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Interactive Means Active

LEARNER INVOLVEMENT IN CBT

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All CBT developers strive to make their programs *interactive*, to design sequences in which their programs pause to accept student input and then use that input to determine what to do next. But one finds many degrees of interaction in today's CBT programs. As Donald Cook has pointed out, the major interaction in today's most popular programs is pressing the space bar or the return key to go on to the next dis-

play. ("CBT's Feet of Clay," *Data Training*, November, 1983.) Even in a program which boasts on its package that users "often" describe it as "by far the best computer-based training for the IBM PC we've seen," one of my colleagues found that of the 309 interactions in the entire course, 224 (over 72%) involved nothing more than such electronic page turning.

Why is there so little meaningful interaction in these programs? In most cases the cause is clearly not a lack of programming skill, but it may

certainly be a lack of programming care. The problems also may be caused by a lack of training in instructional design or simply by a lack of creativity. Whatever the reason, CBT without meaningful interaction is neither instructionally nor financially justifiable. The development of quality CBT demands attentiveness to the principles of interactive instruction, creativity in the design of interaction strategies, and a recognition of the craftsmanship required to develop quality materials in any medium.

Considering Your Audience

The first step in any instructional design process is to consider your audience's background and other distinguishing characteristics. These characteristics have a number of implications for CBT interactive design, perhaps the most important of which involves typing. If your students are experienced typists, they may have no special problems in entering free-form responses to ques-

tions posed in a course. Without such experience, the complex keyboards found on most of today's microcomputers can easily become a source of significant student frustration.

Since courseware developers can seldom change the hardware of their CBT delivery systems, they must design their interactions to minimize the effort needed to convert the conceptual responses that students formulate in their heads to the physical responses that are needed to communicate with the computer. If students are non-typists, for example, one might prefer common multiple-choice questions to free-form responses that require extensive typing.

Two specific design strategies can be useful for simplifying student re-

sponses to multiple choice questions. First, label the response alternatives with numbers rather than letters. If you have four alternatives, for example, non-typists will find it much easier to find the 1, 2, 3, and 4 keys along the top row of the keyboard than the A, B, C, and D keys scattered around the keyboard. This strategy breaks down, however, when the alternatives are numbers themselves. That is, you would not want to present a question this way:

What is the decimal equivalent of binary 00010110?

1. 12
2. 22
3. 24
4. 44



Addressing Your Audience

Audience Angle

The most meaningful way for this program to help you learn to address your audience is for the computer to guide you as you work through the first two writing steps.

Think of one of your recent writing tasks or make up a hypothetical one.

1. CONSIDER YOUR AUDIENCE FOR THE PROPER ANGLE

First, determine who will be reading your work.

Will you be writing to a *single* or to *multiple* readers?

➔ Your response: ➤ multiple

Figure 1. Students interact with the program immediately by specifying whether they wish to write to a single or to multiple readers.

It would be better to present only the stem of this question, leave out the multiple choice options, and allow students to type their answers exactly as they formulate them.

Third, consider eliminating the need for students to press the RETURN key after pressing the number or letter indicating their choice. This strategy makes interaction much faster, but has drawbacks as well. First, it doesn't allow students to correct mistakes, a characteristic that may be acceptable in a tutorial situation but is usually not acceptable in a testing one.

Second, experienced students may press the RETURN key out of habit, and this extraneous key press may be

read as a blank response to the next question. This problem can usually be corrected by clearing the input buffer just before a response is expected (effectively canceling "type-ahead"). This action corrects a number of problems encountered by naive users but can be frustrating for more experienced students. You must make your design choice based on considerations of your audience and the results of developmental tests.

Responding vs. Answering

One of the major barriers to creative interaction strategies is the outmoded concept that CBT evaluates each stu-

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dent response as either right or wrong. This concept is an artifact of CBT's programmed learning roots and has little relevance today. Most of today's best CBT programs contain relatively few evaluations in the traditional sense, because the subject matter is too complex for a single, discrete response to be judged either 100% right or 100% wrong. The approach that these programs take more closely resembles a laboratory than a classroom. They present material in a problem-solving or simulation framework and allow students to interact with it or practice using it until they feel comfortable with its basic tenets and structure.



