

The Strategic Role of Industrial Design in Collaborative Educational Settings: Design Boot Camps for Engineering and Technology

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Introduction

In 1998, the industrial design program at Brigham Young University left the College of Fine Arts and Communications and moved to the then newly formed School of Technology in the College of Engineering. The assumption was that the ID program would be able to transfer itself from the old environment (Fine Arts College) to the new one (School of Technology) with relatively few changes.

One of the major reasons for the move was to strengthen existing collaborative relationships, and find new opportunities for growth in a culture that shared the idea of strong industry connection and involvement. A relationship with the College of Engineering existed prior to the move with the participation of ID students in the interdisciplinary capstone program—a combined effort between industrial design, mechanical engineering, and manufacturing. After moving to the College of Engineering and Technology, rather than strengthening and expanding opportunities for collaboration, the reverse actually happened as the ID program adjusted to the new culture.

In the College of Fine Arts, there were subtle cultural influences that produced an expectation of expression and exploration in the ID students. After the move to the College of Engineering the foundational influences were more focused on methods of delivery and outcomes.

This was to be expected. The arts, whose role it is to *stimulate the senses and mind through emotions and/or ideas*, place strong emphasis on the idea of concept and content—occasionally at the expense of execution. Technology disciplines have emerged from the need to implement scientific concepts that allow human society to control and adapt its environment. They have focused on execution and implementation, often at the expense of content and concept.

The initial seed of curiosity about the need to do things differently had been planted through discussions around innovation and creativity in trade publications, engineering and business conferences, and the media sources such as the *Nightline* “Deep Dive” program.

Showcased in the February 2008 issue of *Fast Company* magazine was a story of the outsourcing of daily, tactical office tasks by pharmaceutical giant Pfizer, in order to free up employees for higher-level strategic tasks. Stories such as this have helped clarify that for over a century the United States has built an infrastructure based on the tactical aspects of implementation. This is the *how* of the “How are we going to do this?” mentality. But now much of the world has figured out the how and they are willing to accept all of the how that we are willing to outsource. All aspects of product development to shift to a more strategic approach and focus on the *what* we should be making, and the *why* we should be making it. This is the content and concept of modern art, within the continuum of which industrial design falls. The effects of our rapidly changing culture on individual disciplines (identified by Daniel Pink as Asia, Automation, and Affluence) are now being acknowledged by engineering and technology programs.

They have had to ask themselves “What does it mean to be strategic?”

While serving on a committee to encourage cross-disciplinary use of labs and space within the school, industrial design faculty participated in arranging visits to several campuses known for their collaborative efforts including the Stanford design school (with a piggy-backed visit to IDEO). The idea of design thinking was introduced, and began to emerge as the central philosophy behind the interdisciplinary and collaborative use of space within the School of Technology.

The ID program found itself in a position to impact the College of Engineering/School of Technology as a whole and introduce potential, cultural change in the form of design thinking classes, boot camps, and workshops to help in the shift towards strategic thinking. The first boot camp was scheduled for March 2008. It included faculty and students from programs such as Manufacturing Technology, Information Technology, Construction Management, and Technology and Engineering Education.

Boot Camp Goals

After discussion, the ID faculty set the following goals for the boot camp:

1. Present the idea that there is a shift in the goal of work for all School of Technology graduates from tactical execution to strategic implementation (hence the need for design thinking).
2. Present an inclusive definition of design thinking that would work as a model for problem finding (strategic) vs. problem solving (tactical) in the various disciplines in the school.
3. Provide experiences/projects that would reinforce this definition/model that would be fun and engaging for all participating disciplines (and not just be ID-centric).
4. Attempt to show that this could be conducted using resources on campus and point to a sustainable, long-term plan of implementation.

Boot Camp Structure

The structure of the initial design thinking boot camp was a two-day experience, blending students and faculty from the six different programs in the School of Technology.

There were two students and one faculty member from each program, making 18 participants in all. The students were split into two multidisciplinary groups of six students each, while the faculty members were put in their own group. We wanted to give the students a chance to work independent of the faculty, and not be influenced by any figures of authority. We also wanted to have a sense of competition between groups. This was a chance for the students to outshine their mentors.

