Teaching Interaction

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Abstract

Teaching interaction and interface design should begin by defining what, exactly, these terms entail. This is particularly important considering the range of undeveloped notions students often bring to introductory studios in interactive media. Although most are avid users of the Internet, few grasp either the conceptual or practical aspects of designing for interactivity.

Most design educators understand that showing examples of design—in this case interactive media design—as a means of defining what it is, let alone how one designs can be entirely misleading. Even well-articulated critiques of examples, or verbal definitions of the process can be difficult to digest by upper-level undergraduates or first-year graduate students. Teaching real-world projects as a means toward understanding has limited usefulness in many design disciplines, and this is an especially problematic approach in the complex cultural, technological, and informational landscape of interactivity. What is needed is an experiential-based introduction that allows students to actively engage in the fundamental concepts of interaction design by direct participation, observation and synthesis.

However, the preconceived expectations students often bring to the classroom—not the least of which is the allure of a high-tech realization—creates an unfortunate atmosphere that educators confront. This expectation focuses on the immediate gratification of learning how to use software tools to create “really cool stuff” apart from more transcendent inquiries into the dynamic nature of interactivity, and how designers can shape nonlinear, interactive experiences.

This paper presents an overview of the above issues, and then outlines an introductory approach to teaching interaction design within a required 6-credit studio on interactive media design in the Department of Communication Arts + Design at Virginia Commonwealth University. These projects, which draw from product design as a learning model and range from two to five weeks in duration, crystallize the concept of interaction as a foundational premise for interactive media design. Through individual and team investigations, direct experience and careful observation, students are introduced to some of its core components; among them are the principles of feedback and conceptual mapping, as well as diagrammatic representation of interactive processes.
For a period of four consecutive years beginning in the fall of 1997 I began all of my design classes—both those specific to interactive media and others more traditionally print based—with a questionnaire. While the nature of the questions varied semester to semester, and course to course, each year I attempted to pull as much practical information about each student as possible (namely email, course expectations, and competency in relevant subject matter and studio skills). But each year I included this question: In your own words, briefly explain “interactivity.”

My purpose with this question was fairly straight-forward. I wanted a sense of what students of design understood about the idea behind the lay-usage of the term. At the time “interactivity” had come to be appendaged to a variety of mass-consumed cultural artifacts, but also to design education as programs positioned themselves more concretely within the vague discipline descriptions of “new media.” Consequently I knew that design undergraduates were being exposed to this term both in design courses and via the larger informational apparatus of design education.

While not scientific, the early results indicated reason to be alarmed. Clearly 30% of the answers ran along the lines of: “graphic design related to 3-D,” “exciting visuals,” “having sound or movement,” or, more directly (and more common): “animation.” Other answers were somewhat encouraging (“participation,” “talking to computers”) and some were vaguely insightful, but much of my students’ approach to their own work in my early courses reinforced a bias toward “animation” as a good description.

There are clearly some formal relationships between kinetic imagery and interactivity, and these similarities are worth understanding. But their differences are, in a way, self-defining. The creation of sequenced but captive narrative, bound by a linear media is not the same as the cumulative participatory experience of an open narrative.

Confusion about popular or practical usage of “interactivity” is at least a good place to begin teaching the subject of interaction. I can compare and contrast. I can point to fundamentals of interaction that pervade publication design, architecture, and product design—in addition to PlayStation. What is not helpful is that students will often bring other expectations to interactive media coursework that obfuscates this valuable lesson—not the least of which is the allure, indeed an almost mystic attraction, of high-tech realizations. Among students’ notable answers to my question of course expectation is inevitably acquiring software and other technical skills. Not as a means to an end; often it is an end in and of itself.

In my experience, devoting introductory coursework to showing examples of real-world projects of interactive media design as a means of defining what design is or the process of its creation gives only additional substance to student’s desire for learning technical as opposed to conceptual routes to realization. Hugh Dubberly, designer and design educator, cautions against this temptation in design education. “Teaching with real-world projects carries risks,” he says. “The outcome or product can overshadow the process. Time spent working on
the product can crowd out time spent understanding principles." ¹ I would add that in the context of a studio coursework, the complex cultural, technological, and informational landscape which is intertwined in the creation of interactive media projects cannot be gleaned from a surface presentation of case studies.

However, as an educator intent on educating, I cannot completely ignore the fascination for technology, the compelling nature of kinetic imaging, or even the appeal of the finished product. Even when only one of these brings students to interactive media design, squashing such attraction defeats the educational intent by undermining a needed level of motivation.

The following is a description of how all of this might be approached in the context of an introductory class. It is an amalgamation of many years of formulation, and includes work from my own class section and two of my colleagues at Virginia Commonwealth University (VCU). The context of the course is a required 6-credit, junior level course at VCU in the Department of Communication Arts and Design. It is a component of a 130 credit BFA degree in Communication Design. Students have previously taken required coursework in publication design, typography and design history as well as 6 credits of computer techniques training. The underlying objective of the course is to actively engage students in the fundamental concepts of interaction, and apply them to their work.

