Reflections on Learning and Design

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The course CEP 913 covered a lot of ground using many perspectives. We looked closely at the following topics: Design, Aesthetics, Innovation, Creativity, and Process. In this paper I cover each in turn.

What is Design?

Everything is designed. Few things are designed well.

- Brian Reed

It is entirely appropriate that a discussion on design begin with Herbert Simon.   Design is a concept we hear about a lot, but Simon was the first to attach rigor to it and discuss it in a serious way. The word "design" is used often in the everyday language in many different ways. Two common usages are: 1) executing the design and 2) an artifact. For Simon design is not a product and it is less about the executing than of the planning of the action. Simon defines design as "to [devise] courses of action aimed at changing the existing situation into preferred ones." Breaking this down we can see that devising course of action is aimed at "planning," which requires "intention" to produce the outcome.

Simon looked at the natural world and asked since there is a science of nature can we have a science of the artificial? This is great importance because much of what is around us is artificial in the sense that humans have had a hand in shaping it. Everything from the landscaping to our pets has been designed in a sense. For Simon we live in a world of artificial and we can have a science of this artificial called design. So not only is a science of design possible, but Simon suggests it is an emerging trend. Again, design is about planning and the process and not so much about the final outcome, and a rigor can be achieved by applying a logical heuristic to the process.

For Simon design lies at the intersection of inner and outer world. If we are designing a car the inner world would be the functional mechanisms that make it work—engine, transmission, etc. The outer world would be the environment that our car needed to function—streets, highways, etc. It is by carefully observing the relationship between the inner and the outer that allows us to understand the nature of design. In other words, when designing an automobile it has to be made with design specification to insure that it will operate properly on the roads it will travel on.

While Simon is interested in the inner and outer world Csikszentmihalyi is interested in the person and object. For Csikszentmihalyi defining a person is too difficult because we are too

complex to fit any single definition. Instead he focuses on the most basic fact of personhood: this being that humans are self-aware and can assume control by directing attention to where they see fit. Directing this attention requires what he calls psychic energy. When a person transacts with an object it in turn causes meaning-making to occur. This transaction is where the person acts on the object and the object acts on the person.

Through this transaction Csikszentmihalyi believes cultivation takes place. Cultivation "involves both senses of the verb 'to tend': to take care of or watch over." Csikszentmihalyi specifically defines it as, "the improvement, development, refinement, or resultant expression of some object or habit of life due to care training or inquiry." In this regard cultivation is compared to the concept "culture." This is not something that needs to be taught but something that is happening naturally. While cultivation is happening naturally how to influence those results can be taught (how to direct psychic energy). Just like plants will grow regardless of a whether a gardener is present or not, but a gardener can learn the art of cultivating those plants to grow a certain way. Much of this cultivation has to do with influencing the environment.

Aesthetics

A designer is a planner with an aesthetic sense.

— Bruno Munari

Aesthetics do not play a key role in Simon's theory of design, whereas for Mishrea et al. "Design is a creative activity that cannot be fully reduced to standard steps, and that should not be thought of as mere problem solving." This corresponds well with the design field where most designers are creative artist types and not people of science. Certainly having an eye for aesthetics is beneficial when designing. The difference between artists and designers is that a designer must consider function. Mishrea et al. state, "Artistic creativity need not fulfill a function, but design requires both innovation and goodness of fit."

No matter how aesthetically pleasing a design is if it cannot perform its designed function it has failed as a design. The designer must find the balance between form and function. Theoretically artists are not constrained by this concern to find balance (although if the artist wishes to make a living they must often make compromises).

Csikszentmihalyi describes aesthetic qualities as, "neither exclusively mental nor physical, subjective nor objective, but belong to specific situations or contexts and forms consummations of transactions between the organism and the environment." Csikszentmihalyi wants an empirically grounded description of the aesthetics experience because that is something that he thinks has been absent from classical aesthetics theory. He sees four dimensions to aesthetics: Perceptual, Emotional, Intellectual, and Communicative. When experiencing the fine arts the most obvious dimension is the perceptual and Csikszentmihalyi found all museum

professionals referenced this in one way or another. Another way to experience the aesthetic quality of art is through the emotions that it generates. Curators were mixed in their thoughts of the role the intellectual dimension plays in appreciating art. It was clear it played a part, but some believed it needs to be a secondary aspect otherwise it can remove something from the work. The final dimension of aesthetics is communication and can be seen as a multidimensional experience and one that integrates the visual with the emotional and the intellectual. The dialogue that this communication brings is important to the aesthetics experience.

