Generating Ideas

Vanessa Svihla

Brainstorming, ideation, generating ideas. These terms and the kinds of practices they refer to are familiar to many, even outside of design fields. As instructional designers, we use such techniques to come up with more ideas—and more creative ideas. But how do these techniques help designers develop ideas? And when and why should we use them?

In this chapter, I first discuss the typical purposes and desired outcomes for ideation. I review some common as well as new techniques and briefly discuss evidence of their effectiveness, in part to draw attention to the kinds of challenges designers face when using such techniques. Finally, I re-center the purpose of generating ideas as reframing the problem.

What Is Ideation? When and Why Do We Typically Generate Ideas?

Designers commonly generate ideas about possible solutions after the problem is initially framed. Or at least, typical texts on design suggest this is when designers should generate ideas. We will reconsider that later in this chapter.

Many ideation techniques focus on generating many ideas, going on the assumption that if you generate many ideas, some of them will surely be creative. This probabilistic reasoning is not always accurate, however. This is because even if we generate many ideas, they may still be similar to each other. Researchers who study ideation techniques argue that novelty comes from having dissimilar ideas. This means that variety is more important than quantity. But coming up with dissimilar ideas can be challenging because of *fixation*—the experience of getting stuck on previous ideas. Compared to designers who are not shown an existing solution, designers who are given an example tend to reproduce features from the example (Jansson & Smith, 1991), even when the example is known to be flawed (Purcell & Gero, 1996). Often, designers are unaware they have incorporated such features, and this is why overcoming fixation can be so challenging—it is often a covert process.

Research suggests that designers who have less diverse precedent to consider may be more prone to fixation (Purcell & Gero, 1996). Who has a less diverse precedent? Some may think this would be novice designers because they have not been exposed to the concepts and materials with which they are designing. But in some fields, like mechanical engineering and instructional design, we commonly encounter designs, but many of us do not encounter much diversity in those designs (e.g., a lot of sedans look like one another, and many school lessons look like one another). Repeated exposure to a limited set of ideas covertly shapes our vision of what could be. And, without deliberate engagement with diverse precedent, we might not be very influenced by that precedent.

New designers also tend to commit to design ideas prematurely (Rowland, 1992; Shum, 1991), and once committed, can feel invested and unwilling to change, a phenomenon referred to as *sunk cost*

(Kahneman & Tversky, 1979). In my own teaching of design, I require messy, hand-drafted first versions of ideation and prototypes and impose a -10% penalty to any such assignment that looks to have been tidied up. This appears to help, but it is still very easy to fall in love with a first idea. Consider the following vignettes in Tables 1 and 2, in which a supervisor (Sunil) requests fire extinguisher training to comply with regulations and the design team (newcomer Noel, experienced Eli, and subject matter expert Marley) considers their options.

Vignette 1. Meeting With Supervisor

Sunil

Of course, we want to make sure our employees are exposed to proper fire extinguisher use. We have to comply with these new regulations ASAP.

Marley

Some units, like mine, have already been certifying employees because we really have to know how to use an extinguisher. But we rely on an external provider.

Eli

It seems like that won't scale to the entire organization, given the cost you shared with us earlier.

Noel

We can just put together a short online training using the PASS model, with a quiz to certify them. I think the pass score should be rather high, though, right? Like 100%. I know we sometimes go with 80%.

Sunil

What is the difference between a pass model and pass score?

Noel

Oh! Sorry. The PASS model—I googled it before the meeting—is a mnemonic to use the fire extinguisher. It means pull the pin, um, aim, and sweep. I forget what the other S stands for, give me a sec—

Sunil

How long would it take you to put that together?

Eli

Before we get to that, I think we need to consider options.

In the vignette, who shows fixation? Premature commitment? What precedent might shape how the design team and supervisor evaluate design ideas? How might they overcome fixation and premature commitment? To answer that, let's look first at the origins of idea generation.

What Are Some Tools for Ideation?

In 1939, Osborn began developing techniques for more creative advertising. He devised classic brainstorming and published techniques based on years of practice (Osborn, 1957). He advocated for the following techniques as part of brainstorming:

- suspending critique
- considering wild ideas
- coming up with as many ideas as possible
- combining ideas, and
- working in a large group of designers.

