Design of User Interfaces


Have you ever tried to turn a computer or computer terminal on or off-and not been able to find the switch? That has happened to me a number of times. Each time I found it terribly embarrassing, since I am supposed to be a computer expert. How is it possible to be a computer expert and not even be able to find the on/off switch?

Have you ever pushed on a door that opens by pulling, turned on the wrong burner of a stove, or scalded yourself in a shower because you turned a handle the wrong way? Do you know how to program your VCR or set your watch back an hour?

All of these questions are closely related. They have to do with the design of user interfaces. Donald A. Norman's book. The Design of Everyday Things, published by Doubleday in 1990, contains a number of examples of good and poor design. While many of the examples come from outside the world of computers, all are relevant to computer educators.

Norman's book focuses on a relatively small number of key ideas. He gives lots of examples of poor design in everyday things: door handles, faucets, VCR controls, and nuclear power plant controls. He also gives examples of good design, for example, certain parts of the user interface in the Macintosh computer system.

As a computer educator, you are a user of a wide range of computer tools. In addition, you develop products that will be used by yourself and others. Thus, you depend on the designs of others in the computer field, and you are also a designer. Some introspection should convince you that you probably know quite a bit about evaluating designs developed by others and about the design process. Quite likely, you know enough to help your students learn more about design of user interfaces.

Consumers

You and your students are consumers of a wide range of products that have good and poor design features. You can help your students to recognize good and poor design, and to become more critical consumers. Examples can come both from the computer field and from the everyday products that students encounter.

What are some of the characteristics of good user interface design? A good design lends itself to "naturally" doing the right thing to accomplish the desired outcome. Feedback is provided that lends confidence that the task is being accomplished and that allows easy detection of mistakes. Provisions are also made for correcting mistakes with ease. A tool with a good user interface is easy to learn how to use, easy to relearn, and just plain easy and comfortable to use. The tool can be operated effectively by a relative novice, but even more effectively by an experienced user.

Think about some of these ideas the next time you use a computer. Are the user interfaces for your computer applications essentially all the same, or do they vary widely from application to
application? Do you and your students get into trouble by not reading the manual, and by using a trial-and-error approach to learning to use a new piece of software? When you instruct the computer to carry out a task that will take it quite a while, does the software provide feedback on the progress that is occurring? Is it particularly difficult to make a "fatal" mistake, such as to delete your only copy of an important file?

Designing

Think about developing a database, spreadsheet, hypermedia document, computer program, or other computer application that you or someone else will use to help solve a problem or accomplish a task. You must develop a user interface that you and/or others will use. This is not an easy task.

There is an extensive body of research literature on design. For example, entire books have been written on how to design the pages of a newsletter. There are good "rules of thumb" on use of white space, color, and placement of graphics and text on a page. That is, there are many commonly occurring design situations that have been extensively studied. It is not necessary to reinvent the wheel in such cases.

However, one frequently encounters new design situations, or situations where there is not much research. There, perhaps the most important idea is that a design should be tested on a representative sample of users. Invariably, the design will not work as expected with some of the users. A trial-and-error approach, working through a sequence of designs, is almost always necessary. Norman's book suggests that in the commercial world, it typically takes a half dozen major trials to get a product design good enough so that it will experience commercial success.

For a concrete example, consider helping a student learn to write. Through many years of experience, conventions have been developed that aid in the design of writing. Some examples include: begin with an introduction that serves as a road map; begin a paragraph with a topic sentence; arrange paragraphs in a linear order that build on each other in a progressive fashion; and end with a summary or conclusions section. Of course, a "professional" writer may chose to violate some of the conventional designs in order to more effectively communicate a message.

Contrast this situation with what is known about the design of hypermedia documents. As compared to the art and science of writing, hypermedia is a brand new field. Very little research has been done. There are few conventions. Each hypermedia creator is, in effect, faced with design problems that have not been extensively studied.

This means that students, even at the grade school level, are being asked to do design work that is at the frontiers of the field. This is both difficult and exciting. It provides an environment in which each student can be a researcher. Each student can develop designs, test them on other students and the teacher, refine the designs, and test them again. Each student can share his or her learning about design. Each class of students can contribute to the slowly growing body of effective design in hypermedia.

User interfaces is an appropriate topic for inclusion in the curriculum at every grade level. While this topic certainly transcends the field of computing, it is an excellent topic to include in any instructional situation that involves computers. Moreover, the topic is one where teachers can learn alongside their students.