Consider, for example, how you might go about designing interactions for a course on business writing. (The examples that follow are drawn from *Sharpening Your Executive Writing*, a CBT course developed by Socratic Software for and in conjunction with KJ Software, Inc., of Phoenix, Arizona, © KJ Software.) Writing is a complex skill, subject to considerable variations in personal style, but a number of basic principles apply when writing in the business world. Rather than presenting these principles and quizzing students on their abilities to recite them, you might lead them through the application of these principles as they write a practice report or memo.

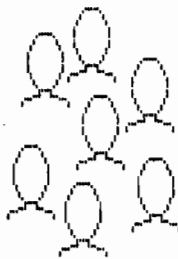


Addressing Your Audience

Multiple Readers

WRITING TO MULTIPLE READERS

- ◆ List up to 9 readers below. You may type actual names or some classification of readers such as "engineering management." Press  between each entry; press  when done.



1. George Washington
2. Abraham Lincoln
3. John Kennedy
4. Franklin Roosevelt
5. John Adams
6. Herbert Hoover
7. Howard Taft
8. Teddy Roosevelt
- 9▶ Dwight Eisenhower

Figure 2. Here, students enter their own list of readers. The program does absolutely no evaluation of these responses.




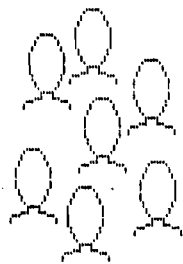
Addressing Your Audience

Multiple Readers

RANKING READERS

When writing to multiple readers or a single reader with auxiliary recipients, the readers should be ranked in order of importance to help you target your words.

→ Your readers are listed below. Use the \uparrow and \downarrow keys to highlight each one and then type a rank number ("1" = most important). Press  when done.



Rank	Reader
1	George Washington
-	Abraham Lincoln
2	John Kennedy
-	John Adams
-	Herbert Hoover
-	Howard Taft
-	Teddy Roosevelt
-	Dwight Eisenhower

Figure 3. Students move the highlight from one name to the next by pressing the up and down arrow keys.

As in designing instructional programs, the first principle of business writing is to consider your audience for the proper angle. The first display in this instructional sequence is shown in Figure 1. Students interact

with the program immediately by specifying whether they wish to write to a single or to multiple readers. This answer is, of course, neither right nor wrong, but the program branches to different instructional sequences for

each response.

For multiple readers, the instruction continues with the interaction shown in Figure 2. Here students enter their own list of readers. The CBT program does absolutely no evaluation of these responses; students can enter gibberish as well as valid data. If gibberish is entered, successive interactions will have little meaning. The design assumes, however, that students are self-motivated and that their own lists, no matter how ill-conceived, will have more relevance than any list the program could have supplied.

Manipulating vs. Creating

Both interactions discussed above required the students to create responses by typing at the keyboard. Another strategy is to let students manipulate data already entered or supplied by the program. This strategy is used for the next topic presented in the writing course, in which students are asked to rank their readers in order of importance.

The display for this interaction is shown in Figure 3. The readers are initially listed in the order in which they were entered, with one highlighted in red. Students move the highlight from one name to the next by pressing the up and down arrow keys. Pressing a number key causes the highlighted name to move to the

corresponding position in an animated fashion. In Figure 3, a student has highlighted "John Adams" and pressed the "2" key. "John Adams" makes his way up the list until he rests in the second position. Other names are erased as the highlighted name moves, but they are restored after the animation is complete.

After the readers are sorted, the instruction explains that readers in different jobs read differently; *managers* look for specific conclusions and recommendations, *general professionals* concentrate on the body, and *specialists* focus on details. The program asks whether the reader ranked at the top of the list is a manager, general professional, or specialist. It then branches to one of the three displays (similar to that shown in Figure 4) according to the answer.

Here students interact with the program by indicating those issues in which their readers are interested. The program presents a list of the potential issues and allows students to move a corresponding "X" for each issue into either the "Yes" or the "No" column using the arrow keys. Like the sorting routine, this interaction strategy involves manipulating, rather than creating, data. The advantage of this approach in the writing course is that it allows students to consider and respond to a large number of audience parameters without excessive typing.




Addressing Your Audience

Readers' Interests

DETERMINING READERS'

INTERESTS: MANAGERS

Listed below are typical issues in which managers are interested.

Use the ← and → keys to move the Xs into the appropriate columns to indicate your readers' interest in each. Use the ↑ and ↓ keys to move the highlighting bar. Press  when done.



