There are several new features in Version 6 of SAS/AF® software that you can use to enhance your computer-based training applications. These features give the course builder more flexibility and variety in designing CBT questions. The enhanced branching capability allows each student to proceed through the course along his own customized learning path. Version 6 of SAS/AF software supports more types of question and feedback responses, so you can make your CBT courses more effective and fun to take.

Seven of the new features in SAS/AF software are

1. fill-in-the-blank questions
2. the FRAME= option on branches
3. the WRONG= option on question frames
4. multiple correct answers to a question
5. multiple answer fields on a line
6. the music interface
7. the SAVE command.

Fill-in-the-blank Questions.

The CORRECT= option allows the builder to ask a fill-in-the-blank question. Only one fill-in-the-blank may be specified per frame. The CORRECT= option goes on the ? line starting a frame. This kind of question tests the student's active knowledge of the subject. A multiple-choice question tests only passive knowledge because the student need only recognize the correct answer from a list of possible answers. Here is an example using the CORRECT= option:

```
1. CORRECT=PORT-AD-PRINCE.
   THE CAPITAL OF HAITI IS ________________?
   FROM
   Very good.
   It is south of Petionville.
   Hint: Haitians speak French.
```

The answer field for a fill-in-the-blank question is indicated by an ampersand followed by optional underscores. The answer field may be up to 32 characters long. To allow embedded blanks in the correct answer, enclose the correct value in single or double quotes like this:

```
1. CORRECT=Standard deviation.
The square root of the variance is called the ____________?
```

In the case of a fill-in-the-blank question, two sets of feedback are needed: the first set is for the correct answer and the second set is for all incorrect answers. The system uppercases both the correct answer and the student's answer before comparing them; however, the answer remains displayed on the screen as entered.
Let's review before continuing.

A frame consists of a group of lines in a CBT entry that are displayed together. There are three kinds of CBT frames: text only, multiple-choice query, and fill-in-the-blank query. The fill-in-the-blank question, a new feature, requires the student to type in the correct answer. You provide the correct answer using the CORRECT:: option on the ? line that begins the frame. This feature allows you to test for active knowledge without branching to a program screen.

This leads us to the next new CBT feature: convenient branching with a CBT entry.

The FRAME= Option

While you can still branch to other screens from a CBT entry, it is often easier and faster to stay within the same entry. Using the FRAME= option, the builder can stay within one CBT entry and perform conditional branching.

In Version 5, wherever you specify a CBT screen to display, you can also follow the screen specification with FRAME=nn to go directly to a particular frame of that CBT entry. Within a CBT course, the builder can cause an unconditional branch using the PPP specification or an unconditional branch based on the selected answer using the > or >> option on the # feedback start line for the answer. If the CBT entry you are branching out of is the same CBT entry that you are branching to, then the FRAME= specification acts like a GO TO command. The GO TO command is known as the "little n" command in the documentation, where the student keys an integer on the command line and presses ENTER, and the system displays the nth frame. Here is an example from a financial planning CBT course that uses this feature:

```
?2
WAY 1 INVESTMENT IS LIQUID?
Q.6.
Gold
Rural real estate
?C
Right.
Sell it in the spot market.
?3
Only if you melt it first.
> INVEST1.CBT FRAME=44
Only if it's under water.
```

In the example above, the first answer, Oil, is correct, and answer 2, Gold, is plausible but incorrect. Answer 3, Rural real estate, is a completely wrong answer. If the student picks answer 3, Rural real estate, then the course author might conclude that the student was not paying attention to the previous frames, which discussed investment liquidity; therefore, he can easily branch the student back to frame 44 of the same CBT entry, so the student can repeat the section on investment liquidity. The FRAME= option can also be used to present the same material in a different way. You can branch to the second presentation if the student answers the review question incorrectly.

But what if all of the possible answers are plausible, yet the student uses up his tries and still has not answered the question correctly? Another way to branch to a remedial lesson after an incorrect response is to use the WRONG= option, the third new feature for CBT in SAS/AF software.

