‘GAMEBOOK’:
TEACHING RAPID IDEATION SKETCHING THROUGH GAMES- AN INTERACTIVE IPAD COACH

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1. INTRODUCTION:

Sketching remains the fastest method for industrial designers to generate ideas as well as edit, refine, and ultimately accept or reject them. As Bill Buxton writes in his excellent book Sketching User Experiences: ‘At the front end of the funnel, when there are lots of different concepts to explore and things are still quite uncertain, sketching dominates the process’. To complicate matters, the acceptable levels of fidelity associated with such ‘front end’ sketches have been expanding to accommodate not only physical products but services and experiences as well. Design sketches today routinely include a wide array of diagrams to help identify stakeholders or product/service attributes, quick initial low-fidelity (ie: stick-figure) storyboards to help visualize personas within scripted scenarios, sketchy wireframes to help visualize and plan interactive navigation and menus, and of course the classic middle or high-fidelity industrial design form-giving sketch or freehand orthographic drawing. This spectrum moving as it does from the nearly cryptic abstract diagram to the child-like temporal storyboard to the classic three-dimensional perspective sketch is rich in possibilities but complex in terms of teaching. Add to this the fact that designers are rapidly integrating unique analog-digital workflows to allow for greater fluidity and nimbleness between pen, paper, and screen, and you have an invigorated skill set that remains not only central to the profession but greatly expanded in terms of use/function, execution, and presentation. Teaching this robust tool in its many manifestations is a huge challenge and one that should be met head-on with the emerging conventions and technologies of the 21st century. In this paper I will discuss what I see as the primary challenges as well as some of the opportunities afforded by mobile tablet technology to ‘coach’ students in their skill acquisition while not losing sight of the richness and even ambiguity that sketching has always benefited from.

2. THE SKETCHING ODYSSEY

Sketching remains one of several ‘holy grails’ for undergraduate industrial design students. The inability to produce a sketch that ‘looks’ like the thing it purports to be is often the source of doubt and possibly even shame. What most students fail to grasp, however, is that the ability to sketch successfully does not come through a single epiphany or a single clear and thorough explanation but rather through the slow and deliberate accumulation of information, countless trial-and-error episodes, endlessly repeated exercises, and finally the successful application of the acquired knowledge to personal work in context. Additionally what’s left out of the equation is the practical reality that design sketching is not a uniform one-size-fits-all process but instead a richly diverse process that must fit the individual designer’s needs and mental models of the larger ideation process. Sketching, in other words, like any skilled activity requires a degree of individualized training accompanied by coaching, practice, and experimentation. And because the rapid ideation sketch is a sequential process full of micro steps with degrees of flexibility requiring interpretation that come together to create a unified result, it’s critical that the student sees her skill within the larger context of problem solving. Sketching is after all one step in a much larger process that feeds the prototyping process, the 3-D modeling process, and other critical design steps. So while sketching existing designed artifacts might be initially useful, students must learn to construct completely new objects in space with confidence, ease, and speed. The focus of rapid ideation sketching must ultimately be on creation as opposed to documentation.

In this respect the sketching process is similar to golfing, cooking, performing card tricks, guitar playing, and any number of other nuanced skills. And like cooking, the end results of a good sketch partially reveal the process of its own making while remaining unique. At the risk of over-exploiting the analogy, sketching begins with good recipes, internalized skills and solid

preparation, and a willingness to improvise and experiment on the fly. The challenge for any faculty member teaching the subject or any book explaining the process is to provide a multiplicity of methods that translate into multiple learning styles while emphasizing the broad range of fidelities required for real problem solving. The 2-minute thumbnail might be all that is necessary to jump start an idea much as the stick figure scenario might be just the right approach to help a designer understand the larger context of use for a mobile phone. There continues to be a massive divide between sketching as an integral part of the thinking process and sketching as proof that one is a designer. The competent (or spectacular) 3D form study sketch cannot be undervalued but it must be understood within the larger continuum that often begins with far less spectacular mark making. For too many students good sketching seems divinely ordained rather than humanly acquired through practice and perseverance and while almost anyone is easily convinced that they can learn to cook, the same cannot be said of sketching.

