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ABSTRACT

This paper examines research studies of learner control in computer-based instruction (CBI) from 1987-1997. The review evaluates predictions and conclusions from previous literature reviews, in light of current research, and discusses the implications of recent findings for instructional development. Findings suggest that the positions that higher-ability students score higher under learner control and lower-ability students score higher under program control may no longer hold true in the current technological age. (Contains 19 references.) (Author/DLS)

Learner Ability and Learner Control: A 10 Year Literature Review 1987-1997

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Abstract

This paper examines research studies of learner control in computer-based instruction (CBI) from 1987-1997. Previous literature reviews (Chung & Reigeluth, 1992; Ross & Morrison, 1989; Steinberg, 1989; Williams, 1992) have drawn predictions and recommendations from earlier learner control research. This review evaluates these earlier conclusions in light of current research, and discusses the implications of recent findings for instructional development.

Learner control, defined as allowing students to make choices among instructional events during a lesson (Schnackenberg & Savenye, 1997) has been investigated with learners at a variety of ages and grade levels, using lessons covering a wide range of content and educational outcomes. The idea of giving learners control over elements of their instruction has been popular among educators for decades. One reason often advanced for learner control is that learners know their own instructional needs best and therefore are uniquely qualified to tailor instruction to these needs (Mager, 1964; Merrill, 1975, 1980). Previous reviews, while encouraging the idea of learner control, have called the effectiveness of learner control "equivocal" (Williams, 1992), "inconsistent, but more frequently negative than positive" (Ross & Morrison, 1989), and "inconclusive, and...more frequently negative" (Chung & Reigeluth, 1992). Researchers have continued to investigate the concept of learner control, seeking to isolate features that might enhance or decrease learner performance.

One factor affecting learner achievement may be general ability or aptitude (Cronbach & Snow, 1977). Williams (1992) points out that some studies confound general ability with prior knowledge. Learner ability is associated with the concept of general intelligence (Williams, 1992), while prior knowledge is referred to as the amount of information a learner has previously acquired on a particular topic or subject. Prior knowledge of content is generally measured through a pretest administered before assignment to an instructional treatment, whereas general ability is measured via standardized tests that assess general aptitude. In the studies under consideration in this review, ability measure include standardized reading tests (Carrier & Williams, 1988; Kinzie, Sullivan, Beyard, Berdel, & Haas, 1987); Scholastic Aptitude Test (SAT) and American College Testing Assessment (ACT) (Schloss et. al, 1988; Schnackenberg & Sullivan, 1997); the Henmon-Nelson general ability test (Klein & Keller, 1990); a figures rotation test (McGrath, 1992); and a standardized math achievement test (Hannafin & Sullivan, 1995).

The use of standardized test scores rather than prior knowledge examination scores in the aforementioned studies enables the reported achievement results to be attributed directly to either the design of the CBI lesson utilized or general student ability, and not to the information and skills subjects may have learned prior to studying content in the instructional programs. This type of isolation of learner knowledge allows the specific aspects of the learner-control/learner ability question to emerge in clearer detail and not be mitigated by subjects' content knowledge in a specific area. It is for this reason that this review focuses only on studies that measure learner ability via standardized tests because it is only in this way that accurate conclusions can be drawn about learner control and students' general intellectual ability.

It has been suggested that lower-ability learners should score higher on posttests under program control, i.e. when the program delivers all possible instructional events in a prescribed sequence. Chung & Reigeluth (1992) suggest that lower-achieving learners lack the knowledge and motivation to make appropriate decisions regarding their own learning needs, making learner control less effective for them. Steinberg (1989) makes a similar argument for reserving learner control for higher-ability students, since these students' metacognitive strategies may be presumed to be better developed.

To investigate a possible interaction between ability and learner control, a number of recent studies have used ability measures as a blocking factor (Carrier & Williams, 1988; Hannafin & Sullivan, 1995; Klein & Keller, 1990; Kinzie, Sullivan, Beyard, Berdel, & Haas; 1987; Kinzie, Sullivan, & Berdel; 1988; McGrath, 1992; Schloss, Wisniewski, & Cartwright, 1988; Schnackenberg & Sullivan, 1997). None of these studies revealed an interaction between ability and type of control. The lower-ability students did not perform any better under program control (where learners could not choose instructional options) than under learner control. However, Kinzie et. al (1987) did find differential effects between eighth-grade males and females: a three-way interaction among ability, type of control, and gender. The learner-control condition favored high-ability females and low-ability males.

Most of these studies, however, found extremely strong effects for general ability on achievement. Higher-ability students typically did much better than lower-ability students, regardless of type of control. This effect occurred among sixth- and seventh-grade students with CAI lessons on advertising concepts (Carrier & Williams, 1988; Klein & Keller; 1990); eighth-grade students learning about solar energy (Kinzie et. al, 1987; Kinzie et. al, 1988); ninth- and tenth-graders in geometry (Hannafin & Sullivan, 1995); and college students studying special education interventions (Schloss et. al, 1988) and instructional design principles (Schnackenberg & Sullivan, 1997).

One interesting finding emerging from several of the studies is that overall, both higher- and lower-ability students using learner control often outperformed students under program control (Carrier & Williams, 1988; Hannafin & Sullivan, 1995; Kinzie et. al, 1987; Kinzie et. al, 1988). However, in the remaining studies (Hannafin & Sullivan; 1996; Klein & Keller, 1990; McGrath, 1992; Schnackenberg & Sullivan, 1997) achievement under learner control and program control were essentially equal. This pattern of results contradicts findings from early learner-control studies (Carrier, Davidson, & Williams, 1985; Ross & Rakow, 1981) in which subjects under program control often outperformed subjects under learner control.

In light of results reported from recent research done in the area of learner control and learner ability, the questions of whether and how to incorporate learner control into CBI may need to be revisited. The posits that higher-ability students score better under learner control and lower-ability students score better under program control, may no longer hold true in the current technological age. This manifestation may be due in part to the changing nature of computers, computer software, and the advent of the Internet which occurred in the timeframe between earlier learner control/learner ability studies and more current research in this area. The newer forms of media have made learner control and free-access navigation more common features encountered by computer-users of all ability levels, thereby perhaps raising the overall competence in the appropriate use of learner control for many of the computer-using population.

As new forms of computer-based instruction are constantly evolving, continued research on the type of control, and perhaps on the amount of learner control, that is most effective with learners of differing ability levels seems justified. Research on the thought processes that lower- and higher-ability learners use to make learner control decisions may also yield information that is helpful to teachers, instructional designers, and researchers alike. Perhaps the most challenging responsibility of future research in the area of learner control and learner ability, in fact, all educational technology research, is in the to attempt to keep current with the rapidly changing nature of computer technology and the instructional implications that emerge from these new innovations.

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