Introduction: T-shape learning model for students in design

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• Key words: Design Methods, Design Process, Design Thinking, Self-directed learning, Systemic Design.

1. Abstract

Background: The purpose of this study is to introduce a practical teaching methodology, the "T-shape learning model," and seeks a reasonable basis to supplement self-directed learning in design. The T-shape-learning model is an advanced design learning model, which was developed for practicing design processes with various design methods and case studies.

Methods: The model includes two steps: A Holistic-linear process and a Cross-emphasis process. 1. The Holistic linear process is an understanding phase of the design process where students seek to understand the design process with given well-organized design methods, including descriptions at the initial stage. 2. The Cross-emphasis process allows students to start a variety of exercises with different design methods to discover a solution that fits. Both steps were implemented in two classes, and two survey studies were conducted during and at the end of the project.

Results: Three vital factors – the importance of real-time interaction, application, and complexity, which are essential for learning various types of design – were extracted from the study. Interaction implies learning different perspectives and ideas from others, application refers to creative attempts, and complexity indicates needing new notions. This T-shape learning model offers practical and professional perspectives for gaining confidence in any type of design project.

Conclusion: The outcome revealed the advantages of applying the T-shape learning model with adoption of the Mural online platform due to pandemic. The model provided well-structured processes and virtual class instruction. The model also delivered comprehensive, effective, intuitive, interactive, and positive new learning models to students in design.

Keywords: Design Process, Design Methods, Systemic Design, Design Thinking, Self-directed learning

2. Introduction

New generations are approaching multicultural backgrounds and the latest technologies, adapting to a variety of unique cultures with ways of gaming, social media, and applications that adults have not experienced in the past. Due to their different experiences, most students have different levels of design skills and technical skills, along with varying expectations of learning in design. Thus, the new generation's situations, behaviors, and rapid cultural changes make it difficult for faculties to seek effective teaching solutions, and studio classes in design have presented many new challenges for faculties. For designers and complex systems, evidence-based and problem-based education should be added in a traditional design discipline (Norman, 2014); therefore, the research team started seeking the ways from evidence-based process learning. The T-shape learning model presents a new teaching method to establish evidence-based-design process learning with various types of problem-based empirical case studies. The goal of the "T-shape learning model" is to introduce a systemic design through the model to complement self-directed learning, introducing a structure for how to collaborate methods for efficient learning from lower-level to upper-level students in design. If we have process-based learning methods, which can be adapted to any design study, it might be easier for faculties when implementing studio-based classes. Most students can follow a well-developed process without confusion.

3. Focus and objectives

The research study started with investigating the challenges of education in design. The first question of the research team was if there are teaching programs that include in-depth design learning. Students often encounter many different subjects for different disciplines, so they are challenged figuring out an appropriate learning method to meet each instructor's expectations. The different sequences and steps in various types of design made it harder for students to start learning design. Most beginning students' questions are centered on how to start ideation and begin the process, and determine what is the expected outcome, as each instructor has a similar but different learning method. Despite their questions, it seems that students prefer to know the entire process flow instead of recognizing how they need to start a project and meet their instructor's expected outcome. Students would benefit having a map to help them anticipate each step. Therefore, this study begins and emphasizes teaching different types of design methods with the design process that fits with each kind of design. Design students are spending much time figuring out and understanding the working process in each class and might not become aware of effective design methods. The objectives of the T-shape learning model are focused on teaching the basic principles and structure of the design process along with notifying design students how many design methods exist, and how to apply and utilize design methods in their work. The advantage of learning design methods is that the methods can be combined to create a new method productively with

many design methods. The research team is expecting that the T-shape learning model can be adapted to most design studies.

4. Complementing self-directed learning

Self-directed learning (SDL) is a process utilized extensively in adult education. Many educators adapt self-directed learning (SDL) as an appropriate learning method for college students, as it has a similar process to the human psychological maturing process whereby students are using a self-directing process themselves in their independent lives (Knowles, 1975). In the stage of dynamic design changes with too many new technologies, most design students who start their major experience difficulties in their preparation period because they are faced with many mandatory software programs requiring various competencies in a variety of skills desired for their careers. The T-shaped learning model (Figure 1) complements the problem of starting self-directed learning of students that require them to take too many subjects and technical capacity in a given short period by proposing a Holistic linear process, the first step in the model. The Holistic linear process is intended to help lower-level students in design understand the process through well-instructed steps such as a design process, research methods, sequences, and tools. This process helps students comprehend the design process quickly without confusion and difficulties, moving to the next direction.