Interested?		Issues
Yes	No	
← X →		What is its significance?
X		Is it a major technical advance?
	X	What is the profit picture?
X		Are we complying with gov't. regulations?
X		Is there an effect on company image?
X		What actions should we take?
X		Who should take these actions?

Figure 4. Here students interact with the program by indicating those issues in which their readers are interested.

Pointing vs. Typing

Virtually all of today's CBT materials are delivered on video displays. One of the advantages of this technology is that it allows students to inter-


act with the material by pointing as well as typing. Light pens—even inexpensive ones—have been around for a long time, but Apple Computer's introduction of its MacIntosh line has practically made "mouse" a house-

hold word. Some herald the mouse (or one of its related devices) as the end of the keyboard, while others see its usefulness in only specialized applications. Whatever your stance, you should not overlook the degree of interaction that can be achieved in CBT by asking students to respond by pointing to an area on the screen rather than typing.

If screen-pointing devices are not available, pointing interactions can still be implemented by teaching students to use the arrow keys and move a cursor in word processing style. This strategy is used in the writing course in a number of forms. For example, the exercise in Figure 5 follows a brief explanation of paragraphing guidelines. Students move the cursor (the rectangular block highlighting the "T" on the third line) with the arrow keys and press the RETURN key when it is pointing to a word they think should start a new paragraph. If the cursor indicates an appropriate paragraph point, the word is highlighted. If not, the message shown at the bottom left of Figure 5 appears.


Another application of this strategy is shown in Figure 6. Here students are asked to point to the correctly spelled words in a group of correct and incorrect words. If they point to a correctly-spelled word, the color of the word changes from white to blue.

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Editing for Content

Paragraphing

Move the cursor to the first letter of each word that should begin a new paragraph & press .

No, that's not a good paragraph point.

The Boston Globe
July 30, 1984

➔ Mark any number of paragraphs, then press  when done.

When it comes to training programs, union and management are not on the same wavelength. That is the apparent conclusion of a study by the Arthur D. Little organization. "In a January 1984 survey of U.S. business executives, less than 1/3 of those polled singled out training as a matter of vital importance," the report said. Yet retraining has surfaced as one of the top collective-bargaining topics among union leaders. The primary reason is automation in both factories and offices. The UAW, currently negotiating with GM, was one of the first unions to insist that retraining be readily available.

Figure 5. This exercise follows a brief explanation of paragraphing guidelines.

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If they point to an incorrectly-spelled word, the color changes from white to red and a message like that shown at the bottom of Figure 6 is displayed.

One of the advantages of the pointing strategy in these exercises is that the students can point to the paragraph points or correctly-spelled words in any order. The interaction is far less restrictive than one which



SPELLING

The best way to solve spelling problems is, of course, to use a dictionary. Some misspellings are so ingrained, however, that you never think to look them up. Luckily, most modern word processors now include spelling checkers. The best ones even check hyphenation. Without a word processor, you must simply be careful to remain aware of words you often misspell.

◆ Try picking out the *correctly* spelled words below by using the arrow keys of our mini word processor to move the cursor and pressing  when it indicates a *correctly* spelled word. Press  when done.

- Grammar
1.
 2.
 3.
 4.
 5.
 6.
 7.
 8.
 9.

receive	changeable	occasionally
acheive	accomodate	indispensible
ocoured	similar	maintenance
procede	dependent	transferred

No, acheive should be achieve.

Figure 6. Here, students are asked to point to the correctly spelled words in a group of correct and incorrect words.

requires students to answer a series of questions.

Maximizing Learning

The only danger in making courseware overly interactive is that highly

complex interactions can interfere with the students' abilities to focus on the subject matter. My general philosophy is that students shouldn't have to take a course in how to take a course! In practical terms, this

means that no more than one display should be necessary to explain what students are expected to do in any one exercise. If more than one screen is necessary, the interaction should be one which will be used a number of times throughout the course.

Directions for interactions should be integrated into the main flow of the instructional material. If, for some reason, this cannot be done, I do not recommend lumping all the directions together in a module on "how to take this course." Such modules usually detract from the subject matter focus, but they can sometimes be effective if they are kept very small. Of course, extensive on-line help should be available at all points in case students don't know what to do next.

Many studies have shown that active learning experiences yield greater achievement and longer retention than passive ones. In CBT, active learning is synonymous with interaction. DT

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