Chapter 1.9

Contemporary Instructional Design

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INTRODUCTION

This article discusses the principles of two qualitatively different and somewhat competing instructional designs from the 1950s and 1960s, *linear programmed instruction* and *programmed branching*. Our hope is that an understanding of these ideas could have a positive influence on current and future instructional designers who might adapt these techniques to new technologies and want to use these techniques effectively. Although these older ideas do still see occasional mention and study (e.g., Brosvic, Epstein, Cook, & Dihoff, 2005; Dihoff, Brosvic, & Epstein, & Cook, 2004), many contemporary instructional designers are probably unaware of the learning principles associated with these (cf., Fernald &

Jordan, 1991; Kritch & Bostow, 1998; McDonald, Yanchar, & Osguthorpe, 2005).

BACKGROUND

An important difference between these instructional designs is associated with the use of feedback to the learner. Although we could provide a student with a score after completing an online multiple-choice quiz, applications that provide more *immediate feedback* about correctness upon completion of each individual question might be better. Alternatively, we could provide *adaptive feedback* in which the application provides elaboration based upon qualities of a particular answer choice.

Following is a discussion of two qualitatively different instructional designs, one providing im-

mediate feedback regarding the correctness of a student's answer, the other providing adaptive feedback based on the qualities of the student's answer. Suitability of one design or the other is a function of the type of learner and of the learning outcomes that are desired.

SOME CLASSIC CONCEPTS OF INSTRUCTIONAL DESIGN AND OUTCOMES

Although the idea of non-human feedback would seem to imply a mechanical or electronic device, other methods could be used. Epstein and his colleagues, for example, have used a multiple-choice form with an opaque, waxy coating that covers the answer spaces in a series of studies (e.g., Epstein, Brosvic, Costner, Dihoff, & Lazarus, 2003); when the learner scratches the opaque coating to select an answer choice, the presence of a star (or not) immediately reveals the correctness of an answer. Examples of the designs discussed next are based on paper books, but they are easily adaptable to technologies that use hyperlinks, drop-down menus, form buttons, and such.

Linear Programmed Instruction

The programmed psychology textbook of Holland and Skinner (1961) asked the student a question on one page (the following quote starts on page 2) and then asked the student to turn the page to find the answer and a new question:

A doctor taps your knee (patellar tendon) with a rubber hammer to test your _____.

The student thinks (or writes) the answer and turns the page to find the correct answer ("reflexes") and is then asked another question.

Questions or statements are arranged in sequentially ordered *frames* such as the previous single

frame. A frame is completed when the student provides a response to a stimulus and receives feedback. Skinner contended that this method caused learning through *operant conditioning*, provided through positive *reinforcement* for stimuli that are designed to elicit a correct answer (c.f., Cook, 1961; Skinner, 1954, 1958).

Skinner (and others who use his methods) referred to his method as *programmed instruction*, which incorporates at least the following principles (cf., Fernald & Jordan, 1991; Hedlund, 1967; Holland & Skinner, 1961; Skinner, 1958; Whitlock, 1967):

- Clear learning objectives.
- Small steps; frames of information repeat the cycle of stimulus-response-reinforcement.
- Logical ordered sequence of frames.
- Active responding by a student who works at his/her own pace.
- Immediate feedback to the response in each frame with positive reinforcement for correct answers.

A technique in programmed instruction is to help the student a great deal at first, and then gradually reduce the cues in latter frames; this is called *fading* (Fernald & Jordan, 1991; Reiff, 1980). If correct responding suggests that a student is learning at a quick rate, *gating* can be used to skip over frames that repeat prior information (Vargus & Vargus, 1991). The programmer is expected to use information about student performance to make revisions; if the student is not succeeding, then it is due to a fault of the program, not to an inability of the student (Holland & Skinner, 1961; Vargus & Vargus, 1991).

Programmed Branching

Crowder (e.g., 1959, 1963) and others (e.g., Pressey, 1963) were critical of Skinner's approach, arguing that students not only learn from know-

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