Several of these ideas were later empirically challenged, especially group size (Mongeau & Morr, 1999). Generally, support has been found for more structured ideation methods (Crilly & Cardoso, 2017; Runco et al., 2011; Santanen, Briggs, & Vreede, 2004; Sosa & Gero, 2013; Yilmaz, Seifert, & Gonzalez, 2010). For instance, an early, somewhat more-structured approach was lateral thinking, meaning thinking in generative ways (as opposed to analytical "vertical thinking") (De Bono & Zimbalist, 1970). De Bono described general methods for lateral thinking, such as:

- generating alternatives with a pre-set quota (number of ideas),
- challenging assumptions by repeatedly asking why,
- suspending or delaying judgement, and
- restructuring or reorganizing elements.

In the vignette below, what techniques (from the bulleted lists above) do they use? Where do they stray from the guidelines for brainstorming and lateral thinking?

Vignette 2. Design Team Meeting: Classic Brainstorming in a Group

Eli

I am a little worried that if we just deliver a compliance training, Sunil will consider that sufficient, even for units like Marley's, because the cost savings will be so appealing. So, I think we should generate some ideas before we commit. So, let's come up with at least 20 ideas. Let's not evaluate them yet, just list any ideas that pop in.

Noel

Well, I think we should do the PASS model, followed by a quiz.

Marley

That makes me think about job aids. Like we could have a sign, maybe next to or on fire extinguishers?

Noel

Nice. And we should make the job aid similar to the training, so the instructional and transfer contexts are similar.

Marley

That’s a good idea. We can use the same font and pictures even.

Eli

Sometimes asking “why” helps. Like, why do all employees need this training? Why don’t they know how to use a fire extinguisher already?

Marley

In the certification course we take in my unit, people think they should aim at the top of the flames, but it’s the base. So, we could focus on that aspect.

Noel

And that is also part of the PASS model. And they need it because of compliance though, right?

Eli

Let’s really try to get some other ideas on the table.

Noel

We could make our own model. SAPS? APSS?

Marley

Or it could be just like a handout they get.

In this vignette, you may have noticed that although Eli encouraged them not to evaluate ideas, Noel and Marley reacted in evaluative ways to each other’s ideas. Although they did not critique ideas, even providing positive evaluation can shape how others respond because it signals that poor ideas are unwelcome. This in turn can impinge on creative thinking.

Noel’s suggestion to make their own model by rearranging the steps is something those of us who teach design see often. Coming up with flawed versions of existing ideas accomplishes two things well—it gets you toward whatever preset quota you need, and it guarantees your favorite idea won’t be ruled out—but it does not lead to more creative ideas. Yet, this approach is common when ideation feels forced or artificial, as can happen when one designer prompts ideation that others do not see a need for (or when ideation is assigned, such as in an ID class!). Knowing when to deploy ideation techniques is critical, but this is learned through experience. For practicing designers, ideation is not always a formal step; they often generate ideas ad hoc. Experienced designers do not always find benefit from typical ideation techniques (Laakso & Liikkanen, 2012; Linsey et al., 2010; Sio, Kotovsky, & Cagan, 2015; Tauber, 1972; Vasconcelos & Crilly, 2016), but research suggests these may hold benefit for newcomers.

Below, I have summarized some common structured ideation techniques. I have included a couple that are not common in instructional design because methods developed in other design fields, like engineering and creativity, are transferrable outside of product design fields (Moreno, Yang,

Hernández, & Wood, 2014). This is important in part because our most prominent design approach—ADDIE—has relatively little to say about ideation, and even newer models like SAM do not provide clarity about where new ideas might come from (Allen, 2012).

Take the fire extinguisher training problem described in the vignettes, and try out two of the techniques in Table 1 below.