When looking at Csikszentmihalyi's aesthetical description and Norman's emotion and design we find a connection. What Norman calls "affect and behavior" is about the feelings and emotions we have when encountering a designed object and how it affects our behavior. So both Csikszentmihalyi and Norman are interested in the emotional aspect. For Csikszentmihalyi it is how the emotional experience influences the aesthetics experience while for Norman it is how the emotional experience affects behavior such as performing a task.

From my experience as an instructional designer, little thought is given to the emotional impact of what is being used for instruction. A good example of this is PowerPoint presentations. I have helped with many and I have yet to see one where emotional devices are worked in. The typical presentation is slides loaded with enough text, bullet points, clip art, charts, and graphs to knock out an insomniac. Imagine if I want to lecture to students about the Vietnam War. What is more likely to grab their attention: a page of bullet points or a quality image of the Vietnam War Memorial? Picture the visceral response this image brings and how much more real the information that is to be delivered becomes. With this approach the speaker would convey the information and the PowerPoint would convey the emotion.

Why Innovate?

One of the things I am always impressed by is the wide variety of things in the world. We don't have one kind of coffee mug – we have hundreds. Not one kind of pen, but thousands.

- Punya Mishra

What compels humans to innovate? Animals do not look at the world and think things can be done better or if they do they certainly do not act on it in any compelling way. Early humans were living on the edge and all actions had to be weighed carefully for their survival implications. Spending time, energy, and resources on tool making could cost lives if the tools had no benefit and save them if they did. Anthropologist believe the only reason early humans survived was because they figured out they could use rocks to break open bones and get to the marrow. This means after a hide had been picked clean and the other stronger animals had moved on, humans could move in and break the skeleton open with their tools and get the life-saving calories.

It has been quite some time since the human race has lived so precariously on the edge. Several authors (Basalla, Norman, and Diamond) find fault with the concept "necessity is the mother of invention." George Basalla makes a compelling case that invention comes first and then we then find a way to use what was invented. He dismisses necessity unless it is life or death. In other words, since we would have survived without most of what has been invented they were never a necessity.

This goes against conventional wisdom that most things are invented to meet an immediate need. However, most inventions go beyond meeting basic needs. Take for example, a car. While it may seem essential nowadays for most of human history people got along just fine without them.

Basalla goes on to explain inventing as an evolutionary process. He explains how machines change slowly over time, why they have vestigial structures, and how they survive through artificial selection. The evolution concept used for describing invention, while handy, is problematic. That's because the forces driving the two processes are different. First, even if it is not born of necessity, inventing requires planning and designing while evolution is simply a natural occurring process with no plan. Second, inventing does not require working with the same tools and materials. An inventor can scrap everything and start fresh. Organic evolution must work within the confines of what it started with. If animals have vestigial structures, whales with pelvises, it is because nature gave it no choice. If an invention has vestigial structure it is because the inventor purposely left it in place. Fourth, organic evolution has a much more symbiotic relationship. A wolf's evolution is closely tied to a bison's evolution and vice versa. This is not true of technology. For example, each component of a computer is constantly being pushed to last longer, hold more, and perform faster regardless of whether its increases vastly outstrip other components of the computer.

Creativity

Creativity without knowledge is like a ship on dry land.

- Tim Xeriland

If we take two children and ask each to invent their own game and one develops an interesting concept with complex rules and rich characters while the other child creates a game with little substance we would not have trouble saying one child is more creative than the other. We know creativity when we see it, but it is hard to define. To me creativity is about being novel and connecting seemingly disparate parts together. Ask most children how we could build a device that can fly and you will get a creative answer, but rarely a functional answer.

This view of creativity has been described as "impoverished." For many (e.g., Kaufman and Sternberg) for something to be creative it must be effective. Mishra and Koehler take it even further and believe creativity must be "novel, effective, and whole." Adding new components to creativity is an attempt to elevate its importance. In New York City people that live in apartments rarely have one lock on their door. Instead they have a whole series of locks that takes several different keys to get the door opened. We should think of our great discoveries, innovations, and leaps as being locked behind those kinds of doors. With this analogy in mind we need to understand that only one of the keys to open the door is creativity, but with the other locks in place that key alone will forever leave us outside.

Csikszentmihalyi found a creative way to explain creativity (I like when the authors model the topic in their papers). He breaks creativity into three realms: person, field, and domain. With this systems model the zeitgeist determines creativity for domain and field. That is, while someone may show "personal creativity" unless a critical mass of experts/gatekeepers in the field recognize and appreciate the novelty of the work it is not creative.

I like to believe in a truth that exists outside popular opinion. If an idea is creative it is creative regardless of whether the crowd can recognize it. However, by breaking creativity up in to realms it does something interesting. Csikszentmihalyi takes the definition of creativity for the realms of field and domain and gives it a meaning that is related to fame.

