

# STUDY GUIDES

The **Chicago Humanities Festival** is committed to creating and fostering interest in the humanities. To this end, the Festival provides study guides to help teachers to bring the humanities into the classroom. Every year, the CHF brings an amazing array of authors, thinkers, and artists to Chicago. We hope you will seize the opportunity to bring the excitement of their works and knowledge to your students.

The unit on **Edward Tufte** on the following pages was prepared for the 2001 Chicago Humanities Festival: *Words & Pictures*.

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Edward Tufte gave the 2001 Publicis Lecture, "Visual Explanations."

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500 North Dearborn Street  
suite 1028  
Chicago, IL 60610  
tel 312.661.1028  
fax 312.661.1018  
web www.chfestival.org

# Edward Tufte

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Edward Tufte's mission as a statistician, graphic designer, and author is to make statistical information more truthful and easier to grasp. The techniques of doing that are a science in themselves—one that Tufte, a Yale professor, continues to pioneer and promulgate in books and lectures. In a world awash in information, it's vital that data be presented with clarity.

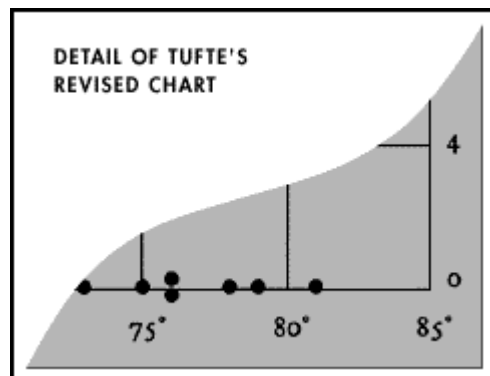
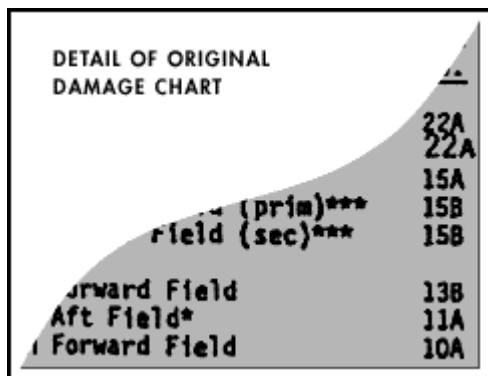
The essay on the following pages, originally published at Salon.com, traces an outline of Tufte and his fascinating work. Use the lesson that follows to get students thinking carefully about the surfeit of graphic design that surrounds us.

## READING LIST:

Tufte, Edward. *Envisioning Information*. Graphics Press, 1990.

Tufte, Edward. *The Visual Display of Quantitative Information*. Graphics Press, 1983.

Tufte, Edward. *Visual Explanations*. Graphics Press, 1997.



# The Data Artist

By Scott Rosenberg

Imagine being passionate about statistical graphs. Caring deeply about the integrity of numbers. Liberating the “data prisons” and expressing “the poetry of visual information.”

If the prospect sounds delightful, you're probably the sort of person who's already fallen in love with the books of Edward Tufte. If it sounds ridiculous, you're probably the sort of person who needs to read Tufte but doesn't know it yet.

In his three books, including the new *Visual Explanations*, Tufte, a designer, statistician and Yale professor, presents a devastating critique of the way information is usually pictured to us. Bad graphics, according to Tufte, lie by distortion, obfuscate by omission and confuse by decoration. We have grown accustomed to awful information: The pie-charts Ross Perot liked to grin over in his infomercials; the pictograms of Russian soldiers that President Reagan's aides employed to show him the size of the Soviet threat; the misalignment of pictures and quantities in journals from the *New York Times* to *Pravda*.

From the cigarette pack Surgeon General's warning, rendered nearly illegible by its thick-rule border, to the endless parade of tax or budget charts

that fail to adjust for inflation, Tufte is merciless toward the misleading—not so much because he shares the popular prejudice about “lies, damned lies and statistics,” but because he's irritated that we end up spending so much time deciphering bad designs when we could be exploring “the wonder of the data.”

