Programmed Instruction, Programmed Branching, and Learning Outcomes

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INTRODUCTION

This chapter discusses the principles of two qualitatively different and somewhat competing instructional designs from the 1950s and '60s, 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 study and debate (e.g., Dihoff, Brosvic & Epstein, 2003, 2004), many current instructional designers are probably unaware of the learning principles associated with these (cf., Fernald & Jordan, 1991; Kritch & Bostow, 1998).

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.

Below is a discussion of two qualitatively different instructional designs, one providing immediate 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.

MAIN THRUST OF THE ARTICLE

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 below 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 quote below 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 single frame above. 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, 1958, 1961; Whitlock, 1967):
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