The WRONG= Option

Suppose you have a question frame allowing the student two tries. When the student selects the first wrong answer, the system displays your feedback lines followed by the message, "Press ENTER to erase old answer and try again." If the student then chooses a second wrong answer, normally he would see more feedback and the message, "Press ENTER for correct answer," since all of the specified tries have been exhausted. If you have used the WRONG= option, however, and the student misses on both tries, you may branch him to another lesson or another part of the same lesson with the WRONG= option on the ? line. This option branches the student to the screen and frame following the WRONG= as soon as the last try is used up and the question is still not answered correctly. For example, here is a question from part of an introductory Spanish course teaching the days of the week:

```
72 WRONG=SPANISH.CBT FRAME=10
THE SPANISH WORD FOR SUNDAY IS:
- DIA DEL SOL
- LUNES
- SABADO
- DOMINGO
- MIERCURIO
- VIERNES
- SABADO
```

In the example above, the first answer, Oil, is correct, and answer 2, Gold, is plausible but incorrect. Answer 3, Rural real estate, is a completely wrong answer. If the student picks answer 3, Rural real estate, then the course author might conclude that the student was not paying attention to the previous frames, which discussed investment liquidity; therefore, he can easily branch the student back to frame 44 of the same CBT entry, so the student can repeat the section on investment liquidity. The FRAME= option can also be used to present the same material in a different way. You can branch to the second presentation if the student answers the review question incorrectly.

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All of the answers are plausible, but if the student does not choose "Domingo" on the first or second try, the builder can cause the section to be repeated. On the 7 line, the WRONG= option is followed by the first frame of the days-of-the-week section, so after the second wrong answer, the student repeats the section.

You can also use the WRONG= option effectively in a password validation application. When a user exhausts his attempts to provide the correct password on a fill-in-the-blank frame, the WRONG= option branches the user to an exit screen.

Here is another new CBT feature that lets you get fancy with a CBT question: multiple correct answers on a multiple-choice query frame.

Multiple Correct Answers

In a multiple-correct-answer frame, the student must select all of the correct answers in order to get the question right. The rule for the display of feedback is simply that feedback for the first answer selected will be displayed. This means that the congratulatory first line of feedback for the correct answer should go on the first of the correct selections, since that selection's feedback will be displayed when the student selects it and the other correct selections making up the correct answer to the question. In addition, when the student makes at least one correct selection, but not all, or also an incorrect selection, then the system displays the message, "Your answer is partially correct." You can see how this type of question may be used in the following example from a wholesaler's in-house training course:

**WHAT DO YOU NEED FOR AN OVERSEAS SHIPMENT?**

- BILL OF LADING
- INVOICE
- VALUED-ADDED TAX LISTING
- SHIPPER'S EXPORT DECLARATION

The bill of lading, invoice, and shipper's export declaration are all required for an overseas shipment, but items 3 and 4 are not needed. The correct answer is selections 1, 2, and 5 only.

You can set up a multiple-correct-answer question just like a single-correct-answer query—simply add the letter C to the feedback start line for each of the correct selections:

**110** Excellent.
**130** Yes, the Bill of Lading is one of the required documents.
**140** Yes, the Invoice is one of the required documents.
**150** No, there is no VAT listing for overseas shipments.
**160** No, the items are already listed on the invoice.
**180** Yes, the S&D is required for overseas shipments.

Multiple Answer Fields on One Line

The next CBT enhancement allows more flexibility in designing the display of the query frame because it allows you to put more than one selection on the same line. This feature is handy when you want to display lots of text in front of the question, and it may not all fit on the terminal at one time. In the following example, sixteen lines of text come before the question, and there is no room for four separate lines for selections plus two feedback lines for each answer. Everything fits at one time on the screen if you put all four selections on one line like this:

**WHERE ARE THE ITEM GROUPS FROM THE MASTER INVENTORY FILE?**

1. PAPER
2. CLOTHING
3. TOYS
4. PRESCRIPTION DRUGS
5. OVER-PRESCRIPTION DRUGS
6. DAILY
7. CANDY
8. PRODUCE
9. ALCOHOLIC BEVERAGES
10. SOFT DRINKS
11. HOUSEHOLD
12. CANDY
13. CANNED FRUITS & VEGETABLES
14. PET FOOD

WHICH ITEM GROUP IS STORED IN THE FAST-FLOW RACK?

- CANDY - PRESCRIPTION DRUGS - PRODUCE

In Version 5, only the first underscore is recognized as an answer field, and the underscore must be the first nonblank character
on the line. In Version 6, this enhancement allows you to place answer fields anywhere on the line, even following descriptive text, and it means that any underscore following a blank (or in column 1) and preceding a blank is considered an answer field. Up to eight answer fields can go on one CBT frame.