When speaking of fame we wouldn't state someone is actually famous the problem is others haven't seen it yet. This is what Csikszentmihalyi does with creativity. Just like it makes sense to say John Travolta was a star in the 70s and 90s, but not in the 80s it also makes sense with the systems method to say Raphael was creative in the sixteenth and nineteenth century, but not in between.

In terms of how to spur creativity Hofstader, Turkle, Papert, and Mishra all suggest ideas of what contributes. In other words, they ask the important question, where do people get creative ideas from in the first place? They pose three different but related ideas: Implicosphere, Bricolage, and Transdisciplinary Creativity.

Hofstader speaks of an implicosphere. This is an imaginary sphere of "things that never were but we can't help seeing anyway." Turkle and Papert present the idea of bricolage. This is borrowed from the French word that means to fiddle and tinker. The concept of bricolage suggests creativity is increased by playful exploration of "objects." Finally, Mishra writes of the importance of transdiscipinary creativity. While there are important differences between disciplines and their approach to creativity the transdisciplinary concept suggest that at a broader level the kind of creative skills employed by experts of any field are fairly similar and that drawing from other fields stimulates creativity breakthroughs.

Using Design

Design is the application of intent - the opposite of happenstance, and an antidote to accident.

- Robert L. Peters

Simon's dream of making design a science has eluded us, but we do have some processes we can apply to design. In the Design Thinking for Educators it gives a design process with five phases: Discovery, Interpretation, Ideation, Experimentation, and Evolution. The idea of five phases is consistent across the literature. There are many different names for the phases, but usually five. Common to see listed as the last phase is evaluation, but I like the idea of evolution. Both idea are similar and can produce the same effect. Say through evaluation it is determined that a design flaw is apparent under certain conditions. If those conditions are likely to happen it will result in changing the product. The same process of weeding out design flaws would happen with evolution. However, the term evolution implies that changing is a natural process that will happen regardless of specific evaluations. Evolution is always in flux.

When designing it is important to understand that the situation we are dealing with can be well-structured problems, ill-structured problems, or wicked problems. Well-structured problems are straight forward and are the kind you would find in most textbooks. Any problem that can be solved by mathematics is well-structured. Ill-structured has a lot of variation and at least some subjectivity. These problems benefit from following a heuristic as mentioned above. Finally, wicked problems are where even the nature of the problem is subjective. It can take a lot of work just to get some consensus on what the problem is let alone how to solve it even worse. We can never really know if we solved a wicked problem.

Reading Buchanan's description of wicked problems I wonder why anyone would tackle this kind of problem in the first place? It seems more realistic and less politically volatile to learn to break a wicked problem down to something manageable. Buchanan suggests that when designers take a quasi-subject matter they attempt to make it specific and concrete (take the wickedness out), but the indeterminacy is still present.

I would like to ask Buchanan why instead of embracing a fundamental indeterminacy we do not find a way to put determinacy back into the problem. Understandably there are issues with this because if you are dealing with a problem of this complexity whittling it down may change the nature of the problem. Still, if we want to make progress that can be measured, redefining the problem in such a way that it can be determined is the route to take.

Because of my line of work how design affects education is of great interest to me. In particular I am interested in how digital media is transforming education. Historically much information was locked away from people. Whether it was that works were produced in Latin, which the average person couldn't read, or that books were chained to the shelves in libraries there has been many barriers to prevent people from accessing information. Digital media does

not remove these walls, but it does make the wall a lot lower. For example, getting into Harvard is beyond the reach of virtually everyone on the planet. However, because of digital media many more can "attend" Harvard classes through things like Open Courseware, EdX, Coursera, and Youtube.

The other key area digital media has made an impact in education is with engagement. Because the door of access has been opened many nontraditionalists have been able to get their ideas across like never before. These new ways of approaching education have had a revolutionary aspect. Some of these methods are so entertaining that students are watching them for fun!

The design studio is described by Cossentino as "a learning culture in which objects to be designed—a house, a car, or a theory—become the focus and the objects of conversation in the designers' multiple roles as builders, testers, evaluators, and presenters." Here again the digital comes into play because it is the perfect medium for creating a design studio. Environments like Logo, Alice, and Geometer's Sketchpad are ideal for building these virtual environments for the design studio to live.

The issue with design studios is that I have seen firsthand that they do not deliver the results we would hope. This started a debate on the discussion board about whether it would be more conducive to learn the multiplication tables through brute force memorization or through a design studio approach. I still believe nothing beats drill and practice for laying down a foundation, but it seems there can be a place for a design studio in education. Why haven't they been as successful as hoped? Mishra has given good reason to consider why these kind of approaches may take time. First, he says, "students have been socialized into certain ways of thinking about learning—and that is often based on their experience in school." Second, he mention how the aesthetic approach can vary from person to person and instruction may need to be individualized.