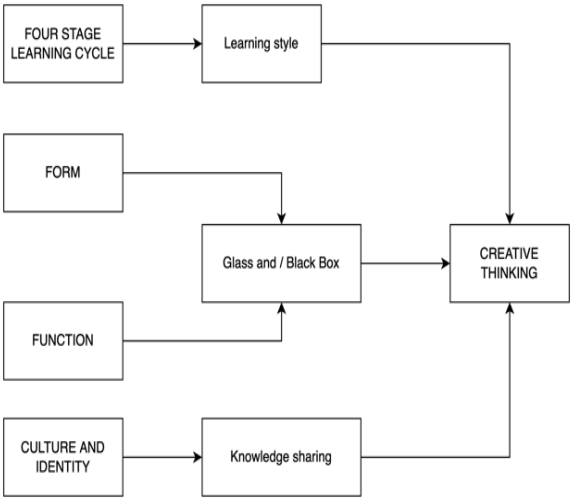

Fig.1: Literature Review Framework.
Author: Nursanty, 2022

Qualitative analysis is carried out using the concept of Butterfly Mamoli which clarifies the role and strength of a place for people who live in it through two ways of thinking the human brain, namely using the right brain as an emotional measuring tool and the left brain as a rational measuring tool (Nursanty and Susilowati 2021).

III. LITERATURE REVIEW

A. Pedagogy in Architecture

While waiting for their first break in insecure contract positions, many young graduates accept low-paying work outside the industry and are frequently exploited in architectural offices. So much more abilities are required today than ever before to acquire a less secure job (5). If we are serious about reforming architectural education, we must first look at the curriculum and institutional behaviors that help shape an architect's identity. (6). This research attempted to undertake deep understanding using an alternate approach guided by critical pedagogical theory, or education.

Critical pedagogy tries to explain how certain power dynamics and fights in the educational process are realistic. Students and teachers explore who shapes knowledge, for whom, and for what purpose. Curricular and institutional practices are instances of cultural politics that include not only the logic of legitimacy and dominance, but also the potential for transformation and empowerment. (5). The campus becomes a place of political articulation and contestation of the forms of knowledge, history, vision, and authority that will prevail as legitimate objects of learning and analysis. This formulation has major consequences for professional education. The humanist idea of subjectivity that supports professional claims to autonomy gives way in the theory of critical pedagogy in a person (Salama 1998).

B. Kolb's Theory of Learning Styles

David Kolb already publishes type style Learning at year 1984 Form development Inventory style Learning. Some big theory Kolb Associated with process Cognitive Internal student. Deep theory Experience, Learning Viewed as cycle four phase, that is: First and foremost, observation is focused on personal and concrete experience. Individuals also reflect on their experiences and develop a general theory of what this data implies (Kelly 1997). Students then create abstract concepts and generalizations based on their hypotheses within next step. Finally, students put these concepts toward the test in novel situations. The process then returns to the first stage of the experience process after this step. Kolb's learning style is built on two key dimensions, active and abstract, which are illustrated in figure 2 above.

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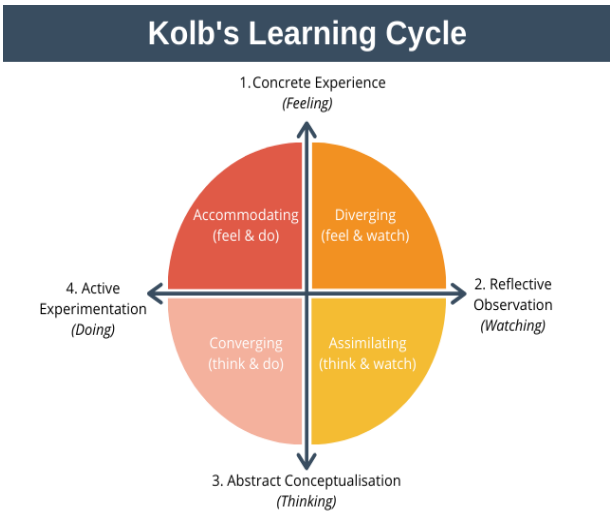

Fig. 2: Learning cycle by Kolb.
Author: edulog, 2021

C. Black and Glass box concepts

The constructivism approach to the educational process advocates learning by directly using real-world problems even though the problems are more complex. Thus, it is very important that the existence of means that allow learners to handle the complexity of problems and successfully solve and learn from this kind of problem becomes the principal goal today. In this paper, we describe the theory of learning by doing and suggest several ways that "doing spontaneously" can be supported without forgetting learning. We use black box and glass box metaphors to illustrate how thinking structures can support the learning and performance of a design process (Oxman 2008). The concept of black box thinking is a model process that facilitates student performance. The black box is how students perform a direct action on the expected goal without a predetermined structured process (Wanner, Herm, and Janiesch 2020). The Glass-box framework is a model that facilitates performance and learning. It is

important for students to understand what is in the structure that already exists in the glass box concept. In the end, the use of glass boxes and black boxes has been experienced by design students in the architecture study program (Hmelo and Guzdial 1996).

