Visualization Criticism

Criticism is a vital part of the practice of design, architecture, and art, and as such, is taught and practiced around the world. It's extremely difficult to establish rules for making good art or designing a new object. Instead of generative rules, we have well-established guidelines, styles, and best practices that often only apply to a finished object, or at least a reasonable sketch. Criticizing a work means applying these standards to identify weaknesses and suggest improvements. In art, some say that it's much less important to know how to do something specific than it is to know how to see.

Visualization is in many respects similar to design and art: We know a good visualization when we see it (or run a controlled user study on it), but it's impossible to define constructive rules that tell us how to design an effective visualization. Critiquing can be a useful tool for teaching, developing better techniques, and deeper thinking about visualization.

The critique in fine art and design

The underlying concept of a critique in the fine arts is that a work of art functions in clearly definable ways, albeit ways that can be complex, layered, and open to subjective interpretation. Art's function—the purpose it fulfills—is the expression of personal feelings, concepts, or values as paradigmatic of the values of the society in which the work is created. It's impossible to define rules for art only in the sense that the principles that govern artistic expression are constantly evolving in relation to changing societal values and attendant goals for expression. With the hindsight of history, it's quite possible to identify specific structures and approaches that have been effective in relation to certain expressive or conceptual goals, if only in the past. The broader goal of critique, and of artistic work in general, is to imagine new expressive approaches in relation to contemporary reality.

An art school critique exists in this wake of historical precedent, and the participants' reactions are a mixture of direct visual response and a recollection of previous structures in past work. Very often there's a shared body of knowledge that's assumed within the group, and comments by an uninitiated outsider, while sometimes providing an interesting new perspective, can also be irrelevant or even disruptive to a shared train of thought. An undergraduate critique isn't usually an open discussion, but one with a focused or limited agenda. A skillful critique leader, like the leader of any discussion, will know how to merge the advantages of an open forum with the benefits of a directed assessment.

In a graduate or research setting, we can set aside the task of shepherding the discussion. Critique participants tend to have clearly shared goals and understandings and are, to a greater extent, peers. In this case, the critique's goal changes to assessing success, failure, or interesting possibility. Expanding "the box" within which the thinking about a certain project has been done might be the ultimate goal, and one that is more often reached by diverse opinions or open frame of reference than in the undergraduate critique.

Critique might be gaining currency in the professional art world as the role for collaboration increases, supplanting in part the previous model of the single-minded artist in an isolated studio answerable only to him- or herself. The skills that the act of critiquing helps develop—articulating concepts and synthesizing diverse viewpoints—have an obvious relevance to the shared creative workplace, one already applicable to design fields such as visualization.

Criticism in teaching and research

One author's (David Laidlaw) early exposure to the formal context of visual critique was in an educational setting. He took a sophomore level painting class at the Rhode Island School of Design. During each class, students would mount their assigned work on the walls, and the teacher and students would comment on how well the work addressed the assignment's design goals and provide suggestions for better addressing the goals. This critique was not just to embarrass each student in turn, but to help students learn to see what satisfies various design goals. A secondary purpose was to help

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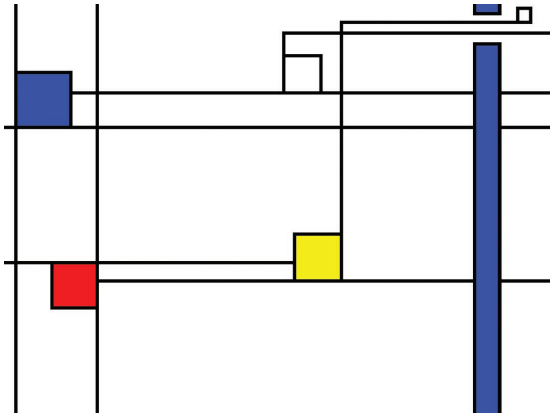**Fritz Drury** *Rhode Island School of Design*

Lars Erik Holmquist, *Swedish Institute of Computer Science*

David H. Laidlaw, *Brown University*

Figure 1. A critiquing session at Brown University, as part of David Laidlaw and Fritz Drury's Virtual Reality Design for Science course.

Figure 2. Informative art showing buses to and from campus.[3]

students learn to articulate their observations. For an art teacher, this is essential; for an artist, it's frequently sufficient to observe at a nonverbal level. In this context, criticism is a teaching tool.

David Laidlaw and Fritz Drury subsequently employed this type of educational visual critique in a scientific visualization design class (Figure 1). Participating as a teacher was quite different from participating as a student. Often during a critique, a series of points would come up, but would do so in an unplanned order. The students would vary the emphasis that had been planned for the critique, and other surprises would almost always crop up, making the process challenging, engaging, and fun. In our experience, one of the most important ingredients for a successful critique is a clearly articulated design goal for each assignment.

