Impossible Design: Fostering Creativity by Quick and Dirty Prototyping

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Abstract: In this paper, we will present the results of challenging students into designing impossible artifacts using quick and dirty prototyping. We have worked during 2017 and 2018 school years with three different groups of undergraduate industrial design students. The challenge was to imagine how living would be in a house in the year 2050. The results show that imagining living in a near future triggers generation of impossible scenarios. Also, working with a limited time to complete the challenge using quick and dirty prototyping allows the students to think less and skip the early phases of the design process, eagerly engaging in the ideation phase while they are also discussing different possibilities with their teammates. Thus, quick and dirty prototyping is seen in this paper as a thinking tool, fostering creativity and promoting dialogue among students. The more uncertain the challenge becomes, as the year 2050 could be, the more dialogue the teammates will need to complete it. Therefore, impossible design activities should aim to bring uncertainty in challenges that could be addressed using quick and dirty prototyping to foster hands-on thinking and creativity in students, while learning about the design process.

Keywords: quick and dirty prototyping; impossible design; border thinking; creativity

1 Introduction: The Role of Prototyping in the Design Process

For schools, teaching the design process has become one of the main concerns. Thus, the hours that students spend in design studios and hands-on activities are more significant than those spent on seminars and theory-oriented classes. Students practice the design process iteratively throughout their professional education, gradually addressing simple and complex problems. Therefore, they learn to the bone perspectives and stages of the design process among which there is design thinking that commonly revolves around six phases: empathize, define, ideate, prototype, test and implement (Gibbons, 2016). In all the activities that could be performed during the design process, prototyping is one “that conventionally takes place at a later stage” (Innella et al., 2016, p. 22) and a “relatively small part of the entire design process” (Lim, Stolterman & Tenenberg, 2008, p. 2). In addition, prototyping has been traditionally used just as a developmental tool as a means of representing a final idea of the design process. However, scholars and educators
have identified different advantages in practicing prototyping at early stages of the process (Innella et al., 2016) such as fostering creativity among other benefits that will be presented in this paper further ahead.

Quick and dirty prototyping is haptic and allows exploration. This tool, used for serious play, is defined as creating “in a goal-oriented but playful way” (Schulz et al., 2015, p. 323). Consequently, we propose impossible design as a class activity that promotes teamwork, goal-oriented playfulness, and hands-on thinking. Our study highlights how these activities positively affect the learning experience of first-year design students and the benefits of implementing them in design education. Additionally, there are recent practices that require different methods to handle open and interdisciplinary forms of collaboration in innovation processes (Schulz et al., 2015). For instance, co-design, co-creation and open innovation are practices that bring together collaborators from different disciplines in which prototyping could become a tool for triggering dialogue and creativity, promoting teamwork even in groups with many participants. These qualities could be a plus in design education because nowadays some Latin-American universities have larger and larger groups of students, especially in the first year of design education, in which groups tend to be larger than 35 students. These characteristics are similar to the case of the University of Aguascalientes, and other public schools where fostering exploration and creativity becomes challenging. Therefore, different approaches have emerged among which quick and dirty prototyping stands out because it allows collaboration in larger-heterogeneous groups and inexperienced designers.

2 Referencing Hands-on-Thinking: Understanding Prototyping and Cognition

Prototypes become instruments for exploring technological possibilities, experiment with design possibilities, an instrument for learning from others and for facilitating “a concrete discussion of visions.” The confrontation with the prototype can trigger “a more extensive idea generation” (Bødker & Grønbæk, 1991 p. 14-15). According to Scaletsky and colleagues (2014), prototyping can be used by designers as investigation, because designers are “thinking while doing, doing while thinking and, in general, are expressing ideas through their making or visualization of concepts” (p. 3). They also state that this type of practice can also be known as Thinking, and when designers have time and space to practice it, they perform better in communicating and generating creative ideas. Hand and brain coordination then can become both a tool for communicating and fostering creativity (Jensen, 2000; Roos & Victor, 1999; cited by Schulz et al., 2015 p. 327).