3. THE CHALLENGES OF ILLUSION

So why is this? Part of the answer lies in the fact that sketching is an act of illusion and unlike cooking- the results of which can be tasted along the way- or guitar playing- the results of which can be heard along the way- the effectiveness of sketching remains partly embedded in vision itself. Many students simply can't see that their sketches are off or wrong as they move through the process only compounding problems as they progress. Combine this with the fact that micro adjustments must be made continuously throughout the sketching process, and we arrive at one of the central problems of teaching the subject: good sketching requires not only a solid understanding of the process but also constant adjustment based on continuous assessment. Put succinctly, a student needs to constantly reflect on the process while in action which assumes a level of confidence which is hard to achieve with beginners. On the other hand, if the process is not approached correctly, bad habits and incomplete mental models quickly emerge that are more difficult to dismantle. A beginning student has to be made aware of their process from the very outset.

Henrik Gedenryd's book How Designers Work references the research and writing of Donald Schön quite extensively and in ways that are immediately applicable to the challenge just described. Gedenryd's goal of clarifying the work of the designer in cognitive terms provides a great starting point for thinking about sketching in the larger context of problem solving and form-giving. The simplest and most direct description of Schön's 'reflective process' is his elegant three-step method of 'moving-seeing-moving.' And while this trio of actions refers more to the discovery process that sketching initiates, it can also be used to help explain the simple act of describing something visually in a provisional and ever-changing fashion. Sketching is in fact exactly that: making a mark (moving), looking at it (very quickly) to assess it, and moving again (making additional marks or adjusting existing marks) until the first phase of the process is complete. This series of simple steps is repeated until the sketch is completed. Again analogs exist in every domain: mastering the control of a basketball (dribbling) must be successfully combined with offensive and strategic movements (passing and shooting) in order to score. No one will rate highly a player who can shoot and dribble well during practice; it's only in the context of the actual game and scoring points that count. Similarly sketching only functions within the context of problem solving and form-giving. A student may become proficient at sketching ellipses, confident lines, or smooth arcs but this type of practice only becomes useful once it is seamlessly combined into the larger flow of exploring and refining form. Ultimately any individual proficiency must be subsumed by the larger process of form-giving.

4. SKETCHING HEURISTICS- THE DEEP 'BURN'

For this reason the steps of any ingrained skill must be burned deep into memory in order to be effortlessly leveraged. Nobel Laureate Daniel Kahneman calls this 'fast thinking.' His research along with that of other social scientists on the psychology of decision making, divide mental acts into two distinct systems: 1 and 2 or fast and slow. A simple example should help to clarify the difference. When learning to drive the beginning student is extremely cautious and conscious of every step made as she steers more than 3000 pounds of steel on to the street and learns to navigate in open traffic. Once the student has logged sufficient hours to feel comfortable, that initial caution is typically replaced by confidence and ease; the student has burned down into memory skills that previously required conscious mental attention to execute. The ability to drive has moved from a 'slow' process (with extreme attentiveness) to a 'fast' process (with much less attention paid to the small incremental steps required to drive). This transition also marks an increased fluidity in the process. The confident driver, even twenty five years later, when caught in a torrential downpour will return to the 'slow' mode of thinking and focus all of her attention on tasks that have been successfully burned into memory a long time ago. Slow thinking, in other

words, is not replaced but merely bypassed by fast thinking. Such is also the case in sketching: what was once a slow and incremental process lacking fluidity and coherence, can, with practice become a fluid continuous process. Another way to think about this is the quick and flexible 'rules-of-thumb' or heuristics that emerge as we burn activities into long-term memory. We literally shorten or compress them into simple rules that can be followed without much forethought, which of course frees up the memory (an important requirement) for design thinking, problem solving, or attention to formal or technical details.