At the start of the course I make it clear to students that much of interactive media design, and much of the work in the course, relates to product design and development. The immediate benefit of this perspective is that students begin by not focusing solely on the computer. However, it is product designers’ focus on users and their needs that I place overt emphasis: the outcome is based on user-centered considerations. For 99% of these communication design juniors, this is uncharted territory. Worse than that—from the students’ perspective—it is not on the computer. But this sense of unfamiliarity is actually very helpful.

I attempt to channel this pioneerism into an 8 week-long analysis and interpretation project involving the use of a mundane object. The object must involve interactivity between itself and the user and be used to perform a simple task. I typically provide a range of appliance and tool choices: setting an alarm clock, using a vending machine, or taking an elevator to another floor of a building. My colleagues have used slightly more complex objects and tasks including the use of a tape player and a copying machine. All of these objects do not reside in the latest technology for interaction designers, but in everyday physical experience. This enables students to study a process without having their thinking obscured by a desire and drive for software training.


This paper is an expansion and update to the portion devoted to Virginia Commonwealth University, “Representing Interaction.”
I use mundane objects and tasks for two reasons. My primary interest is engaging students in observing actions that are taken for granted, automatic, or tasks they’ve done for years without really thinking about doing them. Much of interaction design involves precisely this: the articulation of transparent processes that must remain transparent to be successful. The second reason is that this transparency is harder to identify in unique, compelling experiences. I am somewhat sidelining the poetic possibilities of novel interpretations in uncommon objects and exotic tasks with this project.

It is through these mundane and common place objects that students are immediately confronted with some core components of interaction and interface design: identifying events, actions and feedback that occur in the use of the object. This would include everything the user will see, hear, feel and do as well as everything provided by the object’s interface to initiate, represent, process and otherwise facilitate.

In observing the use of an object, students begin by organizing aspects of the experience into related sequences, such as beginning actions, ending events, etc. With further examination, students identify user actions and feedback, both critical and non-critical to the outcome of the task. Feedback, entailing the response actions in the object’s interface, can vary tremendously depending on the type of object studied. In a manual tool, for instance, the feedback can be the look and feel in the hand, the resistance to a kind of hand movement, the sound of engagement, etc. For an appliance, the feedback might include the result of switching or toggle mechanisms to indicate to the user a particular setting or adjustment, or simply that a specific selection has been made. Related to this is the principle of mapping. Psychologist Donald Norman defines mapping as the conceptual relationship between two things, such as the controls and their movements and the results in their manipulation. 2

The culmination of this exploration is to produce a diagrammatic representation of the user’s experience. To be able to visually interpret events, actions and feedback challenges the student to abstract this process to a level outside, above or simply away from the user’s actual experience. Visual mapping provides students a critical means for plotting, planning and envisioning a course of action and the tools for predicting successes and failures in design and communication.

Preliminary object study
In relation to the object, students use a task-oriented experience as the subject of a simple linear diagramming exercise to precede the more in-depth exploration of the interactive studies that follow. Each task ranges in degree of complexity (getting a soda from a vending machine, setting the time and alarm on a digital clock to a specific time, using an elevator to go from one floor to another).

Students perform and document these largely linear paths of

experience and exchanges, which are visualized into a diagram representing critical and non-critical actions, feedback and consequences. The students are encouraged to innovate the visualization of this information, or find alternative means to visualize the process in a clear and useful way. The work they present ranges from straightforward flowchart diagrams (figure 1) to somewhat inventive typographic hierarchy studies (figure 2). Typographic hierarchies lend themselves to a more expressive visual narrative in representing the user experience while preserving some of the functional detail including flow, feedback, actions and events. Flow-charts tend to clearly represent the functional detail, but often at the expense of this visual narrative. Critiquing both approaches among 15 or so individual solutions allows for a wide ranging discussion on modeling experience.

![Figure 1](image1.png)  ![Figure 2](image2.png)  ![Figure 3](image3.png)

A critique of these preliminary diagrams typically will focus on the clarity of the visual language used to describe the process, and what limits have been discovered in describing the full extent of a user’s experience. Work from this week-long study allows students to develop a vocabulary and corresponding visual language of interaction and lays a foundation for the more complex investigations that follow.

My colleagues have included complex tasks of finding and playing a song on a tape player and making a photocopy. In every case, students are asked to pay particular attention to the interface and aesthetics of the object, direct and indirect feedback, return and exit opportunities, and the accommodations for human error.