Donald Schön is one of the pioneers that looked closely at the link between hands-on activities and thinking, proposing the concept of reflective practice, a “dialectical process in which thought and action are integrally linked” (Kinsella, 2009, p. 7). According to him, this process represents a “dialogue of thinking and doing” through which the practitioner could develop abilities and become more skilful in the workplace (Schön, 1987, p. 131).

Therefore, prototyping becomes a different form of dialogue than verbal communication. During the creation process, “participants have to develop a common language to understand each other in terms of the desired innovation as well as regarding their cooperation processes” (Schulz et al., 2015, p. 324). Thus, the process of making objects can become a “communication tool to better share thoughts and ideas” (Kolodner & Willis, 1996, cited by Innella et al., 2016). To foster this dialogue of thinking and doing, quick and dirty prototyping represents an advantage because it does not allow the students to overthink about the project in a planful manner. This readiness provokes that students jump in directly into a dialectic process in which they begin transforming materials with their hands such as cardboard, paper, chalk, among other materials, characterized as toolkit-based modelling (Sanders & Stappers, 2008), while they are developing and discussing the project. Toolkit-based modelling aims “firstly to explicate thoughts through haptic models to provide shared understandings among diverse people, and secondly to facilitate creative idea development at early stages in the innovation process” (Schulz et al., 2015, p. 325). Such models, when finished, become a representation or explanation of the thinking process of its creator (Schulz et al., 2015, p. 324); a reification of thinking and knowledge about the design process (Galey & Ruecker, 2010).

Finally, “a primary strength of a prototype is in its incompleteness” (Lim, Stolterman & Tenenberg, 2008, p. 7), and because designers did not invest too much time and effort in building these unrefined prototypes, they are more likely willing to make changes or discard decisions. Thus, quick and dirty prototyping broadens the negotiation range between team members. Since the resulting prototypes are only an approximation, this is seen as a positive, because it allows “a degree of ambiguity that fosters the design process instead of blocking it” (Innella et al., 2016 p. 22).

Implementing quick and dirty prototyping in the design studio could embody several positive consequences regarding the teaching and learning process of design:
• Enables and fosters creativity because of its hand and brain coordination
• Unblocks the design process because of its incomplete, unrefined results
• Provokes both verbal and object-communication between team members
• Broadens the negotiating range because ideas are discarded more easily
• Becomes a representation and evidence of the thinking process of the students

3 Impossible Design and Border Thinking: Prototyping as Worldmaking

Impossible design is defined in this paper as the practice by which designers develop artifacts that are not yet able to function in the actual world. Usually, the possibility to function is restrained by technology. In other words, these artifacts would need structural inventions to perform the tasks that they were designed for. Impossible design allows the students to enable border thinking, understood in this paper as “the epistemology of the exteriority; that is, of the outside created from the inside” (Mignolo & Tlostanova, 2006, p. 206). In other words, the inside or central aspects of design practice are characterized by possibility: those artifacts that if created will be able to function correctly; the outside and peripheral aspects of design practice are distinguished by impossibility, that is, artifacts that have not yet developed the technology to function correctly in the actual world. Impossible design is situated in the border of the central-possible and the peripheral-impossible. Center and periphery are conflicting structures (Lotman, 2009); therefore, enabling border thinking means finding ways to negotiating those conflicts. Usually, innovation occurs because of peripheral activity, since the center is seen as inactive and unable to evolve, and the contact between both could represent a process of renovation (Volkova, 2017). At the center are located actual artifacts and practices, at the periphery and outside the border are emerging impossible artifacts and even perspectives that are challenging the very definition of design. For that reason, border thinking becomes a way to foster creativity and dirty prototyping the means to funnel it.