The MUSIC Interface

Another new CBT feature is the music interface. This facility allows you to specify a tune that is played when a frame is displayed or when a particular answer is chosen. The tune is specified in note-duration or frequency-duration pairs following the MUSIC= keyword on the ? or # line. Notes may be a letter A-G, an octave 1-9, and optionally sharp (#) or flat (b). If you prefer, you can designate the notes in cycles-per-second (frequency) rather than by using the letter notation. Duration specifies how long to play the note in 1/100 seconds. So, to play the note A in the fourth octave for one second when a frame is displayed, you can use this notation:

? MUSIC=A4 100

or this:

? MUSIC=440 100

You cannot mix frequency notation with letter-octave notation. Musical rests, which are periods of silence within a tune, are specified with the letter Z. Here is an example of how you could use this feature in a question frame:

?3 MUSIC=P1 80 C31 80 P2 200

When this frame is displayed, the system displays the screen but the user cannot key anything and there is no wait for a keystroke. Then it plays the song. Finally it unlocks the keyboard for the student. A more likely use for this feature is to give the student audible feedback. In the following example, the right answer results in one melody, while wrong answers cause a different tune to be played:

<table>
<thead>
<tr>
<th>72</th>
<th>WHICH DIVISION BELOW IS NOT A REQUIRED PART OF A COBOL PROGRAM?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IDENTIFICATION DIVISION.</td>
</tr>
<tr>
<td>2</td>
<td>INPUT-OUTPUT DIVISION.</td>
</tr>
<tr>
<td>3</td>
<td>PROCEDURES DIVISION.</td>
</tr>
<tr>
<td>4</td>
<td>All music-C0 50 C0 C0 C0 /</td>
</tr>
<tr>
<td>5</td>
<td>At 100</td>
</tr>
<tr>
<td>6</td>
<td>No, the IDENTIFICATION Division is required.</td>
</tr>
</tbody>
</table>

As you can see above, part of the feedback for the wrong answers is auditory: a foreboding melody is played. On the other hand, when the student picks the correct answer, a triumphant melody rewards the student, plus a congratulatory and explanatory feedback message is displayed. Your course should not depend on just the music option for feedback because the student might be taking your course in a room where the music would distract other people, and the student can easily suppress the music by entering MUSIC OFF on the command line. The music remains off for the duration of the student's session or until the MUSIC ON command is executed.

The SAVE Command

The final CBT feature I will discuss is the SAVE command. The student can enter the SAVE command to interrupt the CBT course and exit the SAS System. The SAVE command "saves his place" so that the next time the student invokes SAS/AF software, the course is resumed automatically at the point where he left off.

The SAVE command action can be modified by the builder through the use of one of two SAS/AF special screens. These screens have the reserved names CBTSTOP.PROGRAM and CBTGO.PROGRAM.

If there is a CBTSTOP.PROGRAM in the current catalog or user profile when the SAVE command is entered, then the system does not terminate, but rather it displays CBTSTOP.PROGRAM.
With CBTSTOP.PROGRAM, the builder can honor the SAVE command by submitting an ENDSAS statement, or the builder can query the student and perform appropriate action: continue the interrupted CBT course, exit, or display another screen depending on his response. CBTSTOP.PROGRAM is also good for updating files and saving macro variable values that you would usually handle at normal course termination.

CBTGO.PROGRAM is displayed when a saved CBT course is pending for a SAS/AF user and CBTGO.PROGRAM exists in the same catalog or in the user profile. You can use it to restore the CBT environment that the student had when he entered SAVE or to ask the user if he wants to resume the pending course or go to some other screen. When a saved CBT course is restarted, the system displays the message, "NOTE: Course resumed from prior SAS session."

So, there are some CBT enhancements in SAS/AF software for the PC. You have fill-in-the-blank questions using the CORRECT= option, where you require the student to recall the correct answer. There is branching within a CBT entry with the FRAME= option, and you can branch when the student's tries are used up with the WRONG= option. An addition to multiple choice questions is the option of requiring multiple correct answers. You have the additional flexibility of putting multiple answer fields on the same line. There are bells and whistles with the MUSIC= option to play melodies in your PC course, and there is the convenience of interrupting the course and returning later with the SAVE command. These are tools you can use to create effective and interesting CBT courses.

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