D. Passive Knowledge and Active Knowing Concepts In Architectural Design

'Concept' appears to be the essence of architectural design nowadays, according to every architect and most architecture students. This occurs when formal considerations take precedence over utilitarian factors in determining an architectural design. A building is valued for its concept, significance, underlying idea, and integration, which gives it added worth in comparison to everyday items. Despite the fact that concept generation appears to be critical to architectural competency, little research has been done to understand how and whether it is produced and maintained in architectural design education. (Heylighen, Bouwen, and Neuckermans 1999).

Despite the reality that it continues to experience significant obstacles, architecture education remains critical for social growth and development. Pedagogy's efficacy remains under question, despite changing periods in evolutionary and historical perspectives. In practice, how well do we prepare pupils for a very challenging future? It takes the ability to rethink and reinvent teaching and learning connections in this environment to adapt to today's vital realities. (Charalambous and Christou 2016). Exploring a teaching system that combines active student participation through practice-based learning in design studios, through use of new methodologies and tools, and the development of knowledge across disciplinary boundaries takes time and effort. These activities have been shown to enable students to recognize real-life opportunities to which they can respond optimistically, alternatively, and creatively in the hopes of improving their prospects of establishing a future career path (McPeek 2009).

IV. RESULT AND DISCUSSION

Most design issues have some intervening constraints at the analysis stage. Some designers can reduce possible errors in the design process by developing rules of thumb that ease the cognitive burden that arises from such design problems. (15). Creative thinking skills have become the center of attention of educators in the 21st century who demand student activity and participation. Creative thinking is essential to being empowered and is a high-level thinking skill that can be done simultaneously in the learning process. (Zubaidah et al., 2017). Creative thinking attracts attention not only to education experts but also to society at large. Creativity can be linked to a transformational focus on a problem. (Craft, 2003; Lee et al., 2019).

Since their beginnings in the 19th century, design studios have been at the heart of architectural design education. Although studio instruction is still based on traditional design process models in most cases, the "search for form" has been superseded by the development of new types of research aimed at reinventing architectural education and practice in studio design since the Middle Ages (Luck 2019). The foundation of these transformations is based on well-known transitions originating in industrial contexts and linear thinking, which hierarchically directs them into a post-industrial period consisting of high interconnected types of information and complex systems thinking.

Advances in disciplines, specializations, materials science and systems, and digital data-driven technology have resulted in significant alterations in the environment in which architectural design and production are normally situated. Such progress has prepared the way for the development of a cross-disciplinary attitude of collaboration and communication as a practice (15).

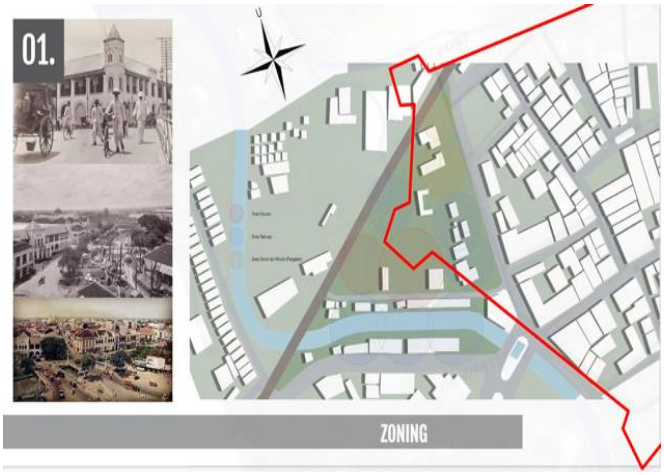

Fig.3: Planning on the riverside park area uses the imagination of the heritage atmosphere in the past. Author: Nuryanto, 2021

With such, through Studio design exist an opportunity for student to test ability they at problem life real or condition scenario. Student moment this must Drive not only to Develop Thought design them, but to Develop taste bear answer towards Others and milieu. They also must Drive to Develop Skills Management and Collaborative to handle all variable and stakeholders' Interests that different deep process Design them. Unfortunately, deep many cases, education architecture is still Structured to produce 'genius solitary' than collaborator moment this. (17). At Essentially, Openness structure Studio design get in effective Accommodate experience life Contemporary that increasingly Divided, complex, and different through a series dialogue Learning that different. That Needed be Involves The teacher Qualified tall and Motivated to Run.