One of the reasons designers sketch in the first place is to simply 'off-load' ideas that are not easily held in short term memory for very long. Research, while not unanimous, suggests that between 4 and 7 objects can be held in short term memory. This is crucial and brings us back to the central point of the sketch process intended to help the designer 'visualize' her thoughts before they disappear. The dynamic sketch page serves as a kind of memory bank. Often when viewing work completed a day or two earlier the designer recognizes a concept or direction that was not immediately apparent at the time the sketch was done. Writers describe precisely the same phenomena. Famed author and journalist Joan Didion puts it succinctly: ' I write entirely to find out what I'm thinking, what I'm looking at, what I see and what it means…' Words like images allow us not only to see what we are thinking but also to adapt, rearrange, and build on previous ideas or concepts. Sketching must become a form of thinking or to put it more precisely: sketching is a form of conversation that the designer is having with herself- another idea first articulated by Donald Schön in his Reflective Practitioner.

In chapter 4 of Gedenryd's book How Designers Work the author uses as an analogy the differences between written language (communication) and spoken language (conversation) to discuss the dynamics of what he calls the interactive and intramental models of cognition. Put simply, the interactive (outwardly engaged) model differs from the intramental (inward) model by seeking constant external input. Conversation between two people flows fluidly with each person pulling the conversation based on their immediate needs, desires, and comprehension of the content. The written paper on the other hand lacks an immediate audience or participant with which to interact with the information as it is being formed or shaped. Sketching therefore is more like conversation than like writing- the page, the marks, the constant adjustments serve as the interactive element so crucial to a good conversation. This is also why a good conversation takes its shape dynamically often leading down paths that are completely surprising or unexpected much like a good sketch.

In Roger Martin's book The Design of Business the author describes what he calls the 'innovation funnel' (see illustration) much like any other convergent model that compacts earlier information into concentrated knowledge filtering and compressing as it proceeds. Martin however adds an interesting spin, pertinent to this thesis, that describes the compression process as one that moves from 'mystery' to heuristic to algorithm. And while this is a metaphor, the concept is clear: what was previously mysterious must be converted into compact rules-of-thumb (heuristics) before being codified into fixed formulas. What's perhaps more crucial in Martin's assessment is the stark contrast between innovation firms and analytical firms: 'Their cultures and routines privilege analysis over intuition and mastery over originality'. These attributes could be applied directly to the learning and use of rapid ideation sketching. Mastery is almost never the point as it impedes intuition, originality, and speed. The codified algorithm despite its metaphorical use here remains cogent. Without a strong system in place for decision-making during the sketching process, the designer (and student) spends too much time thinking about the execution of the process and not nearly enough time using the skill to 'think' about possible solutions and appropriate forms.

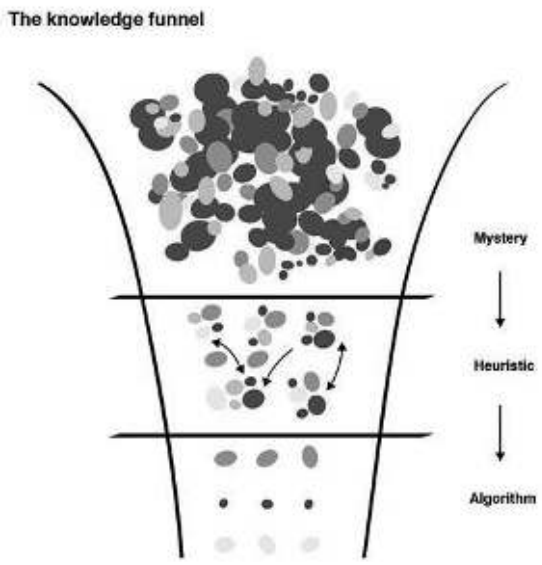

Figure 1. The innovation funnel as described by Roger Martin applies directly to the process of learning rapid ideation sketching. To the average student sketching is a mystery that has to be explained with simple direct heuristics that in turn must become hard-and-fast methods or procedures that are intuitively executed.