Day One: Friday, 8 am to 5 pm

Introduction: The Need for Change

Definition of Design Thinking

User Centered Exercise 1 – Empathy: Persona Mining (Seeing and Creating Meaning)

Personal Filter Exercise – Being aware that you have a personal point of view

Gorilla Video – “Who Saw the Gorilla?”

Project 1 – Redesign of a cafeteria tray

Stage 1 – Inspiration: Look, Do, and Ask

Stage 2 – Synthesize and Present/Share Observations

Stage 3 – Ideation and Prototyping (Idea Generation Techniques)

Stage 4 – Group Presentations

Day 1 Wrap-up summary and evaluation

Day Two: The Following Thursday, 9 am to 4 pm

Previous Session Summary Experience

Summary Exercise: Personal Object Redesign

Empathy through storytelling, synthesis through metaphor, ideation through sketching, refinement through prototyping, validation through presentation

Project 1 – Improvement of Library Experience for Chair-Bound Students (Emphasis on Service)

Stage 1 – Forced Empathy (Wheel Chair/Power Chair Tasks)

Stage 2 – Synthesis and Observation Summary (During Lunch)

Stage 3 – Ideation and Prototyping for multiple Points of View

Stage 4 – Idea Presentation

Day 2 Summary and full course evaluation

Definition of Design Thinking

Information is processed in primarily verbal, visual, or visceral modes: Think, Look, and Do. The preferred mode of how problems are solved in a typically how-centric culture has been a think-first priority.

Think-first (or verbal approach) works well when the issues are clear, the data is reliable, the context is structured, thoughts can be pinned down, and discipline can be applied. An example would be an established production process.

Look-first (the visual approach) works well when many elements have to be combined into creative solutions, commitment to those solutions is key, and communication across boundaries is essential. An example of this would be the new product development process.

Doing-first (the visceral approach) works well when the situation is novel and confusing, and complicated specifications would get in the way and a few simple relationship rules could help move people forward.

With the more complex, strategic problems facing our culture, the think-first approach needs to be augmented with look and do.

Using a hybrid model culled from several sources including IDSA National Conference presentations, site visits including the Stanford design school and IDEO, publications from the Rotman School of Business, and other sources on creative problem solving (see References) we defined design thinking as being a method that is user centered, has a tradition of prototyping (including visualization), and a trust in the process.

That process that one should trust in was further defined as follows: 1. Seeking inspiration for problem finding through the activities of look, do, and ask; 2. Broad divergent ideation; 3. Implementation in the form of prototyping; and 4. Public presentation using the activities of show, tell, and act.

Boot Camp Participant Expectations

The participants were not told much about the workshop in advance of the event. No agenda was published, and no prework assigned. This was done in order to minimize assumptions and stop them from trying to “presolve” problems before hand.

However, at the start of the workshop, while people were getting to know one another, participants were asked to write down a few expectations that they hoped to accomplish through the workshop:

The expectations fell into three categories: 1. Knowledge: Participants wanted to gain a better understanding of design thinking; 2. Application: Participants wanted to know how to apply design thinking in their field of knowledge; and 3. Social involvement: Participants wanted to have fun and make friends.

Some comments that were representative of the whole included the following:

Creatively implement the ideas and tasks with individuals across multiple disciplines, work together in a team setting to make decisions, and have fun.

I hope to better understand the process of design thinking. As in ...when thinking about design for anything, where do I begin, how do I give my ideas shape, and how can I expand on my ideas.

What I want to take from this experience:

- Learn about design principles. A lot of the classes I take are postdesign, so it will be nice to start from scratch with a project.
- Learn from other people in the school
- Have fun.

Post Boot Camp Critique

At the end of the two-day sessions, two different evaluations happened. One was a debriefing session held by the instructors amongst themselves, and one was a survey collected from the participants.

The instructor self-critique can be summarized with the following:

1. Teach more specific “techniques” on data synthesis, idea generation, and judgment. Because of lack of specific instruction, the ideas tended to be superficial, not “rich, novel, or intriguing.”
2. Engage in more “useful play.” Watch the balance between play and entertainment.
3. Work for better group dynamics. Have more getting-to-know-you activities within groups, and increase cross-group connections. The boot camp was weak on the social side.
4. Break the tasks into smaller pieces. Groups had a hard time pushing through larger tasks such as summarize and present your research in the next hour.

