Two Perspectives—One Outcome: Explorations in Parametric Praxis

Thelma Lazo Flores
Ball State University Muncie, Indiana

About the Project: Aims and Objectives

Technology has forged an innovative connection between mathematical theorems, craft, design and digital fabrication manifesting a dramatic influence in our creative thinking and *praxis*. This 21st century phenomenon of integrating technology in creative development gave birth to parametric strategies in design. The study will present the collaborative outcomes between a faculty (mentor) and an undergraduate junior design student (mentee). The collaboration was also designed with the intention of applying and evaluating several methodologies that include a creative inquiry, process-based approach, pedagogical application, and philosophical investigation on art-design/craft-digital axiology. In design context, axiology refers to the value judgments in aesthetics.

There are four major goals initiated in this project: (1) Assess the creative exploration within the contextual intersections of craft, design and technology through a process-based strategy. (2) Evaluate the use of multiple process-based approaches while experimenting and articulating design elements and principles within parametric design manipulations in representational models and scaled prototypes. The processes are limited to: think and make process; form development with reference to *Gestalt* principles of psychology, mathematical theorems and *biomimetic*. In Gestalt, the whole is different from the sum of the parts (Bowers 35) while *biomimetic* refers to the study of structure and function in biological systems for design(Benyus 2); form and structure development with reference to analog and digital representation; material practice; adaptive design process; and evaluative process and feedback-loops. (3) Review pedagogical formats and various methods that can be applied to enhance the creative and analytical activities in a typical studio setting. (4) Examine philosophical concepts such as the review of divergent and convergent factors derived from manifold dichotomies manifested in analog and digital, the novice and expert, the soft and hard materials, the drawing and assembly, the print and product form, and so forth to establish other parameters for process-based strategies.

Procedure: Techniques and Materials

The duration given for the project was twenty weeks spread over two semesters. Ten hours of each week were devoted to a holistic integration of meetings, creative dialogues, prototype making, and project reviews. Both mentor and mentee scheduled a weekly meeting of two separate days with one hour each to discuss and review the design exploration, process and results. The evidence-based design approach was laden with continuous analysis and synthesis that covered six cyclical stages for each product

outcome: visual and literature research to establish design inspiration, concept and contextual development, material properties and scale determination, schematic sketches and digitally measured drawings, craft-based prototypes and digital fabrication; and the review and recording of challenges and opportunities.

Analytical Description

The results generated from this creative research using an evidence-based analysis are:

*Creative Exploration***:** In multiple discussions, both mentor and mentee have identified various benefits that this creative research experience could bring to the latter. Testing the strategies will enhance the mentee's critical thinking skills in form development and in the complex application of design principles; expand methodological approaches in the design and build process; and allow the exploration of several experimental ideas without the stress of a summative assessment.

Process-based Approach: The specific strategies outlined below established points that validated previous explorations such as:

(1) Think and Make Process: The combined visual processes have proven the notion that two minds are better than one. Several schematic drawings that were produced do not normally equate to good quality bearing functional design contexts. On one hand, a solid concept usually stems from several raw ideas co-developed by both mentor and mentee, blurring the ownership of the final form.

Images 1-3: (L to R) Random Patterning and Material Gestalt Study

(2) Form Development with reference to *Gestalt* principles of psychology, mathematical theorems and biomimetic: The exploration of the subject pushed the mentee's creative potentials to challenging dimensions. The mentee found it challenging to creatively think within the terms of mathematical theorems, but made success with Gestalt principles and *biomimetic* (see images 1, 2 and 3).

(3)Form and Structure Development: With reference to analog and digital representations, the study does not support the premise that ideas in paper always lead to

exponentially successful forms. Some designs appeared to be feasible in paper but failed in the actual digital fabrication due to the rigidity of materials, multiple overlays in digital drawing and the standard settings of the laser cutting machine. Image 4 shows an initially laser-cut chipboard prior to bending.

(4)Material Practice: Digital fabrication does not necessarily minimize the production time particularly with complex designs due to varying material properties like the thickness of boards and size limitations (refer to images 5 and 6).

Image 4: Chipboard Bending Study; Images 5 and 6: Leaf and Bird Detail Study

(5) Adaptive Design Process: The informed use of dimensions and tolerable allowances for cut-sheet analyses gave new insights in understanding sustainability issues in manufacturing (see images 7 and 8). The flaws and shortcomings in the digital drawings were made evident in the fabrication process which proved to be useful practice-based notes in saving time, money and effort when prototyping.

Images 7 and 8: Abstracted Mimetic Study

(6) Evaluative Process and Feedback Loops: Oftentimes, the mentee and mentor have diametrically opposed ideas which eventually led to alternative creative form developments.

Pedagogical Review

The plethora of observations made from the study presented the mentor with several pedagogical constructs suitable to interior design students. The use of *biomimetic* and the *Gestalt* principles can be easily applied as effective strategies in enhancing creative thinking in the course Design Fundamentals for freshmen. The use of feedback loop helped mentor to validate the significance of summative and formative assessments in guiding students towards content and context based-learning. The study also re-affirmed that technology associated with creative planning, digital printing and parametric manipulation can develop a deeper understanding of interior design principles. Students can easily convert a digital design plot into a fabricated form, and allow them to review the three-dimensional prototype for strengths and shortcomings. The results will aid them in making intelligent design decisions on material selection and basic construction details.

Philosophical Inquiry

The observations made on several dichotomies included the following: (1) There are significant distinctions in the quality of aesthetics resulting from analog and digital explorations; (2) The complexity in form design demands accurate mensuration and longer time duration in prototype- making; (3) The novice and expert must always work with an open-mind for a successful two-way collaboration; (4) There is higher percentage of correlation that the material determines the design form; and lastly (5) The drawing and assembly should inform each other prior to digital fabrication. Both the print and product formats need follow-through on errors to establish an effective process-based strategy.

Contemporary Relevance

There are manifold merits that we can generate from this project exploration. One, the established methodologies can be implemented by other design instructors in their courses and generate multiple learning outcomes that significantly shape creative thinking, design and build thought process, and new initiatives in material practice. Two, instructors can also adapt the pedagogical value of work progress - evaluative assessments and recording of feedback loops for team and group projects. Three, the integration of activities in making models or prototypes, demonstrating the use of technological design, and understanding how objects and systems work improve the students' design process and fundamental prototyping skills.

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Image Numbers: (Image Index Provided)

1 Random Patterning

2 Random Patterning

3 Material Gestalt Study

4 Chipboard Bending Study

5 Leaf Detail Study

6 Bird Detail Study

7 Abstracted Mimesis Study

8 Abstracted Mimesis Study

Thelma Lazo Flores, PhD is Assistant Professor in Interior Design, Department of Family and Consumer Sciences, College of Applied Sciences and Technology, Ball State University Muncie, Indiana.