In the tape deck diagram (figure 3), students map out the experi-
ence of turning the tape player on, loading a particular cassette and listening to the second song/track on the second side. Particular attention is paid to the sequence of events required to complete the task (including cycles of actions and backtracking steps) and to the sensory feedback that the system provides. This feedback is comprised of visual, auditory and tactile cues. It is further broken down into categories related to direct feedback ("designed-in" responses such as LED lights, textual information on digital displays, audible clicks, etc.), and indirect feedback (the audible whirring of the tape motor, the tape "hiss" indicating space between songs, etc.). User actions are also broken down with respect to required actions (e.g., pressing the "play" button) and optional actions (e.g., adjusting the volume). Some actions are seen to fall into multiple categories (e.g., the adjustment of volume might become a necessary step if it is initially set to zero).

The photocopier is a very complex object to experience, analyze and map because of the variety of operations it can accomplish for the user. The diagrammatic solution (figure 4) for this object focuses on a specific task: to make a single black and white 8 1/2 x 11 copy at 100 percent. This constraint allowed the student team to focus acutely on the subtleties and nuances in the experience. The team determined four significant aspects involved in using the copier and then developed a symbol language assigning a geometric shape to each of the four aspects. These included the copier procedure, payment procedure, user evaluation and feedback. The symbols greatly facilitate an understanding of the experience. They clarify the distinctions between linear sequences, points of decision and user options. The feedback, both direct and indirect, is separated physically from the copying process, but positioned parallel to corresponding events. The looping in this diagram accounts for both human or machine error, making very clear both the things that could go wrong and those that need adjustment and how to successfully accomplish the desired task.
In recent years I have reformed this preliminary study as a three-week progressive sequence starting from a linear list of actions and events that evolve through a typographic hierarchy exercise to better discriminate between the quality and quantity of discrete actions or events (figures 5 and 6). The result has been a welcome diversion through typography and information design in the service of formulating the final diagram (figure 7).

An unforeseen difficulty has been bringing students to the conclusion that diagrams are legitimate end products of visualization, that model making is a necessary and essential step, and that the models are, like prototypes for final products, required in iteration for evaluation. The extension of the preliminary study through this progressive sequence of visual articulation helps to increase students’ appreciation for this need.

**In-depth analysis of interaction**

During the last half of this project the door is opened towards the planning for complex interaction. Using the same subject matter, students work in teams of 2-3 toward an in-depth examination of how to visually represent the many possible objectives in the use of these objects—creating a diagrammatic interpretation of the entire set of possible interactions, experiences and outcomes involved.

The examples shown demonstrate how different objects can be uniquely structured to best visualize user interaction. The elevator diagram (figure 8) segments the task of taking an elevator car from one floor to another into various phases of the experience. The diagram begins with the initiation of the process outside of the elevator car. Actions, events and feedback are categorized within these stages as critical (the up-button must be pushed) and non-critical (observing the floor-to-floor travel). An efficient means of visualizing recurrent feedback and actions is also stressed.
Two examples for the vending machine show the range of interaction representation that can be explored. The first of these (figure 9) focuses on categorizing the many different and detailed user actions involved in the transaction of payment culminating with the choice of one beverage. Here again the emphasis is on the manner that recurring feedback and actions are represented. The second (figure 10) shows a conceptual view of the user experience resulting in an inventive diagram about stages of interaction building upon each other, beginning with the center and ending with the outside. This permitted the student team to align similar actions and feedback across many axes in the resulting circular representation.
What students have in the end is a reverse-engineered investigation of the many considerations we can imagine would be part of the original design and development of these objects. Students are not asked to re-design the object (although many critique discussions point in that direction). The final diagrams are typically very large, well-executed, often color visual interpretations. Predictably this is not what students anticipated doing in this course, but remarkably the students are well-focused on this project. However, the truth is that this is only half of coursework during half a semester's work.

These projects coexist with, but are separate from, technical training that students will later use in the course. Alas, it is not all methodological inquiry into the design of everyday things. I have chosen to emphasize two distinct routes for my students during the first half of the course. Assisted by a twice-a-week meeting schedule students cover technology skills in the use of authoring software one day per week. Students will be required to use these skills in the later half of the semester. I run these days as workshops, and give short 1-2 week assignments covering essential technical skills needed to accomplish basic interactive functions. To contrast with the highly structured object/task investigation, I keep the assignments open-ended, and encourage students to be experimental. Animation, ironically, is the most useful point to begin this training (figures 11 and 12). For my students this means type in motion…. a real crowd pleaser coming off of two semesters of static, fundamental typography courses.

My full complacency in allowing students to indulge in techno-gratification is only checked by the limitations of learning what is, to the vast majority, very complex and unforgiving software. The students do not master the software within the scope of the course, but learn to work within its technical boundaries and where the technical boundaries can be pushed.

Through playful manipulation of type and development of skills that slowly merge animation into interactive components of the software (creating choices for the user, feedback mechanisms, and visual language orientation) students begin to establish connections between this distinctively divergent and open-ended approach and the careful methodological approach to engineering user experience.