The Education DesignShop: A Case Study on Education Reform Through Design Thinking

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Abstract The innovation curve has become saturated; the low-hanging fruit has been exhausted by traditional problem-solving approaches. Any advancement in the education sector from here forward requires a new thinking paradigm: design thinking. This paper documents the process of infusing design thinking into the minds of the education system's greatest problem-solvers: policymakers, engineers/designers, educators, and students of high school, undergraduate, and graduate schools. Using the formation of the Education DesignShop as a case study, we analyze the benefits and points of contention when using a design thinking approach, typical of tangible product designs, in a large-scale application, the systemic reform of education.

Keywords Design thinking • Innovation • Social entrepreneurship • System

1 An Introduction to Design Thinking

Design thinking first appeared in Herbert A. Simon's 1969 book *The Sciences of the Artificial*. Since then, more than four decades of scholars have attempted to define "design thinking" in terms that make most sense to their contextual application (product design, architecture, healthcare, etc.). While most problems in the education system are solved from a research-based, crisis management-based, or linear, milestone-based approach, our design-based approach promises to yield more unique, creative, and effective solutions for the education system.

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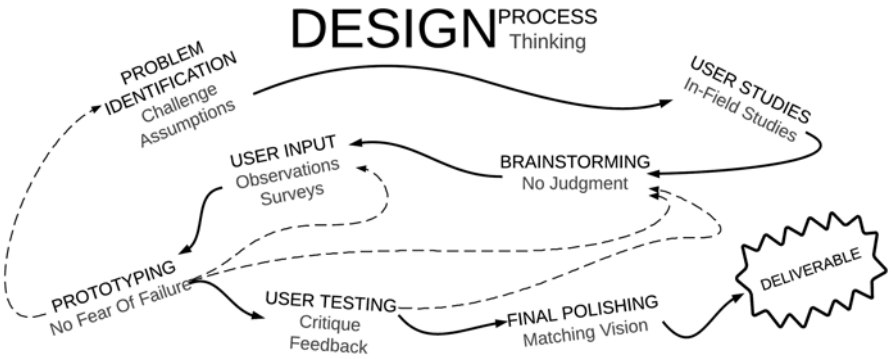

Fig. 1 A roadmap of design process steps (*black*) and their inherent elements of design thinking (*gray*), beginning with problem identification

Often called the twenty-first-century skills, design thinking offers problem-solvers a new departure from traditional standstills in problem-solving. The problem identification and brainstorming stages of problem-solving underline the starkest differences between what is achieved in previous approaches and what is achieved in design thinking practices. Non-designers tend to the dynamic of judgmental interference wherein they cut ideas short of their creative potential and do not give it the chance to grow, develop, or even transform into something that might be a suitable, if not great, solution.

This judgmental interference is unnecessary and ill-suited at the brainstorming stage as it truncates ideas while it is too early to know whether or not they could have become a viable possibility. This truncation can come from endless predispositions that are inherent to the brainstormer's psyche. Among these, the brainstormer can suffer from too much attention to pre-constructed limits (boundary conditions, assumed lack of access or zone of influence, lists of requirements) and/or from pathologically imposed constraints (complacency with the status quo, inherent resistance to change, unyielding preferences, fear of failure, judgment, and unexpected consequences, lacking the impetus for change).

A design thinking mentality, then, is exactly the antithesis of judgment interference. Elements common to brainstorming under a positive design thinking mentality include a vision-based set of goals, an experience-based specification sheet (as opposed to a constraint-based specification sheet), comfort with being risk averse, no judgment zones, and the perspiration of not giving up. Figure 1 describes other elements of design thinking seen through the steps of the design process.

It is important to note that many teams may go through the steps of the design process and still not practice design thinking. Design thinking is more than just a series of prescribed motions; it is an inherent re-wiring of thought that requires complete mental reform from the obstructions we have created in our brains in order to see pathways we would have otherwise not discovered. This paper documents and analyzes recent attempts at fixing the education system through the different mental influence of design thinking.

