Model Making as a Cognitive Tool for the Beginners

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Introduction

Moulding and training the design thinking and thought process of the early design students are some of the challenges faced by the instructors in the first year of architectural design program in many architectural schools. One of the first important skills that they need to acquire is the ability to perceive or conjure up 3-dimensional images, from the derivatives of the manipulation of a 2-dimensional objects or drawings. In other words, the fledging designer visual thinking is trained to arrive at a 3-dimensional image from their 2 dimensional designs or sketches. The best way to do this is through the use of conceptual model, study models or preliminary models and finally arriving at the final model/design. The writing presents the analysis and evaluation of model-making application in the new architectural student design thinking and the use of models as cognitive tools. Model-making, one of the designing tools, is used extensively by the beginners in the first year of the architectural program in the Faculty of Design and Architecture, University Putra Malaysia (Figure 1).
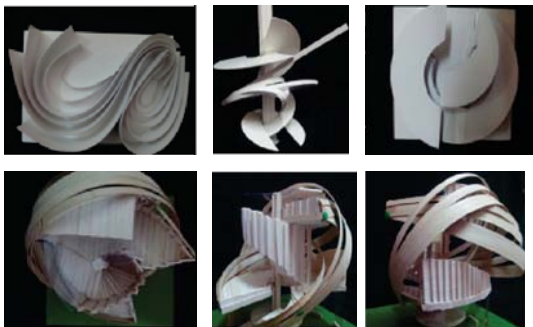

Figure 1: The conceptual models development to the final idea (by Nur Afiqah)

Different types of models and considerations in model-making

There is a certain purpose for models to be created. The purpose might vary to suit its relevance. For the architectural learning environment, the main reasons for model-making are for the purpose of evaluation, description, prediction, exploration and cognition purposes (Dunn, 2007). Besides establishing the clear purpose of constructing a model, it is also important to be clear of the information that needs to be communicated to the designer or viewer. Massing model, usually a monochrome, shows the overall form and layout of the design and how it sits in its context and it gives viewers an instant general understanding of the project. A site contextual model on the other hand, shows a big area/site context and able to help viewers to understand scales from it. Detail model is a partial model of a particularly interesting area or part of the building such as an entryway feature or a decorative detailing. A sectional model slices through buildings to show the internal spatial organization and its volumetric quality. Conceptual model shows the initial idea in its conceptual stage, on where the ideas are derived or developed from. Study models are the various models showing the stages and improvements of design ideas and Final model is the complete model showing the final design solution in its finest (craftsmanship). Students need to think of the scale of the models, and the available time, materials, cost and facilities before embarking on the model-making process as these have an impact on the completion and quality of their models.

Methodology and process

The students completed three stages for this model-making exercise. First, they were asked to create conceptual models of their initial ideas. After these models were presented and feedback from lecturers was received, students then proceeded to the next stage of the design development. Several more study models were developed until they reached to their final design (Figure 2).

The paper describes the feedback received from students based on a short focus group discussion consisting of fifteen first year architectural students. The students were asked to describe how the model-making helped them in their design process as well as the advantages and limitations of model-making in the process. They were also requested to express their views on the differences between manual model-making and computer visuals (model-making/3D). Below are the excerpts of the conversations from the young designers.

"It's helps us identifying and solving our design problems such as form, proportion, form and plan integration. However, the use of computer images (3D) can save time and money and can save storage space. Real model is better if they don't know how to do it manually, I think it's not easy to do it by computer"-Khilmie

"...it helps me to develop the form of a building in relation to spaces orientation and requirement. Both computer 3D and manual are equally important. At the beginning I must use manual-way, because I can learn

how the design or elements are merged and combined " -Firdaus

"....it is better to use the real model so I can clearly see how my final idea would look like and it is easier to make changes". - Syaza

Figure 2: The study models showing development of ideas (by Ahmad Amirul)

Models as design thinking and design cognition tools

Models are representation of reality, where representation is the expression of certain relevant characteristics of the observed reality (Echenique, 1970, p.25). According to Echenique (1970), model is a representation tool of noted importance, for communicating information and it is considered as essential within many disciplines. Several iteration processes happen during the developmental design stages (Figure 3).