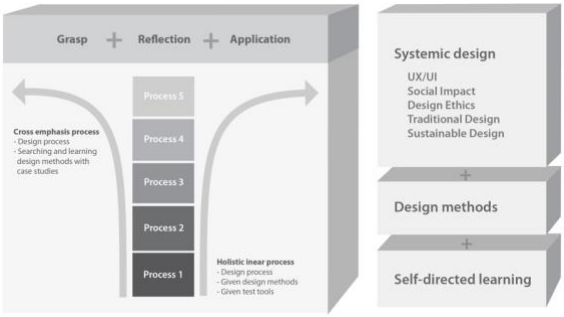

Figure 1. Visualization of the T-shape learning model

5. Emerging dynamic level studies

Systemic design is the umbrella term incorporating systems thinking and human-centered design to understand the broad aspects of design with more in-depth perspectives through various topics in diverse contexts (Nousala et al., 2012). The T-shape learning model adopts five categories to teach a systemic design with a different issue of design areas: ethics, UX/UI, social impact, traditional design, and sustainable design. In terms of dynamic variety contents, the Cross-emphasis process (Step 2 of the T-shape learning model) is able for students to encounter various problems in diverse circumstances. The Cross-emphasis process is for upper-level students in design who completed the Holistic-linear process. After learning the Holistic- linear process, students practice expanding parallel knowledge with the second step Cross emphasis process that is an advanced boosting process in which they can face various experiences with diverse problems. Through the second process, students can discover appropriate methods and tools for several given case studies to experiment types of design in a short period. It complements self-directed learning in which upper-level students can start self-directed learning by themselves without problems.

6. A spectrum of target fields

The T-shape learning model suggests utilizing five target fields of study in graphic design. It can be different in other design fields. In order to experience most Graphic design fields before starting their career, the following specific five target areas of recent design trends are recommended for graphic design students to enable them to practice various design areas during the academic years.

• **UX/UI design:** UX/UI design is a well-known emerging technology-driven area of design. It is an inclusive, interactive, collaborative, coordinative, logical, and interdisciplinary design area for target audiences. Students need to learn how to deal with the iterative workflow collaborating with their team members. The T-shape learning model is an excellent fit for UX/UI design.

• **Social impact:** Social impact is a broad area where designers can contribute to the community. It is contributable, collaborative, feasible, interactive, changeable, needed, and cohesive with the community. Students should focus on desirability, viability, and feasibility within the community for long-term adaptation of design more.

• **Design ethics:** Design ethics is a discipline of action that implies designers should be responsible. Designers should be accountable for creative work distributed within communities and society. It is ethical, considerate, variety, understandable, reasonable, desirable, for works to be contributable to communities and society.

• **Traditional design:** Traditional design such as typography, editorial, identity, and packaging and are essential to graphic design as students should learn most of the fundamental design rules and principles throughout the study of traditional design. It is theoretical, expectable, closeable, compelling, understandable, and intuitive.

• **Sustainable design:** Sustainable design is a design process that integrates a friendly, environmentally, and reusable natural resources in design work. It is integrative, eco-friendly, recyclable, functional, renewable, durable, and cost-effective.

7. Research methodology

The research methodology combined two processes with design process (any relevant process with 5 steps that fits in the project): Holistic-linear process (empirical-based design) and Cross-emphasis process (evidence-based design). In the

Holistic-linear process, students start figuring out what the design process is. Since students are inexperienced in the field of graphic design, understanding the Holistic design process of the project provides them with a broad spectrum of their possibilities for the next step. To engage students to focus only on learning the process, the research team provided the structured design methods which students can follow through each step. Cross-emphasis includes not only each work process but also several design methods that students can use to complete each step. In this step, the most important consideration is that students have an empirical study with the given design methods interacting with team members and participants who were hired for the project. For example, in the Ideate process, there are given design methods: Benchmark, Mood board, Card sorting, and information architecture that are provided with the description of each design method. Without losing time to consider what to do next, students in a group complete each activity and think more about the given project. After completing the five steps, they are ready to move to the next process, the Cross-emphasis process.