2 Design Thinking for the Education System

At the product level, the Education Designathon in Spring 2013 [1] demonstrated that there was space for creativity and innovation in educational tools if certain education challenges were approached with a design thinking framework. Examples of these tangible products included, among others, DynamicTable, a rotating high top table that connects to a computer's monitor such that restless kids would have to walk around the table clockwise to scroll the page up and counterclockwise to scroll the page down, as well as the Little Book of Circuits, a children's book with integrated circuits that allow for a parent and child reading pair to interact and learn directly from the book.

While design-based approaches are common in tangible engineering and design products like DynamicTable and the Little Book of Circuits, they are only now beginning to prove themselves in their application to systemic challenges, like education. This next step is imminent. The challenge of using design thinking in education rests in that policymakers—currently the bigger power holders, or stakeholders, in the education space—are trained otherwise. As IDEO explains, "the natural tendency of most organizations is to restrict choices in favor of the obvious and the incremental. Although this tendency may be more efficient in the short run, it tends to make an organization conservative and inflexible in the long run. Divergent thinking is the route, not the obstacle, to innovation" [2].

3 The Education DesignShop: A Case Study in Using Design Thinking

Design thinking and maker thinking are on their way to being infused into schools with the recent developments in nontraditional educational spaces such as the Art and Science Prize, NuVu High Schools, and "Innovation Schools" [3] like the Up Academy and the Boston Green Academy. To drive home change in the education system, however, there needs to be more.

In order to fix the education system, design thinking needs to be established as an embedded problem-solving paradigm. This paper documents the design thinking elements behind creating the first ever Education DesignShop (to occur at MIT in Spring 2014). The event began as a final class project for the then cross-registered class at the Harvard Graduate School of Education (HGSE), T-550 Design for Learning by Creating. The event experiments with bringing interdisciplinary students and professionals together in a unique mentoring and building environment to solve problems in education, all the while practicing design thinking. As follows, each section highlights the major step of the design process and the key action items within that process that, altogether, yielded the proposal for the Education DesignShop.

3.1 Problem Identification

Beginning with the initial stipulation that education still suffers from various systemic challenges that need fixing (some are centuries old), we reasoned that what it really needs is a new method of problem-solving. Notice that design thinking strategies common in product design were not present when approaching education reform. Observations from frustrated conversations across various circles identified that key stakeholders (e.g., educators and policymakers) were not communicating to find solutions that pleased (or were even informed by) both parties.

I asked myself if the root of the problem was a lack of creativity and innovation in the education space. Thinking back to products born at the Education DesignShop [1], we realized that while there were creative solutions at the bottom level from practitioners in the field (especially current students closest to the victimizing side effects), these rarely if ever trickled up to the high level change agents that could have the power of implementation at various levels. Quick investigations into the backgrounds of policymakers confirmed that these key stakeholders were lacking creativity and innovation in their practice because they had not been trained with a background of assimilating these elements into their work's problem-solving. Pressing a little harder on that hypothesis, however, revealed that regardless of the approach that key problem-solver takes, another root of the problem remained that the policymaker is too far removed from the real problems happening in the classrooms, for example, to understand enough of the problem he is trying to solve.

If, hypothetically speaking, a policymaker had been trained with design thinking elements and was somehow closely immersed into the everyday education routine, would our solutions look different? This revealed another element of the triad missing: the tools to fix the education system are still very limited and limiting to any new innovation. Space had to be accommodated for makers, such as engineers and designers, to have a chance to adapt their creative talents to the education space, too.

3.2 Brainstorming and User Studies

First steps included outlining what the event would look like if we could have limitless resources, ideal participants, and achieved goals. This envisioning is key to later specification checks to make sure that a mission-vision-goals statement has been fulfilled to some extent that is true to its purpose. Brainstorming drew inspiration from previous attempts to attack similar problems, such as the Education DesignShop [1]. From the feedback survey that followed, we learned that users wanted a more narrow scope of topics. Tools to envision the final product, like a draft of the sessions that would occur, were useful in helping my mentors visualize my prospects for the final event. Visionary tables like these are a good moment to remember the key design axiom that "Real Data is Truth" [4] and that efforts to include real or simulated data from the beginning will help frame a much more accurate picture that your brain is trying to materialize.