Figure 3: The design development of studio tower depicted in models (by Ayu Amira)

Cognitive studies in design reveal how designers design, what kind of knowledge they have, how they approach their problems and what kind of thinking the design requires. The thought and cognitive processes are

recorded and reflected in the progressive creations of their designs, shown through various study models being made.

"...Models help me to improve my design before the final submission" - Amelakuraina
"...we can figure out how our building 3D or perspective will look like" - Syakir
"...it helps us to understand the principle and form that we are going to use...elaborate our thinking during the conceptual stagesbefore we get to the final one" - Ezri
"by making different models with different arrangements/positions, we can explore more on new forms. Models also help me to determine the openings and locations of shading devices".- Shon

There are differences between model-making in practice as compared to the application of model-making in the learning environment. In practice, there is an interruption of "self-communication" in the process as the models in the conceptual design phases are created by interns or novice architects, not by the architect (Burry et al., 2007). However, models used as designing tools by students help them in understanding architecture, improving their design learning process and developing their skills in design communication (Figure 4). According to Schon & Wiggins (1992), students who develop their own models for their projects will get in a conversation with their models. That process is called a reflective conversation with the situation.

"....By making study model, we can see if any further changes in the arrangement of forms or spaces are needed thus we can decide if

the design principle that we use is suitable. The changes can be seen clearer in model instead of just in sketches. I think physical model is necessary to begin the whole idea for the design and can help me visualise the whole form. The computer 3D can help us explore further"- Ikmal

Models can help the creative process of visualizing 3D spaces. Also, by functioning to help understanding complex visual relationships, a model typically outperforms drawings (Dunn, 2007). The information contained within a model is denser since models present the relationship between different parts and different properties (i.e. size, form, materials, color, and texture) of the design simultaneously without any verbal aid (Dunn, 2007).

"...models help us understand the emotions in our design' he reflective information shown in the study model can hardly be gained by pure imaginations'...they help solving the space arrangements with the best proportion and scale"-J. Chiew

The students progressively use different models to express and communicate their thought processes. Exploring alternative solutions, formulating new hypotheses, and using the models as tools to communicate to one-self, are some of the functional benefits of model-makings.

"...in realizing our design ideas, sometimes our imagination or sketch is not enough. We need a 3-dimensional medium that can help us learn how to build it, tell us which one is right and wrong, how it looks like in 3D, how

to solve the problem, how it's constructed, and how to replace and improve the design according to our conceptual ideas and design principles." - Geo

Changes or improvement on their ideas are best represented through model-makings; such as the alterations of scale, dimensions and complexity as well as experimentations with colours and textures. Complex reality or ideas are made more comprehensible, workable and operational by manipulating or transforming the study models. According to Cannaerts (2009), in design, models deal with the new and non-existing, thus, it can be used as the basis for conceptualizing, communicating, assessing, and realizing design intentions.

"...It gives us an idea on how to develop our design from time to time and we can play with the form until we get to the final design. We should maintain our design concept in every study model, so if there are any changes in the space or the form, we need to solve it by referring to all the study models and then we analyse whether the applied principle of design is still applicable". - Izzat

"...It's like a prototype or experimental device to test my design ideas". - Rasyid

Figure 4: The different stages of design ideas communication (by Mohd Firdaus)

Conclusion

The study contributes to the understanding of model-making in the early stages of design process particularly in the architectural learning environment. Within this context, the departing idea is to inquire the role of physical model-making and the uses of the physical models in the conceptual design process. The processes involved in the model-making reflect the lengthy discussion that the students have within themselves, allowing them to explore, experiment, analyse and evaluate their design ideas in more in-depth. Through observation, it is evident that the design solutions by some higher year architecture students in UPM have lack of detail and can be considered shallow in their thinking process. Hence, it is recommended highly recommended that the practice of using models as a designs and cognitive tool to be continued and made compulsory to students in higher years. In fact, the practice of using model-making in the design and cognitive process should be rigorously emphasized through-out the design education development and journey.

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