All critique types are somewhat similar, but by keeping the goals of the critique clear within the different contexts, they can often be made more effective. We believe that the visualization field can benefit from using more and better critiques of all three types: teaching, design iteration, and design review.[1,2]

An InfoVis critique and a response

An example of a short critique can be found in an article published at InfoVis 2001,[3] in which the authors describe their visualization for bus schedules (among other data) based on the style of abstract painter Piet Mondrian (Figure 2). They installed the piece in a university cafeteria to test if people would use it. After it had been there for a week, the authors conducted a study, which found that many potential users didn't realize that this was a visualization at all: they considered it a decoration. In subsequent work, one of us, Lars Erik Holmquist developed a model[4] of the three steps involved in being able to read a visualization; the first step is to identify a display as a visualization.

To put it another way, the visualization failed to work in the intended way. But why? Information graphics and bus schedules (even graphical ones) have certain styles, and they also exist in a certain context (that of a bus stop). There's no bus context in a cafeteria, so the bus schedule must be shown in a way that looks familiar, or at least be similar to the style of bus schedules. Using a style that's more common in a cafeteria setting (a Mondrian-like painting), but uncommon for bus information means that viewers will simply apply the decoration category and ignore the piece. When using art concepts, we have to understand the differences between art and visualization, and can't simply pretend they don't exist. Clearly, there are connections between the two, but they're just not as obvious as they might seem. Art—representational or not—works and is read in different ways than visualization. This fundamental difference makes it necessary to dig much deeper than merely copying a style for a visualization. Doing so would pretty up the visualization in the best case, and entirely destroy it in the worst. We need a better understanding of representation in visualization so as not to repeat such mistakes. But thanks to this study, we have taken a first step—we know that representation is different in visualization.

In response to this critique, the authors of the piece argued that they were looking for a type visualization that wasn't just confined to the desktop, but could break out into the real world. Their hypothesis was that what you are prepared to hang on your wall is fundamentally different from what you would accept running on your desktop monitor. People have to find a balance between different factors such as visual appeal, immediate readability, longer periods of use, and the demands on human attention. The aesthetics weren't also just considered the "icing on the cake" but instead were tightly integrated into the whole. In addition, the authors offer a simple test of the technique's effectiveness—they use it every day to catch the bus.

A critique of critiquing

In a critique, it's necessary to be aware of the context in which it's applied. While the art or design

"crit" as practiced in education is a give-and-take exercise, where the creator can engage in a subjective dialogue on a distinct and often very personal work, an information visualization application exists in a different realm. It must first help the user to solve a task, clarify a complex relationship, or otherwise prove itself useful. We can easily see this by examining different kinds of user studies and heuristic evaluations,[5] thus showing a visualization technique's effectiveness. Anybody is welcome to improve upon it and show that his or her technique is better using similar means.

For a critique to be more than armchair criticism, it must be done in the right way; it should be based on facts that come from real-world tests with users, performed in the right usage context, as well as being a professional and unbiased look at the visualization in question. In short, a critique cannot be done in an ad-hoc fashion, but requires evidence to back it up.

Finally, critiquing requires an open mindset of all involved parties, who might find it difficult to become comfortable with the practice, especially technically minded researchers who aren't used to a culture of criticism. A design prototype is a vehicle for communication about design, even if that isn't called criticism. Most people can discuss a design in a meaningful way, but when inexperienced people critique, it can easily develop into arguments about taste and preferences instead of objective principles. Additionally, when done too early in a creative process, it can limit the exploration of new and unusual ideas.[6]

Criticism for a new visualization

Criticism isn't a bad thing—it's a tool for pointing out and learning from mistakes. In a visualization context, critiquers can function as an impromptu test group, assessing qualities of organization and usability. Expertise in a professional critique means anticipating, as much as possible, all potential concerns for the design, from purely practical issues to matters of content and even broader social implications. This is no different from designing successful visualization techniques.

Writing about visualization means using a static medium to describe a highly interactive and dynamic one. It's difficult to capture a visualization's essence this way, and visualization papers often fail to describe the interactive parts of a technique or system in a way that's meaningful to someone who hasn't used the method or system (or at least seen a demo). In critiquing visualizations, we can develop a language and intellectual framework for describing visualizations more effectively. Taking that idea further, one of us, Robert Kosara, has argued that similar to art criticism (which is synonymous with art theory), visualization criticism could be a tool for further developing and increasing the usefulness of visualization theory.[7]

We are all used to the formal criticism we offer and receive in the form of peer reviews. The journal *Behavioral and Brain Sciences* publishes critical comments together with some articles, and allows the article authors to react to the criticism. This provides stimulating discussions that help clear up points and let the critiquer take credit for suggestions. The CHI (Computer/Human Interaction) conference is also adopting an open review system for its alt.chi track this year, in which anybody can post a review (using their name), and authors can comment on reviews.

Criticism isn't a new idea, but is inherent in our work—the design, evaluation, and publication of visualization ideas. Understanding what criticism is, and where and how it can be used, will help us move the field forward.

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