It's really only through a form of coaching that students can begin to see the learning process as a series of plateaus. Comprehension and comfort with the first phase of the process allows a student to move on to the next plateau or level much like a game. At some point the skills required to be truly inventive will emerge based on previous foundational levels. The design student slowly levels up in a way that is unique not only to their style of learning but their own mental model of the process. The 'game' of sketching has captured their imagination significantly that they now want to get better at it and they are beginning to understand the levels and dynamics of the process/game. Eventually they can reach that plateau where sketching is transformed into a truly inventive skill. These are the challenges of standard print text books. They simply can't assume such a dynamic role in the process. They are unable to encourage a student in specific directions or challenge the student until a level has been achieved. The design student needs to have the sketching process broken down into small yet comprehensible steps that can be easily and efficiently practiced with some form of feedback (ideally in multiple formats), and constant encouragement to move forward and complete the game.

5. THE 'GAMEBOOK' CONCEPT

We live in a world where more and more learning is happening asynchronously on-line through websites, video channels, blogs, and social media sites. A world where students view their mobile phones (and increasingly tablets) as untethered tools to link them to instant information and continuous communication. As a result we are witnessing a 'de-centering' of the traditional book as rich media formats proliferate. It is well documented that the learning styles for visually inclined learners are visual and hands-on: 'People with this kind of intelligence tend to learn most readily from visual presentations such as movies, pictures, videos, and demonstrations using models and props.' And still we try to teach from textbooks that are static, less participatory, and poor in terms of multiple media (modalities). Even in the traditional classroom there is usually an overhead projector for the faculty member to augment their material with powerpoint or keynote presentations and/or direct sketching on whiteboards to reiterate key concepts. A teacher will also typically work one-on-one to provide more targeted and focus feedback to a student. Once the student leaves the classroom however, this type of attention vanishes and the student is often left feeling alone and lost.

And while a verbal explanation works well for one student, a diagrammatic explanation or animation might be far more effective for another type of student. With interactive books it is now possible to deliver content/information in a multi-modal manner through text, images and captions as well as through rich video interviews, video tutorials, animations,

interactives, dynamic quizzes, etc. In this scenario the student maintains greater continuity with the materials they are learning when they leave the classroom because they carry the rich media with them. The interactive book also presents multiple pathways for navigating the content and learning the skills both in and outside of the classroom. Redundancy, much like the multiple menus/ways of interacting with software, is standard with most interactive media: there is more than one way to do anything. So the student is able to choose her ideal mix of modalities to learn content- a reality that remains consistent throughout the book experience. For example this could be an audio file explaining an image or exercise; it could be an animation demonstrating a technique; it could be a textual description accompanied by rich information graphics; and so on. The various modalities live side-by-side hidden until activated by simple buttons that bring up the information a student wants when she wants it. As the student's knowledge increases she may find herself using less of the rich media and more of the traditional text/image explanations. This option remains open and therefore engaging.

Figure 2. Digital video shot with a Canon 60D (DSLR) provides professional quality video capable of leveraging the manual focus to help direct the viewer's attention where it needs to be.

The book continues to feel and function like a book although its essentially a 'mash-up' of the media types students are familiar with and seek out through video channels, blogs, and forums. The biggest challenges are getting the elements correctly balanced: the right mix of textual description, video interviews, animations, and audio/textual descriptions so that there is a 'game-like' quality to the interaction. The student has to be drawn to the book much like they are drawn to a game: to explore, to compete, to win. The capabilities of HTML 5 widgets to connect to social media sites definitely increases the game-like qualities by allowing students to upload sketches photographed with the internal camera or send sketches drawn within the book (another HTML 5 widget) without leaving the actual book. These more sophisticated widgets will greatly improve the social aspect of learning. For now however, Apple has provided a nice set of simple-to-use widgets that create instant interactivity in the form of embedded keynote presentations, image galleries, scrolling sidebar, pop-over, interactive images, review (interactive quizzes) 3D objects (DAE files required), and embedded rich media (video, animation, and audio). While these widgets require a lot of testing within the book to gauge effect, the learning curve for creating content is reasonable and generally intuitive.

Figure 3. The interactive book uses some standard navigational conventions such as the thumbnail page scroll while allowing for simple and intuitive rich interactive media triggered by custom designed buttons and beautiful graphic overlays.