The Cross-emphasis process suggests three given case studies for students who can practice with design methods with three phases (Figure 2). In the Cross-emphasis process, students start with the first case study (Grasp) and meet with many different kinds of design methods. It is a "Grasp" phase, which allows students to learn design methods themselves and make a specific plan for the chosen case study

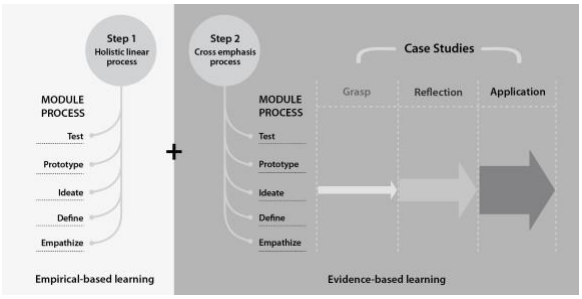

Figure 2. Visualization of the methodology

Although they won't go further with the preferred methods, their strategy should be very detailed as a preparation of the step. Group members are going to make a plan only to learn how to use the design methods. For example, if they chose a survey method, they should list the questions that they would ask the participants or target audiences. Students are familiar with the design process due to their learning in the Holistic-linear process, so they begin to apply as many design methods as possible to each step. Each step has selected design methods to enable students to practice whether the methods are fit with given situations and solutions. However, students should choose the best few methods for each step to provide a more detailed plan. Students will practice and learn what each method is and learn how to apply it to their case study, gathering knowledge of each method from books or online articles so that they can practice in the world of design methodology.

When students start the second case study, they will focus more on the specific planning of each method. They are now sure or confident at most design methods and are aware of how to play. This stage is the "Reflection" phase. The students are familiar with the new process of the "Cross learning process," and they start to develop a specific plan for each design method in each step. After completing the second phase, students realize that there are many similar functioning methods they can combine and work together.

In the third phase, "Application," the students start applying and blending the design methods to make new flexible design methods themselves for better group activities and research results. The research team expects that through these three phases, students will be confident in any type of design fields.

8. Primary research setting

Among the suggested five design target fields, UX/UI design classes were chosen, and each step of the T-shape learning model was installed in two classes, where one of the projects has a UX/UI design-related project. The first process (Holistic-linear process) was adapted to the class of ARTD 217 Graphic design for non-majors, where most students did not have experience using a UX/UI design. A total of 18 students from various departments who were interested in learning Graphic design, participated in the project. Previously, students had two projects where they could learn essential graphic tools, fundamental theories, and typography (Table 1).

Table 1. Class setting for the Holistic linear process

Target field	UX / UI design				
Class	ARTD 217 (Graphic design for non-majors)				
Enrollment	Advertising	6	Freshman	1	Total 18
	Industrial design	6			
	Photography	2	Junior	1 1	
	Communication	1			
	Natural Resources & Environ. Sci.	1	Senior	6	
	Painting	1			
	Statistics	1			
Given project	Application design for 20's well-being				
Duration	5 weeks				

The second process (Cross-emphasis process) was installed for the class of ARTD 418 Advanced interaction design, where most students already had experience in UX/UI design-related projects at the previous class of ARTD 317 Interaction design or from other classes. All students were graphic design students who indicated they were willing to learn more advanced UX/UI design. They had a similar experience in

dealing with the Design Thinking process, but most of the class had utilized the same depth of methods, and few had further experiences on design methods (Table 2).

Table 2. Class setting for the Cross emphasis process

Target field	UX / UI design		
Class	ARTD 418 (Advanced interaction design)		
Enrollment	Sophomore	1	Total 19
	Junior	14	
	Senior	4	
Duration	5 weeks		
Case Study			
1. Grasp (2.5 weeks)	The Krannert museum: (https://kam.illinois.edu)		
2. Reflection (2.5 weeks)	Urbana-Champaign Independent Media Center: (https://www.ucimc.org)		

8-1. Step 1: Holistic linear process

At the beginning of the T-shape learning model, students started the empirical study with the learning design process. Each Design process included design methods, and the project had a given topic with target audiences. It was comprised of a group-based project in which the groups were generated randomly. The Mural online program in which students can complete their group work online at the same time was offered due to the pandemic situation in March 2020 (Figure 3). All design methods were provided on the Mural boards, and students needed to complete all the given design methods for each design process.

Figure 3. Mural board – Holistic linear process

8-2. Step 2: Cross emphasis process

The students, who had experience in the Design Thinking process, participated in the Cross-emphasis process. It was a group-based project and randomly generate groups, which have four students in a group. Because of time limitations, only two case studies were installed among three case studies in the Cross-emphasis process. The Mural online program, in which students can complete their group work online at the same time, was offered due to the pandemic situation in March 2020 (Figure 4).