The student with the final task titled Riverside Tourism Area located in the heritage area describes the creative process carried out using the process where he imagined a unique atmosphere in the 17th-18th century where this environment played an important role for the business life of traders both locally, regionally, nationally, and internationally, as seen in figure 3 above.

According to Lamdhy Agus Nuryanto, the emerging form is a merger between past community activities and

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culture that occurs in using outdoor space for the city community (Nuryanto 2022). This process is known as the process for synthesis and metaphorical in architecture. Architectural synthesis is an important stage of the design process conceptually. In the constant evolution of complex systems, architects often find it difficult to conduct a thorough search of all architectural solutions worthy of a set of requirements to perform a complete depiction in creating an idea of form (Hartmann et al. 2018) The creation of the form here refers to the overall form of a form of building configuration. The main shape and outdoor space are the key elements of architecture. This reciprocal relationship is very important, considering the purpose of architectural design to provide a sheltered space for humans from now on. Synthesis in design is translating research data into actionable knowledge and is an important part of design method. The goal of this process is to find relationships between unique pieces of data to uncover meaning in the behavior observed during the research phase. (Kolko 2010).

Metaphor can be defined as a comparison between two different and unrelated things. In architecture, buildings not only play with visual images of shapes but play with hidden meanings in them (Allahmoradi 2018). Another student who designed the Youth Arena Building clearly revealed clearly the creative process in creating shapes through basic shape changes that were changed according to the wind movement required for sports activities both players and spectators (Prihanto 2022) . See figure 4 above.

Process this Known as attempt to use to create design creative through priority function room and activity user in it. Shape follow design It is a design principle related to architecture and industrial design of the late 19th and early 20th centuries. Concept this: It states that the shape of a building or object must primarily relate to its intended function or purpose. 'Form follows function' is the principle that proposes the purpose of a building should be the starting point for its design rather than its aesthetics. (23).

Fig. 4: The creative process of creating a form of Youth Center. Author: Prihanto, 2022.

Figure 5 Under describes process creative between second case Above, where process main Culture Identity and cycle of learning become food Lecture that always Integrated deep sum process creative at student assignment end.

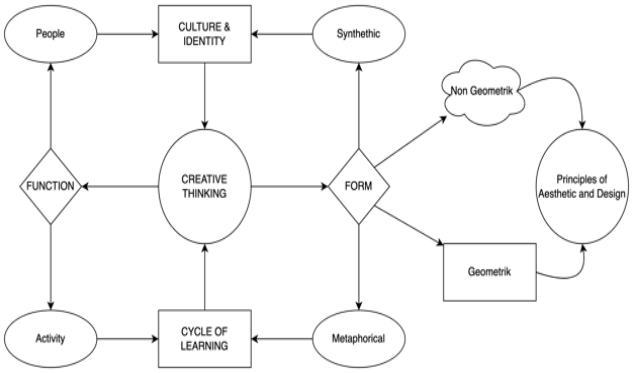

Fig. 5: Creative Processes and Indicators That Occur in Relation to Practice Conditions.
Author: Nursanty, 2022

Figure 6 below describes the results of answers from 124 respondents of architecture study program students who are preparing for final assignments and have completed architectural studio design courses semesters 1 to 6. The catalyst revealed is as follows: (i) Creative thinking has indicators as problem-solving skills; Finding a problem; Come up with ideas; Reading data; Emotional skills and intelligence (Envick and Mullen 2020). (ii) Learning Style has indicators as kinesthetic abilities; Visual; Read/write; Aural/Audio (25); (iii) Knowledge sharing has indicators as knowledge sharing; willingness to share knowledge; knowledge sharing Behavior (26); (iv) Culture and identity have indicators as Cultural Understanding; Cultural Identity; Cultural Planting (Hatch and Schultz 2002).