6. THE IPAD AS A PROTOTYPING MACHINE

As with any thorough design work, research and testing are a necessity. Certainly designing an interactive book is no different than designing a product. A book, like an object, must be intuitive to use; it must deliver the desired experience(s) in a pleasing and effective fashion; and it must be affordable. The single biggest difference in the product development cycle of an interactive book is the speed and immediacy. With the ibooks author software and the hardware (ipad tablet) one has a virtual prototyping lab at their fingertips. The only ingredient beyond good layout, smart use of interactives, and logical storytelling, is the ability to produce the appropriate assets- rich media as mentioned previously. The software requires little or no coding (HTML 5 widgets can greatly extend what the book can do but they not required) and provides a wysiwyg (what you see is what you get) environment leaving the designer free to explore, build, and test all in a matter of minutes. While designing apps requires a lengthier process of creating wireframes and testable simulations to sidestep costly errors once the programming is undertaken, ibooks author templates allows for the quick creation and immediate (a matter of minutes) testing on end-users. This is an amazingly seductive issue turning the ipad itself into a prototyping machine.

The challenge however is meeting the production standards students have come to expect through documentary films like Helvetica and Objectified and the beauty, novelty, and intuitiveness of interfaces like those found on droid devices, Windows 8, or the Mac IOS. Students will put up with the poor production value of a youtube video tutorial demonstrating surface modeling strategies for Solidworks, but they are less inclined to want that in a book they have paid for. And while the economics of ibook distribution and generous royalties provide plenty of incentives for creating highly produced books with the expectation of easily recouping the investment, it still forces an industrial designer/educator to move outside his comfort zone to become a documentarian, animator, and writer. The situation can be remedied in several ways: first by simply learning what's required to create highly polished professional looking 3 minute video and animation pieces or by initiating creative collaborations that bring in small but highly produced 'chunks' to create the first interactive books and then financing subsequent media components from book profits. With a distribution network that is both global and virtual and none of the upfront costs associated with paper, printing, and physical distribution, the process is very manageable.

The real challenge is understanding the true capabilities and building a base of users/supporters interested in the transmedia possibilities of any subject. Henry Jenkins' writing on transmedia is especially pertinent to these developments.

7. THE FUTURE IS TOUCHABLE

The future is increasingly about intuitive and touchable (haptic) information: gaining valuable learning insights not through vision alone but through touch. Touch, the most primordial of our senses, deepens the learning outcomes because of the direct engagement with material. When we really want to know what a fabric feels like we touch it. When we want to know whether something is really warm, cold, coarse, or smooth we touch it. And when we want to connect with someone more deeply we touch their shoulder, pat their back, or shake their hand. With so much information possible and ultimately accessible (lurking under simple buttons) the possibilities open up for each of us to select what we want to see and when. There is also the real possibility to return to a richly endowed book to read it in a slightly different way or to access the information over and over again like a tutorial. Touch is a conscious choice we all make and all conscious choices require attention that in turn forces us to focus on the selected choice. It's really only an infant that will push ten different buttons for the heck of it; for the rest of us it's a conscious choice driven by curiosity and desire and once that commitment is made it is more deeply ingrained in our consciousness. The ability to create interactive books that open up the possibilities to hear or watch professionals doing what they do best and explaining it followed by a diagram that reiterates the fundamentals or an animation that annotates it is like Sunday football complete with the commentary, slow motion replays, graphic overlays, and of course the game itself. We live in a world where layered information is the future replacing the singular modality of any former media. Audio is great but audio accompanied by the right image is greater. The possibilities are endless but the future is certainly there in books that work like games that contain prompts from coaches combined with quizzes and words of encouragement. The smart book is the book of today and it is not Gutenberg's moveable type but rather moveable and moving media.