Figure 4. Mural board – Cross emphasis process

9. Results and findings

Three key factors can be extracted from the study: interaction, application, and complexity. Team Interaction enabled students to learn different perspectives and ideas from others. The application of design methods enabled students with experience beyond comfort to create their own concept of design methods through complex and diverse case studies. This T-shape learning model offers broad professional perspectives increasing self-reliance through any type of design project.

9-1. Mid survey

A mid survey was conducted during the project when students had completed nearly half of the process. The methods were explained at the beginning of the project, and students followed the instructions for each step. When the mid survey was conducted, the students in ARTD 217 in Holistic-linear process had completed step 3, and the students in ARTD 418 in the Cross-emphasis process had completed the case study 1.

ARTD 217: Holistic linear process

As the Holistic linear process was intuitive, and apparently letting students know what design process is, made it easy for beginners to follow. Using a given design method saved a lot of time for processing each step, allowing students to focus more on each design method and each process. Among 18 students, 15 participated in the mid-survey. Eighty percent of the participants had experience in the Design Thinking process, whereas 60% did not have any UX design experience (Table 3; Figure 5 & 6). Although it was an online activity, the participation rate was acceptable, and students indicated they had managed the steps accordingly.

Table 3 Mid survey participants: Holistic linear process

Class	ARTD 217 (UX/UI design for non-majors)		
Survey Participants	Freshman	1	Total 15
	Sophomore	3	
	Junior	10	
	Senior	1	
Gender	Female	10	
	Male	5	

Most of the problems, beginners experienced, were related to confusion and challenges regarding how to start the process. Not many classes deal with various types of design methods, and existing design methods are a seamless solution to overcome challenges. The essential part when choosing the design methods in each process is to find mixed matched design methods to complement the lack of functionality of each design method. When students experience a well-developed process, they can start their second step more diversified. Furthermore, the easy start of the process with their team members implied they were interested in their group project.

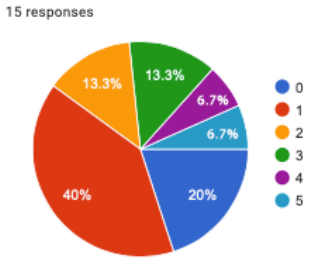

Figure 5. Experience in Design thinking related classes

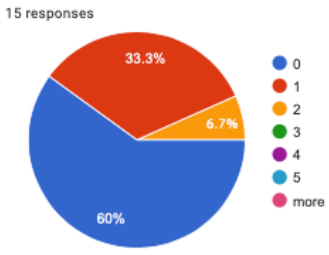

Figure 6. Experience in UX/UI design related classes

It should also be noted that the real-time Mural board activity assisted individuals to interact with each other as well as enabling me, as their instructor, to manage their activity in real-time as well. The two questions (Figure 7) revealed they were not positive regarding their improvement at the end of the project which related to the question of efficiency of the given process of the project.

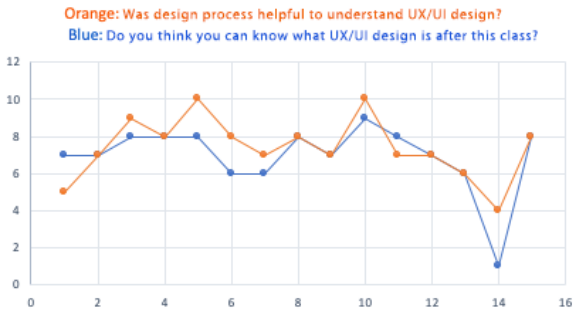

Figure 7. Experience gained from the Mural board activity

ARTD 418: Cross emphasis process

The Cross-emphasis process included three phases: Grasp, Reflection, and Application. However, due to the time confliction, only two phases with two case studies were implemented for the Cross-emphasis process. Among 19 students, 17 participated in the mid survey after completing the case study 1 (Table 4).

Table 4. Mid survey participants: Cross emphasis process

Class	ARTD 418 (Advanced interaction design)		
Survey Participants	Sophomore	1	Total 17
	Junior	12	
	Senior	4	
Gender	Female	14	
	Male	3	

Most of the students had expected the same structure of their previous UX/UI design classes. However, all students had at least one previous experience in the Design Thinking process and UX/UI design, and 80% of students had two more times of the experiences, so the new learning method emphasis process was introduced with a new structure on the Mural board online (Figure 8 & 9).