Table 1

Common Structured Ideation Techniques

Technique	Outcomes	Use in ID
SCAMPER		
An elaboration of traditional brainstorming, this technique structures ideation by providing questions tied to actions that form the SCAMPER acronym: substitute, combine, adapt, modify/magnify/minimize, put to other uses, eliminate, and reverse/rearrange (Eberle, 1972). For instance, ask "What can I substitute?"	Studies suggest that SCAMPER may result in more high-quality novel ideas compared to unguided methods (Moreno, Yang, et al., 2014).	SCAMPER has been commonly used with elementary students. It is a particularly promising technique for making incremental changes to typical instructional settings, where major changes may be viewed as threatening or problematic.
Design Heuristics		
Based on expert performance in product and engineering design (Yilmaz, Daly, Seifert, & Gonzalez, 2015, 2016) this is a well-studied set of 77 strategy cards—such as add levels, adjust functions for specific users, repeat, compartmentalize, contextualize, build user community, change flexibility, scale up or down, and incorporate environment—for designers to use as inspiration as they generate ideas.	Design heuristics can support newcomer designers to develop more elaborated and practical ideas (Daly, Seifert, Yilmaz, & Gonzalez, 2016).	While many of the strategies are specific to engineering or product design, many are salient to instructional design, especially if we change "user" to "learner." For instance, several focus on user agency, which we could frame as learner agency—allow the learner to customize, reconfigure, reorient. What other heuristics might we identify from expert ID practice? The list of ID heuristics could be a place to start (York & Ertmer, 2011).
Design-by-Analogy		

These methods include various forms—Synectics (Gordon, 1961), biomimicry—and include techniques like mapping related words in a network like a concept map or exposure to near or far examples. The latter mirrors intuitive as well as professional design practice in which designers rely on precedent. However it involves deliberately considering ideas that may be similar or wildly different as sources of inspiration. Common to engineering design, the TRIZ (Altshuller, 1996) approach involves first identifying "contradictions" then looking at ways others have resolved the same kind of contradiction.	Design-by-analogy methods can help designers produce more novel ideas (Moreno, Hernandez, et al., 2014) especially if the designers use far analogies (Chan et al., 2011) which can help them think more broadly about a problem (S. M. Smith & Linsey, 2011). TRIZ has led to more varied ideas (Belski, Hourani, Valentine, & Belski, 2014).	Although not commonly used in ID, this is a promising technique to overcome exposure to traditional precedent. Developing clarity about tensions is also promising. Common contradictions salient in instructional design are breadth versus depth, efficiency versus understanding, and convenience versus learning.
Nominal group		
In a group, individuals silently generate ideas. Each member shares ideas. After all have been shared, members clarify and evaluate ideas collectively then vote individually.	Compared to an unstructured group, nominal groups generate more ideas (Ven & Delbecq, 1974).	Nominal group techniques are beneficial when generating ideas with stakeholders or in groups with power imbalances because it opens space for all members to participate.
Bodystorming		
Rather than attempting to generate ideas removed from context, bodystorming involves acting out the problem and possible solutions in situ (Oulasvirta, Kurvinen, & Kankainen, 2003).	Bodystorming has been helpful when designing with new or unfamiliar learning technologies (B. K. Smith, 2014).	Although not commonly used (in ID or other fields), bodystorming can be particularly generative when considering the configuration of learning spaces, ways to arrange collaborating learners, and mobile learning.

Contrast the two techniques you tried out:

- Which did you prefer and why?
- Which led you to produce more ideas?
- Which do you think led you to generate more novel ideas?
- Which do you think led you to generate higher quality ideas?

If you found answering the last two questions more difficult, you are not alone. Researchers have long debated the best ways to measure novelty and quality of ideas. While counting the number of ideas generated is straightforward, as mentioned earlier, this does not necessarily result in better ideas. Novelty is often characterized by the variety or breadth of ideas of a single designer as well as the frequency of their ideas compared to other designers (Hernandez, Okudan, & Schmidt, 2012). Quality is sometimes measured as feasibility, usability (Kudrowitz & Wallace, 2013) or the degree to which needs are met without violating constraints.

Others have also considered characteristics such as ethics and empathy. This means evaluating the just distribution of risks and benefits for multiple and especially marginalized groups (Beever & Brightman, 2016). Although not commonly used, techniques that sensitize the instructional designer to the experiences of marginalized groups and connect this to their own experiences prior to generating ideas has potential for addressing persistent inequities and structural oppression (Kouprie & Visser, 2009; Visser & Kouprie, 2008). Such approaches also tend to more clearly change the problem space.

How Can Ideation Reshape the Problem Space?

So far, we have mostly focused on the solution space, but due to the ill-structured nature of design problems, ideation also changes the problem space (Cardoso, Badke-Schaub, & Eris, 2016) as designers reframe the problem during ideation (Daly, Yilmaz, Christian, Seifert, & Gonzalez, 2012). Designers sometimes relax constraints and this can reshape the problem space (Chan, Dang, Kremer, Guo, & Dow, 2014; Silk, Daly, Jablokow, Yilmaz, & Rosenberg, 2014). By temporarily ignoring a key constraint, sometimes we can notice something new about the problem space.