By thinking about a world were non-functional artifacts exist, impossible design takes the perspective of social constructionism (Berger & Luckman, 1976). When designers restrain themselves from technological boundaries, they are at the same time collectively constructing new worlds. According to Goodman (1978), worldmaking is a human activity by which humans continuously make and remake versions of the world. Humans can construct worlds by using words, pictures, objects among other symbols. In this sense, prototyping is an activity for worldmaking. By building prototypes, designers are bringing to the actual world models and simulations of possible worlds (Skaletsky et al., 2014, p. 2) therefore, constructing new worlds. A prototype then becomes an interface between the actual world and the possible world. The prototype becomes one step closer from the possible to the actual world in each stage of iteration. If and when, the prototype becomes fully functional, both worlds merge.

Impossible design brings uncertainty to the process of thinking and worldmaking of practitioners. According to Kinsella, “practice is characterized by uncertainty, instability, uniqueness, and value conflict, and that this is where the important questions of practice are negotiated” (2009, p. 6). Thus, the border between the possible and impossible of design practice will enhance those uncertain aspects of design, provoking that dialogue and negotiations between team members become fundamentally important. In other words, bringing impossible design as a class activity will enhance those positive outcomes that dirty prototyping, hands-on collaborative thinking, represent for students: unrestrained creativity.

4 Countdown to Creation: Activities for the Design Studio

The activities presented in this paper were implemented during a first-year class in the industrial design undergraduate program at the University of Aguascalientes during 2017 and 2018 school years. The participants of the activity were students currently taking Strategies for Design course which aims to introduce first-year students to the design process. The primary objective of this course is that students attain a general overview of the different stages of the design process, traditionally explained on a linear perspective. However, these activities aim to present a different approach to the design process enabling prototyping at early stages as a technique to foster the creative process instead of demonstrating it.

Instruction for the impossible design activity was presented to students as follows:

Imagine how living would be in a future scenario.

• How would inhabitants rest, clean up, feed, work and have fun the inhabitants of a house in the year 2050?
• How would the power supply be of this house?
• Where would it be located and how would it be configured/built?
• Who would inhabit this house and how would these people relate and communicate between each other?

After you have reflected upon these questions you should team up and build the house of the future using quick and dirty prototyping. You have only one hour to complete this activity.

In these design activities, students face a given challenge: to think about how it would be like to live in the year 2050. They must build the 2050 house using quick and dirty prototyping within an hour, using available resources which usually are cardboard, paper, laminated and some other second use materials. These requirements aim to build creative confidence in students, allowing them to imagine impossible ideas that could come to be in the given 2050 scenario. Impossibility incites students to explore uncharted routes of creation.

The 2050 scenario brings uncertainty to the process. This uncertainty triggers dialogue between team members, the reason why students are asked to team up in larger groups because it is expected that each team member fully participates in the conception and development of the 2050 house rooms and areas. A common practice during this activity is to group in large teams of 8 to 12 participants approximately.

Time and available resources become a determinant element because students tend to feel limited. These aspects are planned for impossible design activities because it brings the students to a thinking/not-thinking border. Students do not have time to fear of what people will say, so they begin to express carelessly every crazy idea that comes to mind; also, they do not care about the quality of the prototype allowing them to discard ideas easily while they are building and modifying the prototype. As pointed out before, the prototype becomes a thinking and negotiating tool, a hands-on conversation, instead of representing an outcome (Figure 1, left and right). Therefore, a 60-minute countdown also helps students to maintain focus on the given challenge instead of focusing on building perfect models or carefully planned well-done solutions (Schulz, 2015).

An essential aspect of these activities is that they have fewer restrictions than the usual design studio activities. Thus, outcomes are not bound to functional, procedural, production, market or technological possibilities. Therefore, the creation process begins freely; the impossible suddenly becomes possible. Outcomes show that students usually part from commonly known future problems. Hence, solutions also have common attributes with impossible updates. Border thinking then is visible through these hybrid impossible/possible, functional/non-yet-functional prototypes, because students are thinking of exteriority-impossible, created from the inside-possible and familiar aspects of everyday life as we know it.