Wonder? But aren't graphs and charts just dry compilations of boring statistics?

Ah, Tufte writes: “If the statistics are boring, then you've got the wrong numbers.” By this he doesn't simply mean that the “right” numbers hold intrinsic interest because of their real-life impact in politics, finance, medicine, everywhere. He's arguing that inspired design can actually cause the meaningful “right” numbers to flash out from statistical murk, the way heat reveals the lemon-juice marks of a child's invisible-ink experiment.

This sounds like a kind of magic trick—so it's not surprising to find a whole chapter in the new Tufte book devoted to graphic depictions of magicians' stunts. Only Tufte is studying the magician's tricks of indirection in order to refine the art of direction—to learn “what not to do if our goal is truth-telling rather than illusion-making.” Tufte's trilogy—the groundbreaking

Source: Scott Rosenberg, “The Data Artist,” available from Salon.com, <http://www.salon.com/march97/tufte970310.html>, [24 September 2001].

*The Visual Display of Quantitative Information* (1983), the follow-up *Envisioning Information* (1990) and the new *Visual Explanations*—is definitive work, the kind of combination of criticism, history and teaching that rewards repeat readings over the years. His first book recalls George Orwell's classic essay "Politics and the English Language," and not only because it paraphrases Orwell's famous advice that writers should break his rules rather than "say anything outright barbarous": In Tufte's words, "It is better to violate any principle than to place graceless or inelegant marks on paper."

On a deeper level, Tufte shares Orwell's impatience with doublethink and humbuggery, his insight that bad thinking and bad expression travel in a pair, and his awareness that they are usually deployed in the service of some brand of propaganda. It's no coincidence that so many of Tufte's examples of deceitful charts illustrate politically charged issues like oil price rises and tax rates. One particular swarm of disinformation clusters around the oil-price spike of the late 1970s; Tufte traces wild exaggerations in the *New York Times*, the *Washington Post* and *Time* magazine, where charts decorated with barrels and rigs added to the confusion.

**D**enouncing the presumption that graphics are "devices for showing the obvious to the ignorant," Tufte advises designers instead to assume a smart, curious reader who's willing to explore complex information as long as it's presented with grace and clarity. He quotes E.B. White: "No one can write decently who is distrustful of the reader's intelligence, or whose attitude is

patronizing." That's from *The Elements of Style*, another classic to which Tufte's books, particularly *The Visual Display of Quantitative Information*, earn a comparison.

Like that perennially rewarding writer's guide by White and William Strunk Jr., each of Tufte's lovingly designed, pristinely produced books exemplify the principles they codify. For instance, you never have to turn a page to follow a graphic reference in the text. It was the author's own demanding printing requirements that led him away from the commercial publishers to the do-it-yourself market; each of Tufte's books has appeared under his own Graphics Press imprint, and though retailers carry them more widely today, they're still most easily obtained directly from his Cheshire, Connecticut office (the information number is 800-822-2454).

It could be, too, that the big publishers unfairly pegged Tufte as a bit of a crank. His writing sometimes exhibits a curled-lip testiness toward its targets, and he's unafraid to wield the knife of the polemical critic. He declares, for instance, that a ludicrously overwrought chart of 1970s college enrollment from *American Education* magazine "may well be the worst graphic ever to find its way into print," or that a bar-style listing in a small-aircraft flight guide is "perhaps the worst index ever designed, a rare perfect failure."

But most of his books' worth lies in practical demonstrations well beyond the realm of critical derision. In case after case, Tufte offers step-by-step accounts of how to edit a bad chart, erasing distractions, removing unnecessary "data prison" grids, replacing meaningless labels with self-

explanatory ones, steadily reducing clutter and adding context and increasing the amount of valuable information per square inch. These are unforgettable little performances for brain and eraser that will almost certainly transform the way you read.

Each of Tufte's volumes also provides a trove of inspiring examples, ranging from thousand-year-old Chinese maps to representations of the entire charted universe of galaxies, from photos of Roy Lichtenstein murals to Japanese railway timetables. From such examples, Tufte builds a set of common-sense principles for data design: Tell the truth. Show the data in its full complexity and let viewers make their own discoveries. Highlight the “differences that make a difference.” Ruthlessly remove unnecessary ink. Offer “visual access to the subtle and difficult.” Reveal what is complex.