Similarly, my own approach—the Wrong Theory Protocol (WTP, https://edtechbooks.org/-IAVb)—likewise tends to reshape the problem space. In this approach, we ask designers to first come up with ideas that would cause harm and humiliation prior to generating beneficial ideas. I was inspired by a magazine article on artists and designers deliberately creating displeasing and wrong works (Dadich, 2014). When we first incorporated it into an ideation session, we noticed that the most humiliating ideas led to more empathetic insights and changed problem frames. Consider the vignette below to understand why this might be.

Vignette 3. Design Team Meeting: Wrong Theory Protocol

After individually generating harmful and humiliating ideas, the team discusses their insights:

Eli

I think my worst idea was locking the learner in a room with a small fire burning and a sort of Rube Goldberg fire extinguisher with terribly complex instructions. They first can't get it started, and once set in motion, the extinguisher has too many steps to get through and the fire grows and grows.

Noel

Wow. That's terrible. Mine was giving them a depleted extinguisher with no instructions and putting them on one of those weird game shows, where if they can't make the extinguisher go, they have to eat spiders.

Marley

Ew! You both had much worse ideas than me. I think mine was just lazy. I said just give them no instructions and wait for a fire, then put up a list in the hall of those who messed up. Eli, your wrong design makes me think of how—in some of our units, it could go really wrong if someone who got basic training used the wrong kind of extinguisher. Some of our labs have two or three kinds for different situations.

Noel

You know, at first, I thought, we just need to make sure everyone knows how to use a basic model, but now I wonder if that could actually lead to accidents. If we tackle this just as a compliance problem, we could make it worse.

In this vignette, how did the problem change as a result of insight gained from generating wrong ideas? Why do you think it changed?

In our work on WTP, designers' beneficial ideas, though not numerous, tend to be both creative and empathetic. We have several reasons for why WTP might work. Perhaps designers feel beholden to stakeholders after coming up with harmful and humiliating ideas? Or perhaps they simply gain empathy? Maybe they notice something new about the problem situation? Or, perhaps in absence of the pressure to be right, they are able to be more creative? Afterall, research on suspending judgment suggests that it is difficult to accomplish.

Conclusion

Instead of treating ideation as the tipping point between being problem- and solution-focused, try generating ideas across the depth and duration of your design process to help you frame the problem with empathy and design learning experiences that meet needs without unintentionally widening gaps. By depth, I mean that it can help to drill down and ideate on a particular aspect.

While this chapter introduced a few techniques, there are many more available.

Additional Readings and Resources

There are many texts that illustrate additional ideation/creativity techniques. I always recommend keeping an eye out for one that appeals to you.

Kelley, T., & Littman, J. (2006). The ten faces of innovation: IDEO's strategies for defeating the devil's advocate and driving creativity throughout your organization: Crown Business.

Michalko, M. (2011). Cracking creativity: The secrets of creative genius: Ten Speed Press.

Michalko, M. (2010). Thinkertoys: A handbook of creative-thinking techniques: Ten Speed Press.

Sawyer, K. (2013). Zig Zag: the surprising path to greater creativity: John Wiley & Sons.

Finally, ideation can be an effective tool when employed at any sticking point. Low fidelity prototypes, use-cases and early storyboards often reveal issues that can be dealt with through ideation. Even in pilot implementation, having ideation techniques ready-to-hand can avert disaster when issues come up. This kind of generative thinking—How can it work? How else could it work?—serves designers well throughout their design work.

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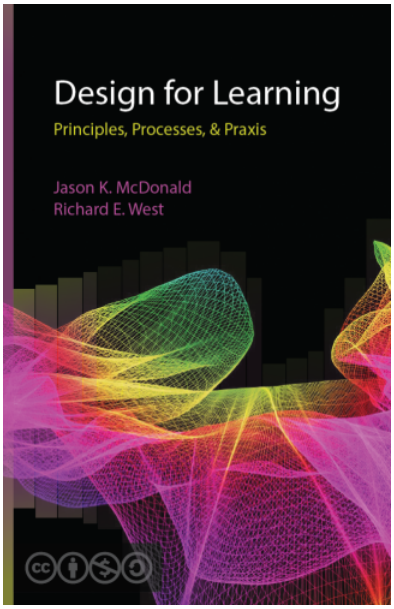

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