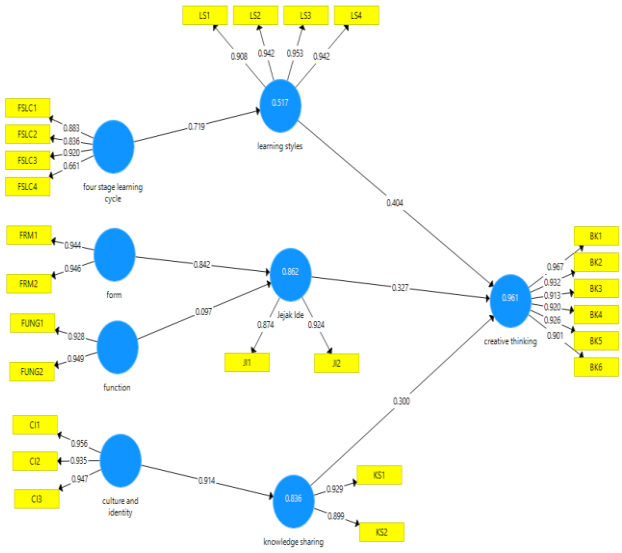

Fig. 6: Diagram of the results of the Creative Thinking Indicator test.
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The results of the indicator test conducted through the ollection of questionnaire data illustrate all variables are valid and interconnected except in indicators that refer to the fourth learning cycle i.e., the process of generalization of FSCL4 code is considered invalid, figure 6 above. Using the interview process, it was later found that in the fourth stage when presented by a group of reviewers is often perceived differently.

Since its beginnings in the nineteenth century, architectural design studios have unquestionably been at the heart of architectural design education. Efforts to "seek form" have been superseded by the development of new forms aimed at redefining architectural education and practice in studio design in general settings, even though studio teaching has still been based on classic design process models. This shift is based on a well-understood transition from the industrial to the post-industrial era, as well as a closely linked form of knowledge and complex systems thinking. Advances in disciplines, specialties, materials and systems science, and digital data calculation have resulted in significant shifts in the context in which architectural design and production are usually situated. Such advancements have paved the way for the development of a collaborative and communicative cross-disciplinary attitude.

Through the results of interviews with the presentation and documentation of the final exam, found 9 (Nine) elements that use the basis of Butterfly Mamoli theory analysis. Butterfly mamoli theory is a person's way of deciding using the left and right brain that is integrated between memories of the past, present and hope in the future (Nursanty and Susilowati 2021).

Result analysis that Done finds that student do Creative thinking process use alternative synthetic with join Various ideas and condition become shape new and do metaphorical Form Existed imagination that Expected. While process think that use Ratio appear moment student consider function building by necessity human that use room together Activities, like that Imaged Figure 7 below.

In this approach, a design studio allows students to put their skills to the test on a challenge or in a real-life situation. Students nowadays should be encouraged to develop not only their creative thinking skills, but also a "feeling of responsibility" for others and the environment. Architecture students have been immersed in culture identification and the Cycle of Learning since the beginning of the lecture, and it has formed the foundation of their thinking from beginning to end in all they undertake.

V. CONCLUSION

The hope of bringing innovation into the world of education depends on the identification efforts that can be made in the syllabus's improvement and whether students will take a more proactive and pro-active role in their curriculum's learning process Education is critical in training students to redefine their roles in a professional setting. It is essential to improve one's relationship with a specific field of work.

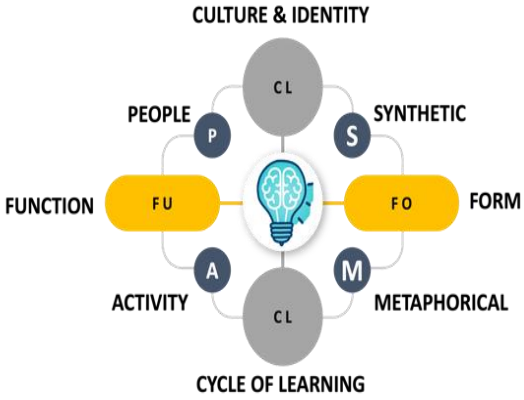

Fig. 7: Model of Creative Thinking Formation in studio final project students of architecture department.
Author: Nursanty, 2022

Although the dominance of spontaneous ways of thinking creatively that is commonly done by architecture students using Blackbox methods is often done dominantly, but in the end, students still experience a cycle of learning that is commonly used and becomes a structured process that can be tolerated. Blackbox thinking is the ability of students off the field and determines their success in responding to new things that have never been learned before. Designs formed through the Blackbox way of thinking are done spontaneously by recognizing several things and combined into a big idea. Creative thinking using glass box methods is done by architecture students when striving for the ultimate result as efficiency. Efficiency is an effort to accommodate space users and their activities in an integrated space both in quantity of space and the quality of space organization.

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