DOCUMENT RESUME

ED 158 728 IR 006 183

AUTHOR	Bunderson, C. Victor
TITLE	The TICCIT Learner Control Language. Occasional Paper No. 5.
INSTITUTION	Brigham Young Univ., Provo, Utah. Inst. for Computer Uses in Education.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	Dec 75
CONTRACT	NSF-C729
NOTE	8p.; Institute for Computer Uses in Education Series; For related documents, see IR 006 174, 177, 178 and IR 006 180-182
EDRS PRICE	MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS	*Computer Assisted Instruction; Cybernetics; Display Systems; Historical Reviews; *Instructional Design; *Instructional Innovation; Learning Motivation; *Learning Theories; Man Machine Systems; Programing Languages; *Technological Advancement
IDENTIFIERS	*TICCIT Computer System

ABSTRACT

The TICCIT command language is a synthesis between work in instructional psychology and cybernetics, and broadens the degrees of control available to students well beyond the capabilities of existing CAI systems. Student control commands manipulate important instructional variables and information is provided to guide the student's choice of presentation form, and inter-display relationships (easy-hard) as well as requests for instructional help. TICCIT is designed to provide students with optimal and transferable learning strategies, increased motivation, and attitudes of individual responsibility. (Author/CMV)

INSTITUTE FOR COMPUTER USES IN EDUCATION

THE TICCIT LEARNER CONTROL LANGUAGE

C. Victor Bunderson

Occasional Paper No. 5

December 1975

Supporting Agency:
The National Science Foundation
under Contract #NSF-C729

DIVISION OF INSTRUCTIONAL RESEARCH, DEVELOPMENT & EVALUATION

Brigham Young University

Provo, Utah

The Occasional Paper series of the Institute for Computer Uses in Education is designed for communication primarily with faculties and administrators at the test colleges involved in the TICCIT Project. The Occasional Papers treat topics and issues which are of immediate concern.

THE TICCIT LEARNER CONTROL LANGUAGE

C. Victor Bunderson
Brigham Young University
December 1975

It is useful to put learner control in context with historical developments in the field of computer-assisted instruction. Very little work was done in computer-assisted instruction prior to 1964. Most work since that time divided itself into four program categories: drill and practice, tutorial programs, simulations and games, and problem-solving use of computer terminals. The three categories, drill and practice, simulation, and problem solving are all adjuctive applications in which the computer is a resource to the mainline instruction provided by teachers. Tutorial programs could also be used in an adjuctive mode; however, they were designed to handle a heavier burden of instruction, usually on concepts and rules. Concepts and rules characterize the great majority of instruction above the junior high school level. By contrast the objectives of drill and practice instruction focus on memorization skills. Simulations and games focus on the application of concepts, rules and information rather than their initial learning.

It was noted in the early research that considerable motivation accompanied work with simulation, games and problem-solving. By contrast, students caught in the network of conditional branches which comprised a tutorial program, express less motivation and enjoyment than in the freer forms of instruction.

Attempts were made after the first several years of research with tutorial programs to loosen up the strictures of the tutorial dialogue. At the University of Texas considerable work was done on learner-control in an effort to capture some of the motivation inherent in the use of problem-solving languages and simulations. Simultaneously, work was being done at Brigham Young University by David Merrill and his co-workers on synthesizing the instruction literature on concept and rule learning to provide a taxonomy of instructional variables and a set of instructional theorems for teaching concepts and rules. The cybernetics models developed at Texas and the instructional psychology theoreums at BYU ultimately came together in the TICCIT Learner-Control language. This synthesis occurred when about ten of the key personnel working on the TICCIT project at the University of Texas moved to Brigham Young University and started the Institute for Computer Uses in Education.

The British cyberneticist, Gordon Pask, provided a framework for man-machine dialogues which is relevant to the design of the TICCIT Learner-Control language. Pask speaks of three levels of discourse, L0, L1, and L2. Each higher level is a language for discourse about the next lower level language. At level zero in any computer-assisted instruction system exists command operators which students can use for getting around any pre-programmed network, such as a tutorial program. Student control is limited by the author's sequence strategy decisions.

Level 1 (L1) is a language for talking about the strategies which the author may have used at Level 0. In learner control, the student is given control over sequence strategy. A strategy consists of at least four phases: a survey phase, a learning tactics phase, an evaluation tactics phase, and a review phase.