Figure 1. (Left) Photograph of students using prototypes as a dialogue and negotiation tool during the activity. (Right) Students building artifacts while making trial and error decisions.
Impossible Design: The House of 2050 has been implemented as a class activity for three generations, and there are some similarities in how students imagine the future. When thinking about the year 2050 they are imagining impossible scenarios such as subaquatic living, suspended in the atmosphere housing or even underground habitations. Students argue that these types of living will be necessary because of resulting environmental damage due to human activities, wars, and natural disasters. Thus, inhabiting the earth surface will not be tolerable. Therefore, to think about that living as we know it will not be possible, they have to imagine how to live like nowadays in impossible scenarios. This border thinking allows them to work in an unrestrained manner, fostering creativity, bringing every impossible idea into the conversation.

Three aspects of the imagined future stand out in students’ projections. Firstly, it is interesting that students imagine apocalyptic scenarios due to the possible lack of vital resources such as water. According to them, future users would have to cover their basic needs sanitizing their body with technological artifacts that produce steam. This way, a steam shower could cleanse the body in a few seconds; therefore, this technology could help humans to save water (Figure 2, left). Secondly, there is also destruction as a recurrent scenario, so the use of recycled materials for house building could be a common practice. Debris would become a common building material since it will be available because of natural disasters or war destruction. Thirdly, technology continues to grow its participation in everyday activities becoming the primary mediator between users and the world. Holograms, sensors and virtual interfaces will allow automatic communication between users and house appliances, allowing them to create or modify instantly clothing, room arrangements, and even food. Everything will be available and ready just by merely thinking of it (Figure 2, right).

These aspects highlight the final outcomes of impossible worldmaking; however, it is important to focus on the process, how students experienced it, and how implementing activities as simple as the aforementioned task during class could provoke border thinking and unconstrained creativity. After the activity was over students were asked to answer a brief questionnaire to help them reflect upon their experience and highlight their impressions. Results show, in general, that students had a positive experience. Their perspective and direct quotations are presented in this paper regarding five main resulting actions:

1. For as long as necessary. Gaining creative confidence. The creative process during the activity was perceived by some students as quick, improvised, strange and unorganized. Although all these concepts could mean chaos in a negative manner, students referred to them as positive aspects of the experience. For them, the process was "funny and encouraging" meaning that working in this kind of activities allowed them to generate a lot of ideas.
and to recognize their own creative potential, therefore, increasing their creative confidence. A student expressed: “a bunch of ideas came to me and I could realize how creative I am”. The list of ideas that students could put together is also perceived as positive, referring to them as creative, spontaneous, innovative and interesting. This experience allowed them to express uncommon ideas fearlessly of what people will say, in this case, without feeling judged by their teammates: “I thought it was a really fun activity because you are not stressed about your idea, thinking that it might be too crazy”.

2. Provoking boundary breaking. It was notable that some students felt somehow insecure at the beginning because of the uncertainty of the outcome, and they were hesitant on organizing themselves to address the challenge. The uncertainty that this task represents began to disappear when they reached the border between the possible and the impossible: “to be honest, I was finding it a little complicated since I never go beyond the feasible [...] but once I started breaking through that thought, I began having a lot of fun”. In other words, uncertainty provokes border thinking, which is perceived from students as a dynamic, free, interesting and fun activity. Also, besides breaking the possible/impossible, the borders of the traditional design process began to break. Some students declared being able to let themselves go and not following any preconfigured-structured process. According to them, this was possible because the activity allowed that kind of openness and freedom: “I didn’t really follow any steps, I just began putting pieces together in the way that I liked, shaping some objects or elements that could become part of the house while taking into account my teammates’ ideas”.