In the participant evaluation, the results were in the majority positive, with most respondents answering positively to questions such as:

Was the time you spent in the boot camp worth it in terms of new knowledge or increased educational experience?

Do you believe a two-day experience like this would be helpful for every student in your program?

The participants rated the presenters as “engaging”; however, they were occasionally “unclear” and some participants would have liked the boot camp to have had more structure, including taking the projects beyond a prototype, and working it out to a working solution.

In terms of length (2 days, 8 hours/day), the split was 60/40 between “Too Long” and “Just about Right.”

In evaluating the knowledge component of the boot camp, when asked “How would you define or explain Design Thinking to your parents or friends?” participants responded:

...we learned to look at everyday problems from unusual angles and to explore solutions beyond the traditional solutions.

It is a way of developing ideas starting at the root rather than the problem [as stated].

Design thinking is thinking up a consumer, making specifics about the life (likes/dislikes), and figuring out a way to make their life/experience better.

Design thinking is a family of processes for understanding problems on an ethnographic human-centered level—leading to innovative solution concepts.

It helps to think about things from the user to the problem rather than from the problem to the user. So often, the problem has already been defined for us, but a major key is finding the problem, not just the solution.

Boot Camp Improvement: Participant Suggestions

The question was asked “Do you have any additional comments or suggestions to make that will help us critically analyze the value of the boot camp and help us improve it?” The following is a representation of the responses:

You had us divide into groups so that we could all participate, which was good. I think it would be even more effective if we would have been encouraged a little by competition. There were times when we were supposed to be coming up with multiple ideas but it was hard to get motivated because the only thing we were going to do with them was present. If you had rewards for the group with the most ideas and the best ideas then we would have been more inclined to get involved and try harder. You could also bring in someone who matters ...to judge the different

ideas to decide which ones would be the recipients of the rewards. Simply put, I feel competition between groups would have helped to make the whole process more engaging.

One faculty member participant had this to add as a participant:

I see a few key issues:

Diversity: Both within and beyond School of Technology, teams should be diverse. This should remain an important concept while planning/executing boot camps.

Integrating the boot camp experience into the technical specialties of the majors: i.e., after the boot camp, how are the concepts taken up by other classes? ... A corollary of this is how to tie a design thinking approach into the technical design approach that [technology] students use ... to create complex, working, high-fidelity prototypes. [Design thinking] applies strongly to the vision end of the “vision–structure–detail” model of technology design.

Scalability: There remain several concerns:

Freshness: Need to generate problems that are interesting and fresh – so that the instructors don’t get bored either! Also so that we do not overtax BYU resources (200 students following cafeteria trays each year would rapidly pall)

Prototyping supplies: How to have what we need; how to allow for creative “messiness” while keeping the lab under control for the next group; how to pay for them.

Staff support: This will require significant time commitment from several people.

One bottleneck of note was the time it took in getting the research/documentation/photos out and available for all of the teams to see and build off of. A computer and photo printer were available to each team, but printing took up a lot of valuable time and helped contribute to the feeling that “...we were just wasting time sometimes.”

Conclusion

In the opinion of the instructors, it is felt that the first cross-disciplinary design thinking boot camp was a success. There is room for improvement, but this effort has set the stage for a plan to run boot camps for all students in the School of Technology before graduation. Hurdles to overcome include staffing, funding, fresh content, and changes in the curricula of participating programs in order for them to take advantage of the new knowledge and approach gained by student participants.

One significant roadblock is the perception that industrial design is asserting undue influence over the School of Technology. Instead of using the term “design thinking,” new efforts will be called innovation boot camps, and be held in the Innovation Lab.

In today’s world, the problems for us to solve are no longer straightforward or even defined or discovered. For us, the answer to the question “What does it mean to be strategic?” means the ability to find and define problems in a broad context, and understand their impact and meaning in terms of “What” and “Why” over “How.” This comes from the arts emphasis on concept and content.

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