At Level 3 we can conceive of a language for talking about strategies in general. A Level 2 language would allow student/machine dialogue concerning general aspects of strategy and tactics which are independent of content. How well is a student strategy working? What other strategies are available to the student? In the TICCIT system, an advisor program collects data on student performance. It uses color coding on structural representations (MAPS) of course, unit, and lesson hierarchies to indicate which segments, lessons, and units the student has passed, which ones he has failed, and which ones are in progress. The colors green, red, and yellow are used for these designations. The student may solicit status information at any time by pressing the MAP key and observing the colors, and by pressing the ADVICE key for more specific status information. General suggestions concerning the sequence the student might take through LESSON and UNIT MAPS and concerning evaluation in learning tactics is also available from the advisor. Sometimes the advisor interjects unsolicited advice on strategy and tactics.

It is important to recognize that all of the major CAI systems which have been developed over the past twelve years, with the exception of TICCIT have worked primarily at Level 0. The drill and tutorial programs written in existing CAI languages have only occasional instances of Level 1 and Level 2 functions. This criticism applies to all of the major CAI languages including Coursewriter, Tutor and Plan It. The criticism does not apply to the use of APL, basic and other student problem solving languages. Here the student has complete control over the programs that he himself writes. However, these problem solving applications are not appropriate for mainline instruction in concepts and rules, nor do they provide Level 2 support for student learning.

Development of a set of student commands, especially in the areas of survey tactics and learning tactics, required the application of research and theorems from instructional psychology related to the acquisition of concepts and rules. The taxonomy developed by Merrill served as the basis for the design of student commands. It was desired that the student control commands manipulate important instructional variables. A further constraint was that the student would not be given a control command in an area where he had no information to guide his choice. The commands were implemented as buttons on a special learner-control keyboard, and as choice points on displays on the SONY TV terminal described in Schneider's paper.

The first category of variables in Merrill's taxonomy entitled "presentation form." Each presentation may take either an expository or an inquisitory form, i.e., we may <u>tell</u> a student or we may <u>ask</u> him. The content of this presentation may be in the form of either a general statement such as the definition of the concept or a formal statement of a rule, or an instance. An instance may be either an example or a non-example of the concept or the rule in use.

The TICCIT system gives students control over three of the four types of presentation form. He may see an expository generality by pushing the RULE button, an expository instance by pushing the EXAMPLE button and an inquisitory instance by pushing the PRACTICE button.

The second variable category in Merrill's taxonomy is that of inter-display relationships. This category yielded two more learner-control commands, the EASY and the HARD button. Generalities may differ in terms of their abstractness or concreteness. Thus on TICCIT, the student can see a more concrete or more abstract version of the RULE by using the EASY and HARD commands. These commands also vary the difficulty level of instances.

The last category of instructional variables is that of instructional help. This is the provision of cueing and prompting techniques which highlight the critical information, focus attention and lead the student through the procedures in a step-by-step fashion. The use of colors, arrows, and other graphical symbols and step-by-step presentations provides instructional help. It is accessed appropriately enough by the HELP key. The student may press the HELP button for both rules and for specific instances.

The commands discussed above apply primarily to learning tactics. Survey tactics requires other keys including the MAP key, the OBJECTIVE key, the INTRO command and RULE key. The student may immediately bounce up to a higher level map by pressing the MAP key. He may descend to a lower map by picking a numbered element on a map and pressing the GO command. He may orient himself to the contents of any map element by pressing the OBJECTIVE key and seeing an illustration of the objective of that segment, lesson, or unit. The INTRODUCTION command gives him a video tape or a page-by-page mini-lesson orienting him to the contents of a lesson or unit quickly. The map structure as developed in the TICCIT system were derived from the work learning hierarchies reported in the instructional psychology literature.

The TICCIT command language is thus seen to be a synthesis between work in instructional psychology and cybernetics. It broadens the degrees of control available to students well beyond existing CAI systems.

The objectives which can be achieved with learner-control are broader than convention CAI's efficiency and mastery objectives. The designers of the TICCIT learner-control language hope that through its use students will achieve better learning strategies and that this new proficiency will be of value to them in systems other than TICCIT, including books and classrooms. The designers also hope that the use of a command language will prove motivating and liberating for the students, and that they will develop a more positive attitude of approach rather than an avoidance toward learning. An attitude of individual responsibility is also sought. Finally it is hoped that after an initial learning period the students will prove more efficient in the use of their own strategies than with any pre-programmed approach.

[In the oral presentation, color slides of TICCIT displays were used to illustrate student use of the command language.]