Tufte largely succeeds in following his own prescriptions; if he has one failure, it's the way his three books blur together. Though he has described the trio as being dedicated in turn to “pictures of numbers,” “pictures of nouns” and “pictures of verbs,” the distinctions are more evocative than absolute, and there is a small amount of repetition from volume to volume. Yet each of the books provides so much extraordinary, otherwise unavailable material that such complaints are quickly forgotten in the rush of discovery and connection. Voraciously eclectic, Tufte has no trouble in his latest book finding common threads between a two-decade flow-chart of rock 'n' roll ancestry and a Soviet cosmonaut's graph-paper chart of a 96-day orbit. Part of the fun of reading his work lies simply in wondering what obscure

masterpiece of graphical problem-solving he'll next unveil.

This kind of connoisseurship isn't simply an archival diversion. One chapter in the new *Visual Explanations* provides terse, stunning evidence of the real-world consequences of bad information design: It contrasts a Victorian doctor's successful use of maps to isolate the cause of a cholera epidemic with the misconceived charts used in the disastrous decision to launch the Challenger space shuttle. With heartbreaking thoroughness, Tufte shows that the industrial engineers who tried to persuade their bureaucratic superiors to delay the launch because of cold weather had all the data they needed to make an irrefutable case—but failed to include the right figures or to arrange them convincingly on the page. As Tufte edits and revamps the charts to highlight the cautionary logic in the numbers, you realize, if you hadn't already, that *this stuff really matters*.

“The visual display of quantitative information” isn't a very sexy phrase, and at the time of Tufte's first book, it might have been possible to view his agenda as fascinating but marginal. Today, as machines whose entire function is “the visual display of quantitative information”—computers—swallow up whole chunks of our economy and our culture, his work unmistakably addresses the very heart of our public lives.

Surprisingly, Tufte has little to say directly about digital design. He's appalled by the low resolution of computer screens compared to the versatile data-density of paper; he's dismayed by the way “computer administrative debris” and pointless

decoration eat up so much of the already limited onscreen turf. Mostly, he's alarmed by the way the tools of computer design have made it easier than ever for bad designers to litter their work with unnecessary icons and distracting "chart junk"—all of which has culminated in the reader-hostile pages of *Wired* magazine, with their jumbled type, their deliberate confusion of ad and editorial space and their gaudy inks that hide information rather than illuminating it.

With the exception of some deserved praise for Robert Winter's CD-ROM explication of Beethoven's Ninth Symphony, Tufte has nothing good to say about what he sees on computer screens. And sure enough, that index he cites as the "worst ever designed" looks dismayingly like the vertical bar-indexes you find all over today's leading Web sites.

This hostility has understandably led some digital designers to dismiss Tufte as a backward-looking engineer who doesn't understand the nature of interactivity. That's too bad, because the fledgling field of interface design can only benefit from the kind of historical perspective Tufte offers—and from his unwillingness to let technological possibilities and limitations shape the substance of his work. Much of Tufte's theorizing explores different visual techniques for making three-dimensional information readable on the "flatland" of the two-dimensional page. This is precisely the problem confronting computer designers—who get to employ an unthinkably powerful tool for multi-dimensional modeling and then have to squeeze its complex output into the

narrow windows and pixels of flat little monitors.

Three-dimensional digital imagemaking already dominates arcane fields like genetic modeling and aircraft design; faster than any of us expects, it is also going to invade the workday worlds of finance and telecommunications. As the speed and complexity of information multiply geometrically, the demand for visual tools to make sense of that information will only grow. The kind of cyberspace that uses real-time transformations of 3-D shapes to track the flow of financial markets and individual investments is no longer a cyberpunk pipe dream but a likely evolution of today's hair-trigger trading environments. We'll all be better off if the designers of such virtual spaces share Tufte's commitment to clarity and truth.