3. Developing teamwork skills. Students perceived that working in teams with numerous participants was a fluent, fun and dynamic experience, although at first, they expressed having felt confused and stressed out because an apparent disorganization and chaos. Having a lot of participants in the team is the main reason for this feeling, because the more participants it has, the more thoughts, ideas and possible routes the team will generate. Therefore, this could become a disorienting factor for those that have never worked in teams with those characteristics: “I have never been in a group so large to do teamwork and at first everything was chaos. Everyone was sharing ideas, and nobody was structuring anything. Soon leaders began to emerge, and we could pick up the reins on the project making the most of the proposed ideas. Finally, we divided into groups and began building [prototypes]”. As formerly expressed, lack of leadership was identified as a barrier for teamwork. Without a leader, organization and communication was harder for the team, as well as demanding the same level of commitment and performance from each team member. According to students the ideal number of participants in a team for this type of activity should be from 4 to 6 members. This shows that students do not have yet the necessary tools and skills for working in teams. However, teamwork was also perceived as a safe space for proposing and communicating ideas while receiving feedback form teammates. Students expressed having felt comfortable since the impossible design project allowed every voice to be listened, sharing a criticism-free space between them: “I liked teamwork because instead of criticizing our own ideas we supported each other to project a more creative house”; “Nobody kept quiet during brainstorming which I think is important”.

4. Engaging hands-on thinking. The experience of building ideas through quick and dirty prototyping was enjoyable thanks to the flexibility of that technique according to students: “You materialize your ideas instantly and they come up naturally. I think this is the main advantage: the given freedom to create things”. Most of the participants jumped in directly, without sketching anything, to building with their hands whatever came to mind: “I didn’t do any physical sketches, only mental sketches, and as soon as ideas were coming up, I tried to shape them before it was too late, and they could disappear from my mind”. As a creative tool, these experiences highlight the importance to foster quick and dirty prototyping among class activities, because it allows the student to express unrestricted ideas immediately. Some students managed to see the potential in this technique, particularly to promote idea generation in early stages of the design process.

5. Saving time and materials. Finally, students highlighted as benefits of quick and dirty prototyping a more effective use of time and resources: “I consider that the best advantage is the versatility in the creation process because you don’t need anything else than second use material and your imagination, you skip sketching or thinking about exact measures”. They also point out other benefits such as materializing ideas quickly, identifying errors and correcting them ipso facto. Another benefit is that because of its imperfection and quick making, dirty prototyping allows the creator to focus only on the creation phases of the design process: “I think

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1 Direct quotations are taken from answers to the questionnaire given as homework. They will appear between quotation marks and in italic type to differentiate them from author’s quotations.
that because you do not have to worry about outcomes and refined finishes of the prototypes, you can focus on being more creative”.

6 Final Discussion: Fostering Creativity in Design Students

Fun, versatile, free and engaging are aspects that sketch out how students experienced the class activity. Impossible design fosters border thinking, which provokes challenging tangible certainty. In other words, border thinking invites students to leave the center and get closer to the periphery. This means abandoning the certainty and assurance of following steps in the design process or traditionally predefined stages such as discover, define, develop and deliver (Design Council, 2007). This is probably a contradiction to design schools’ goals, because they are commonly aiming their efforts to transfer knowledge, teach methods and processes so that the student develops professional skills, and that his/her professional practice and creative decisions will not be based on speculative information or random discovery. However, this focus could also be constraining the development of creative skills, undermining other activities such as exploration, experimentation, in which delivering incomplete products is not of importance. As it has been stressed out previously, although there could be tangible outcomes from impossible design activities, its value does not rest in the marketable or profitable possibilities of the resultant artifacts, it resides in the development process and how it impacts in the creative awakening of design students. Undergraduates should probably need both during their design training: firstly, to learn a structured, step by step vision of the design process through which they can perform professionally; and secondly, at the same time develop the capability of skipping steps and engaging disruptive exploration to foster imagination and creativity. Therefore, as findings from the activities presented in this paper, we can highlight that, bearing in mind the characteristics pointed out before such as teams with ten or more participants, a limited time, and considering undefined, uncertain, or even impossible aspects of the project, working with quick and dirty prototyping could become a way to foster creative balance to the training process of design professionals.

References


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