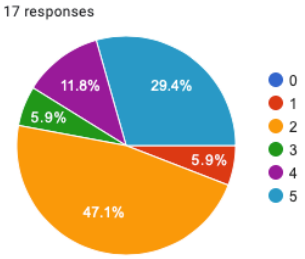

Figure 8. Experience in Design thinking related classes

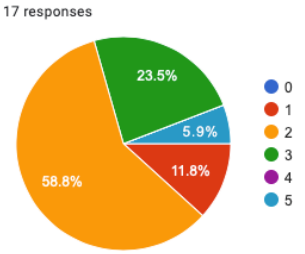

Figure 9. Experience in UX/UI design related classes

The students were requested to find most of the design methods fitting into the given process of the case study, including descriptions of each method and planning on how to apply them. It was not an easy process for students who did not have any experience in planning a UX design. After completing case study 1, students were not satisfied with the results but started realizing that they could experience better results in case study 2 (Figure 10). This is the reason it is called the Grasp phase, in which students figure out how they can complete the process.

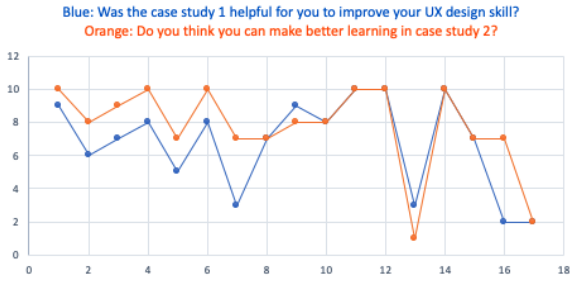

Figure 10. Experience of activity on the Mural board

9-2. Final survey

The final survey was conducted after the project ended. The same number of students participated in the final survey: ARTD 217 (15) and ARTD 418 (17).

ARTD 217: Holistic linear process

The students in the Holistic linear process did not think all the processes were easy but largely perceived there were no problems. They also indicated the given processes were enough to lead them from step to step (Figure 11).

Figure 11. Experience of activity on the Mural board

One outcome I learned from my observation was that the schedule for each design process should be adjusted to provide enough time in each process. Due to well-structured design methods, at the beginning, students perceived they had too much time for processes 1 and 2. Moreover, it would be better to provide more design methods for their research in the processes 1 and 2.

ARTD 418: Cross emphasis process

Students completed a phase 2 Reflection and, as planned, those in phase 2 were more satisfied with their results in case study 2 as they could focus more on finding suitable design methods instead of learning each design method. They started to understand how they reflected the plan of each design method and were ready to mix match the design methods to create their own design methods. If they did case study 3, it was highly likely they would be able to create their own methods with better outcomes. They were very positive with case study 2 and confident of their results (Figure 12).

Figure 12. Experience of activity on the Mural board

10. Conclusion

The findings of the study revealed the advantages of applying the T-shape learning model with adoption of the Mural online platform due to pandemic. The results indicated the T-shaped learning model delivered comprehensive, effective, intuitive, interactive, and positive new learning models to students in design. The most thought-provoking part was that students looked forward to a step-to-step approach without trouble or tension.

11. Future Study

Future study might consider an additional adaptation of one more process at the end of the Cross-emphasis process as the students need more practice in a free-formed setup. The additional process for practice might be named "Practical Adaption." Research on T-shape learning theory with further Activity theory from HCI would provide a different perspective in design education.

References

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers* (2nd ed.). Beverly, MA: Quarto Publishing Group, Inc.

Martin, B., Hanington, B., (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions* (1st ed.). Beverly, MA: Rockport Publishing.

Norman, D. A. (2014). *Why DesignX? Designers and complex systems*. Retrieved August 2019, from https://www.core77.com/posts/27986/why-designx-designers-and-complex-systems-27986

Nunez-Pacheco, C., Straker, K., & Loke, L. (2018). *Design, think. Make, break, repeat: A handbook of methods*. Amsterdam, The Netherlands: Bis Publishing.

Tomitsch, M., Wrigley, C., Borthwick, M., Ahmadpour, N., Frawley, J., Kocaballi, B., Nousala, S., Ing, D., & Jones, P. (2012). *Systemic Design , Education and the Design Research Agenda, 5*(1).

Visocky, J., & O'Grady, K. (2017). *A designer's research manual* (2nd ed.). Beverly, MA: Quarto Publishing Group, Inc.