A Comparison of Two Corrective Feedback Methods in Computer-Based Training for Vocational Education Students

Howard Solomon
Florida State University
hms3683@fsu.edu

Roberto Pérez
Florida State University
rgp6722@fsu.edu

Purpose

This study compares the effectiveness of two methods of introducing corrective feedback while vocational education students are using a computer based training program to learn a new procedure. One of methods presents feedback as a set of "leading questions" posed by an animated agent on the computer screen, adding appeal and motivation to this computer-based training program. While we expected that questions asked by an animated agent would stimulate active engagement in the learners, CBT that uses this method is time consuming and expensive to produce. The alternative method simply displays the feedback as text in a box that must be clicked to continue. From a software design standpoint, this alternative method is far quicker to create, but it does not add the excitement or motivation to the overall CBT program that would stimulate the active engagement of the learners.

Rationale and background

One has only to look inside a vocational education classroom to see that computer-based training plays an important role in almost every program. Solomon (2002) found that vocational education directors in Florida (n=10) estimated that 38% of instruction in vocational institutions is currently being presented to students through computers. Advocates for the use of multimedia CBT in vocational education (Sabah, 1997) suggest that this arena is one where multimedia computer based training may have its greatest usefulness.

While Alessi & Trollip (2001) cite studies indicating that when used properly, computers improve learning efficiency, the vagueness of what is meant by "proper use" leaves open questions of how learning experiences should be designed. They find that a lack of good instructional design in the computer programs is often cited as the reason for only small improvements in learning outcomes when CBT is used to provide student instruction. If this is the case, decisions about the design of different instructional events in computer-based instruction should be based on experimental research that compares the results obtained when different design approaches are implemented.

Gagné, Briggs, and Wager (1992) suggest that feedback about a student's performance is a necessary part of an instructional experience. But they let the situation guide the choice of how feedback is delivered to the student. From this, no specific guidelines for the presentation of corrective feedback can be derived. Almost any feedback delivery form is appropriate as long as it performs the function of informing the learner about the correctness of his or her performance (Gagné, Briggs, & Wager, 1992).

By contrast, Alessi and Trollip (2001) suggest that feedback needs to be "high quality" before it will be of any use. This is defined as feedback that increases the learner's capability of performing better in the future.

Ross and Morrison (1993) found that feedback that allows learners to answer until correct is more effective than feedback that provides the knowledge of a correct response when future questions about the learned material are substantially different than those given in the learning context. They caution that this is only so when the feedback stimulates active engagement with the learning material. We suggest, along with Wager and Wager (1985), that one of the functions of questions in learning is to establish and maintain attention. From this we reached the expectation that the presentation of feedback in question form by an animated agent should stimulate active engagement with the material and result in improved learning outcomes.

Data Source

Twenty-seven vocational education students enrolled in electronics and computer repair programs participated in the study, conducted in March, 2002. The ages of the participants ranged from 14 to adult. All 27 of the participants were male. Sixteen participants were white, 8 were black, and the other 3 were of other racial backgrounds. Each participant was asked to take a computer-based lesson of approximately 15 minutes duration. The lesson involved the simulated disassembly of a CD player mechanism. This was inherently motivating to both groups since the subject matter is involved in both computer repair as well as electronics repair. Two versions of this simulation in mechanism disassembly were created for this experiment. The only difference between the two versions was the method by which corrective feedback to a student was presented whenever a student chose to use an inappropriate tool. 14 students took the lesson at computer stations where an animated questioning agent provided corrective feedback. The other 13 students took the lesson at identically equipped stations where text boxes appeared on screen when inappropriate tool choices were made.

Method

As preparation for the experiment, the experimenters modified the mechanism disassembly portion of the Panasonic Virtual Mechanism lesson. The modifications included the creation of a tracking system for monitoring student tool selections while they took the lesson. This was included in both versions of the software. The modification that provided a difference between the two versions was the presence of two different types of events that were triggered by an incorrect tool choice. In one version (n=14), an animated agent resembling a Genie appeared on screen, gestured toward the tool selection palette, and spoke a question about the student's choice of tools while displaying the text of the question in a balloon. In the other version (n=13), a text box with the same amount of text as the Genie's balloon appeared along with an "OK" button near the lower middle of the box. The box could only be eliminated from the screen by pressing the "OK" button. Each student was seated at the computer station and told to follow the onscreen directions for completing the task. All students completed the task. Records were kept for each student of the total number of tool choice errors made, the last step where an error was made, and the version of the lesson taken.

Results and conclusions

The mean total number of errors made by students whose feedback was presented by the questioning animated agent (6.86, sd=5.26) was only slightly lower than the mean total number of errors of those whose feedback was presented in text boxes (7.23, sd=4.71). The mean last error step for those in the questioning animated agent group (11.43, sd=5.12) was slightly later than that of the text box group (11.38, sd=3.78).

A t-test was used to determine the effects of each of the feedback presentation methods on total tool choice errors and the step at which the last error was made. The t-test revealed no significant differences between feedback presented in question form by an animated agent and feedback presented in statement form, shown in a text box. The result offers no support to the hypothesis that providing feedback from a questioning animated agent will result in fewer tool choice errors or earlier cessation of errors than providing the same feedback as statements in a text box.

Limitations

The initial choice of a product to be modified for these experiments was based on the availability of the product to the experimenters. Other products actually in use in the vocational programs may yield a different result. This product was, however, designed to be used by vocational education students, and the target group was selected to be as appropriate as possible for the product. In the design of the experiment, we presumed that we would have a relatively small sample population with which to work. This led us to roll up the combination of animated agent, question asking approach, spoken text, and written text all into one experimental manipulation. Cognitive load theorists might suggest that the experimental presentation form was too demanding on cognitive powers by introducing too many sources of information at one time.

In addition, the subject areas of electronics and computer repair serve a largely male student population, and there is no indication in these results that they are applicable to female learners.

Implications

In this experiment, it was observed that “bells and whistles”, including animated agents and spoken audio, have little positive effect on learning measures for this group of students. In order to make a better use of resources (time, multimedia expertise, etc.), the design and development process of CBT products should only include advanced interactive technologies for stimulating the learner to actively engage with the material when their influence on learning is documented. This study seems to indicate that feedback is valuable for its content and timing rather than for the form in which it is delivered. When working with motivated learners, there is little to be gained by implementing gimmicks for learning-enhancement purposes, whose value is likely to be in the area of motivation.

Alessi, Stephen M. and Trollip, Stanley R., (2001) Multimedia for Learning: Methods and Development, (Boston, MA; Allyn and Bacon Publishing).

Gagné, R.M., Briggs, L.J., Wager, W.W. (1992), Principles of Instructional Design, (Belmont, CA: Wadsworth/Thomson Learning).

Ross, S. and Morrison, G., (1993) Using Feedback to Adapt Instruction for Individuals, in Dempsey, J., Sales, G., eds., Interactive Instruction and Feedback, (Englewood Cliffs, NJ: Educational Technology Publications), 177-195.

Sabah, Nassir H. (1997), Multimedia in Vocational Education, Convergence 3.1, available at staff.aub.edu.lb/~webfea/media/converge5.htm

Solomon, H., unpublished survey results, July, 2002 memo to Florida Department of Workforce Development.

Wager, W., Wager, S. (1985). Presenting Questions, Processing Responses, and Providing Feedback in CAI, Journal of Instructional Development, Vol. 8, No.4, 2-8