In Tufte's ethos of information design, "clear and precise seeing becomes as one with clear and precise thinking." We need such clarity and precision more than ever. To think intelligently about almost any urgent controversy today requires an alert reading of statistical evidence—whether it's an economic issue like the interplay of budget deficits and Social Security, an environmental issue like greenhouse warming or a social issue like the containment of medical costs.

Grasping our world demands grasping numbers—and trusting that we have grasped them correctly. Under these circumstances, Tufte's work becomes a friendly compass in an informational wilderness—and, when necessary, a machete to chop through thickets of disinformation.

# Bring the *chf* into the Classroom!

## Lesson Plan: Graphic Arts Awareness

### Activity Objective

In this lesson, students examine and evaluate examples of graphic art. They will consider whether the graphic art is clear or confusing, and consider the consequences of poor graphic design.

### Grade Level

This subject is suitable for high school students.

### Background

Graphic design matters. Prior to the disastrous launch of the Space Shuttle Challenger on January 28, 1986, engineers for Morton Thiokol, the rocket-maker, warned NASA against launching. The engineers had the right idea (O-ring erosion is related to colder launch temperatures) but the thirteen charts they faxed to NASA were unconvincing—with horrific consequences. (For Edward R. Tufte's exhaustive analysis of the Challenger disaster, see *Visual Explanations*, pages 38-53.)

### Suggested Approach

- Prior to this lesson ask students to find
  - examples of graphic art that conveys information clearly.
  - examples of misleading graphic art.Examples may include diagrams, pie charts, maps, tables, advertisements, and product packaging. Sources may include newspapers, magazines, junk mail, cereal boxes, and flyers.
- Post the examples around the classroom for examination.
- Use the questions below to guide discussion and observation.

### Questions to Guide Discussion

- What is graphic art?
- What happens when words and pictures are combined?
- How does graphic design affect our lives?
- What makes good design? Can there be objective standards?
- What elements tip you off to poor design?
- What are the consequences of bad graphic design?

### Questions to Guide Observation

With regard to a given example:

- What is your immediate impression?
- Is there a caption? What is its function?
- Is there a legend? Is the legend easy to understand?
- What are the colors? How are they used?

- Describe the typeface. Is it elegant, ugly, oppressive, amusing?
- How are lines used?
- Is it easy or difficult to read? Why?
- Is the information clear or confusing?
- Is there unnecessary information that is included? Is there necessary information that is not included?
- Are there distracting graphical elements? Are important graphical elements missing?
- What is misleading? Why? Do you think the example is deliberately misleading?
- What is your impression after a thoughtful analysis?
- What would you change? What would be the results of your change?

### **Follow-up activities**

Based on the classroom discussion, select an example of good design. Ask students to articulate in writing why it succeeds, with attention to all the design elements: font, white space, point size, lines, color, etc.

Select an example, again based on classroom discussion, of poor design. Ask students to articulate in writing what is flawed, to redesign the example, and to articulate in writing how the new design solves the problems.

Ask students to find a chart used as an illustration in a newspaper, and to read the accompanying story. Have students write about the chart in relation to the article. Does the chart clarify or confuse the subject? How? Is the chart misleading, and if so, why? Is important information missing? How could the chart be improved? Is there a better way to present the information in either the text or the graphic element?

Ask students to examine the Surgeon General's warning in cigarette advertising. Evaluate the graphic design (lines, point size, font, placement). What purpose is it supposed to serve? Does it serve this purpose? Explain why or why not.

### **ILLINOIS STATE GOALS**

**1.B.4b** Analyze, interpret and compare a variety of texts for purpose, structure, content, detail and effect.

**2.B.4a** Critique ideas and impressions generated by oral, visual, written and electronic materials.

**5.B.2a** Determine the accuracy, currency and reliability of materials from various sources.

**5.B.4a** Choose and evaluate primary and secondary sources (print and nonprint) for a variety of purposes.

**18.A.2** Explain ways in which language, stories, folk tales, music, media and artistic creations serve as expressions of culture.

**14.D.4** Analyze roles and influences of individuals, groups and media in shaping current debates on state and national policies.

**22.B.2** Describe how individuals and groups influence the health of individuals (e.g., peer pressure, media and advertising).