3.3 Requesting User Input

First rounds of presenting the brainstormed versions of the Education Designathon were necessary as a way of getting user input from, in this case, the professor of the class and the advisor that would approve and oversee the end product. A promising visual tool was creating a tree hierarchy of all the possible options at each node of a decision to be made. This gives insight into the direction of the next steps that must be taken and researched further.

To build resources and a knowledge bank of ideas and persons that could potentially be linked to the event, we attended the "How to Design a Course Workshop" at Harvard's Graduate School of Education. There, we met another potential user. Meetings with coaching figures were helpful in prying answers to different questions like the goals for a successful event and the balance between a pedagogical and competitive event.

3.4 Prototyping: A Refinement of Brainstorming

In the case of this intangible product formation, a proposal for an event, prototyping often meant writing out the format and content of the event in various forms. Each set of questions required thinking of a different set of details, thus revealing new connections and interrelations. Perhaps most helpful to the exercise of answering different questionnaires is the iteration portion of answering each question as if it were the first time considered. Without copy-pasting from previous answer sets, a trend in the development and growth of the product can be tracked over time. Other useful tools while prototyping iterations were making timeline goals of the upcoming steps in the development of the product. This exercise is most helpful in identifying what key decisions and actions need to be made from your status to the envisioned final product, as well as compiling a list of the resources available along the journey.

3.5 Requesting User Input

Almost every time design decisions are made, the user should be brought in for some feedback. At this stage, we created a survey that would be sent out two types of people: potential users and potential expert mentors that spend a lot of time thinking about these issues already. While there are many ways to gather widescale feedback, in this case, open-ended questions with many options were a better approach over a binary- or multiple-choice questionnaire.

3.6 Iterative Prototyping with Key Risks

I used these survey results to make some formatting decisions and to inform myself of what topics interested potential users. We took their advice of making a list of specific roles and duties for the persons that would have to be involved in order to pull off this kind of event. We used the feedback to flag new key risks that would determine the success of the event, including how to really engage the underrepresented and most critical group, policymakers, in a techy event.

3.7 User Feedback

For the next iteration of the feedback, we created a refined event proposal that would be shown to different parties for their feedback (sponsors, student participants, and mentors). We attended the Students for Education Reform (SFER) State Summit and led a session where these potential users were allowed to share their impressions and critiques of the proposal. The key to user feedback is that the more involved in the development of your product a person is, the more likely they are to jump on board and attend or advocate for the product. The summit also opened pathways to future meetings with Massachusetts Representative Jeffrey Sanchez and Massachusetts Secretary of Education Matthew Malone to leverage potential resources between their office and my event. These comments from user feedback sessions were later used to create a tighter value proposition for sponsor recruitment.

4 Conclusive Thoughts on Design Thinking Challenges

There is vast opportunity to applying design thinking as a driving approach to fixing the education system. Elements of this framework will inherently excite end users since they have been consulted from the beginning; iteration of prototypes will weed out the bad ideas early on. Most importantly, thorough problem identification and brainstorming will open new pathways and solutions that will, theoretically, take more accurate stabs at the root of a problem.

References

1. Artiles J. Education designathon. [online] 2013. www.edudesignathon.com. Accessed 10 Oct 2013.
2. Brown T, Wyatt J. Design thinking for social innovation. Stanf Soc Innov Rev. 2010;8(Winter):30–5.

3. Massachusetts Executive Office of Education. Innovation schools approval process. [online] 2010. http://www.mass.gov/edu/government/special-initiatives/education-for-the-21st-century/commonwealth-readiness-project/readiness-goal-4-innovation/innovation-schools/innovation-schools-approval-process.html. Accessed 10 Nov 2013.
4. Herasimchuk A, Wroblewski L, Sonin J, Knemeyer D. Design axioms: real data is truth. [online] 2013. http://designaxioms.com/quotes.php?view=single#realData. Accessed 19 Nov 2013.