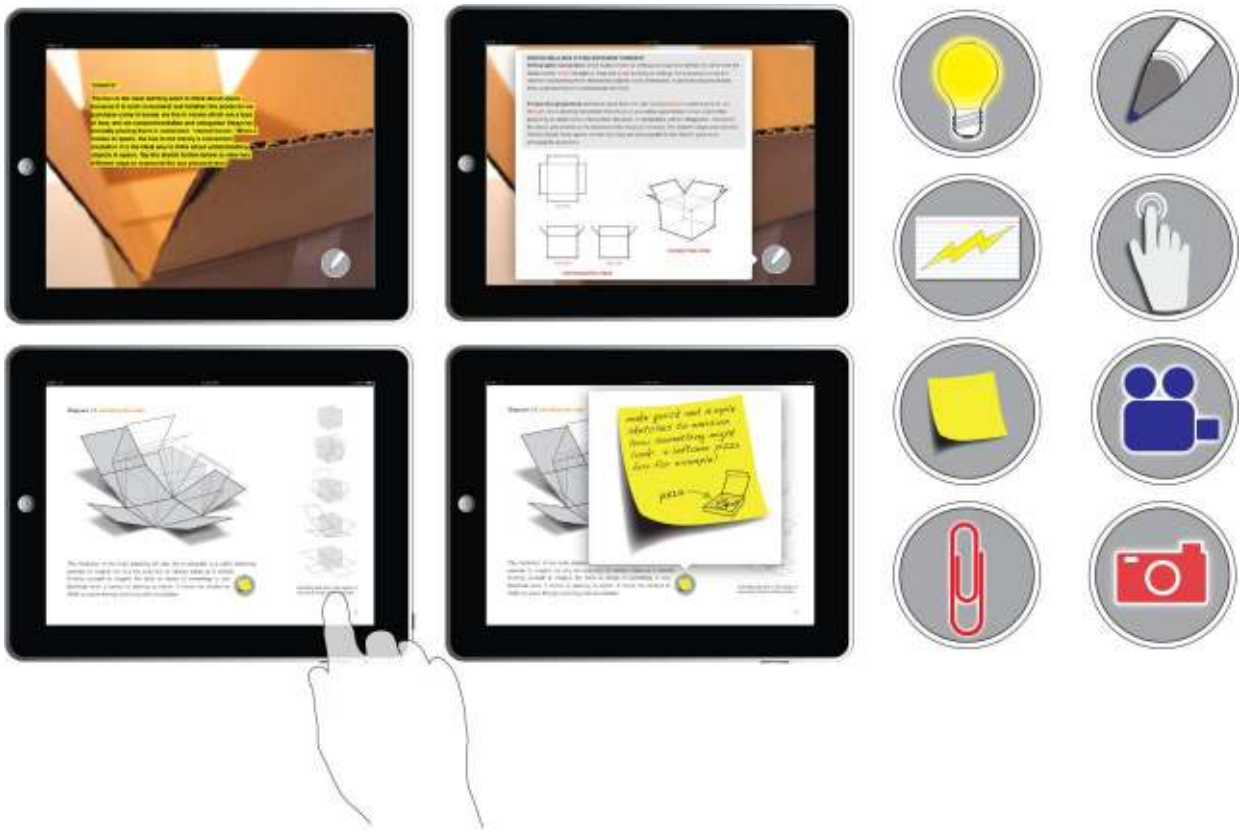

Figure 4. The 'coach-like' aspects of the book come in many forms. On nearly every page there's direct feedback on key issues (post-it note icons bring up simple short reminders), quiz icons test on a rolling basis, touch points bring up deeper explanations often in the form of info-graphics, and pencil icons demonstrate technique in very focused ways. Additional audio clips and video/animation clips demonstrate by doing rather than describing.

8. SUMMARY

This emerging platform while certain closer to an interaction designer's heart than industrial designer's heart is after all still a product and demands industrial designers to enter the fray. While book design remained the domain of writers, editors, and graphic designers, the interactive book is both book and object- a perfect melding of content to form. And while as an industrial designer I might not be able to impact the form of the ipad, I certainly can think about the experience the resulting book can afford. More importantly as an educator (hence a domain expert) I (and all other educators) have the insights and knowledge of knowing how students learn and what they need to move forward. Increasingly I see myself as the coach George Kembel described in his Forbes article on the classroom in 2020. And as we move towards a more open classroom full of cross-disciplinary collaborators working in seemingly chaotic and less organized ways, the proliferation of coaches (real and virtual) out at the periphery of the process will become ever more important. Designing those coaches and learning from that incremental process is the future of education and certainly breaks the rules of both the static classroom and the static (albeit well-designed) text book. Game on!

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