DOCUMENT RESUME

ED 320 563 IR 014 479

AUTHOR Koohang, Alex A.; Stepp, Sidney L.
TITLE Computer Assisted Instruction: A Support for the Mastery Learning System.
PUB DATE 84
NOTE 10p.
PUB TYPE Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; *Courseware; Elementary Secondary Education; Individualized Instruction; *Instructional Development; *Mastery Learning; *Models; School Schedules; Teacher Role
IDENTIFIERS Bloom (Benjamin S); Carroll (John B)

ABSTRACT

It is argued that computer assisted instruction might be an answer to the scheduling problems resulting from the implementation of mastery learning programs in the public schools. The mastery learning model proposed by Carroll and the transformation of this model into a working model by Bloom are described. The difficulty of implementing mastery learning given the fixed schedules of public schools is noted, and the potential contribution of computer assisted instruction (CAI) is outlined, noting that CAI facilitates instruction at the student's own pace while reducing constraints on teachers' time and allowing them to devote more time to students requiring remedial instruction. Criteria for instructional software which can support mastery learning are outlined. It is noted that software must be clear and understandable; must motivate students actively in drilling subject matter, passively in reinforcing all learned subject matter, and interactively to give fast, positive feedback; must move consistently through subject matter and end at a given mastery level of objectives; and must be both user-friendly and entertaining. Emphasizing that the computer cannot replace the teacher or the textbook, the paper concludes with a model for CAI use in mastery learning situations which incorporates initial teacher instruction, student practice (individually and in groups), formative testing, teacher remediation and CAI lesson referral, CAI (paired or with small group practice), further teacher remediation, and summative testing. (5 references) (GL)

# Computer Assisted Instruction: A Support for the Mastery Learning System

Alex A. Koohang
North Carolina Wesleyan College

and

Sidney L. Stepp
Southern Illinois University at Carbondale

Alex A. Koohang is an assistant professor of computer information systems at North Carolina Wesleyan College.

Sidney L. Stepp is a graduate assistant in curriculum & instruction department at Southern Illinois University.

SEND ALL CORRESPONDENCE TO:

Alex A. Koohang, Ph.D.
Dept. of CIS
North Carolina Wesleyan College
3400 N. Wesleyan Blvd.
Rocky Mount, NC 27804

Mastery learning system, a learning theory developed by Carrol (1963) and transformed to a working model by Bloom (1968) is a powerful instructional model which offers a new approach to student learning. It has been described as leading almost all students to a successful, rewarding learning experience. In its application, however, time has been cited as a drawback in classroom situations (Horton, 1981). Unmodified, mastery learning can be a detriment to students by lowering the overall requirements for mastering material. Computer-assisted instruction or CAI might be an answer to the problem and allow the mastery learning theory the freedom from limitations to be a realistic, as well as, effective as an instructional model.

Carrol (1963) suggests that if each student takes the time necessary to learn material to a specific level of achievement, the student will probably achieve that level. He diagramed the theory as the following:

$$\text{Gains in School Learning} = \frac{A + B}{C + D + E}$$

Where A is perseverance, B is opportunity to learn, C is aptitude, D is quality of instruction, and E is ability to understand instruction.

In this model, a student, who takes little time for a subject and possesses little ability in the subject will not succeed in learning. Bloom (1971) transformed this model into a working model and believes that if students are normally distributed with respect to aptitude, and are given

the same instruction then the outcome will be that their achievement will be normally distributed.

A student's classroom gains depend on perseverance and opportunity relative to aptitude, quality of instruction, an ability to understand instruction. Bloom (1971) believes that time is the primary factor in two of the variables and one of the major factors in the other three and given the appropriate time all or almost all students can master the subject. A student must be willing to spend the time in learning, and h must have the time to spend. Likewise, a student needs time to develop an aptitude and an ability in the subject, and a teacher needs time to adequately individualize and prepare a subject for application. In all of the variables in the model, time plays a vital role in the success of mastery learning.

Horton (1981) recognized time as a necessity to achieve mastery learning and reported that mastery learning was not practical in light of fixed schedules used in public schools In his research, almost all schools maintained a schedule of 45 minute-class periods, 5 1/2 hours school days, and 180 school days a year. This fixed schedule in schools conflict with the requirements of mastery learning which mandates a flexible schedule. Various amounts of time are needed in classrooms because of individual differences in rates of learning acquisition. In short, it is impractical to expect different students to achieve the same mastery of material. Subsequently, more time is required from the teachers to

individualize lessons and teach various levels of students. For all students to achieve a 95% mastery of a subject, the instructional component should be increased by 10% to 20%. This cannot be considered a reasonable demand on teachers since most teachers do not have that kind of time to spare (Horton, 1981). The bottom line is a two-fold problem.

First, while mastery is an ideal of learning in the mastery learning theory, how can students and teachers find the necessary amounts of time to practice the theory and arhieve the ideal? Second, mastery learning is an excellent theory but it is not easily applied in current educational institutions where there are inflexible time limitations that cannot be easily changed. Together these problems could be an impasse to the application of a good learning theory, except for at least one--CAI.

CAI, computer assisted instruction, eliminates problems concerning time. CAI is simply using a computer and a program as an instructional tool. The one outstanding consideration in the use of CAI in a mastery learning system is that one can learn a subject at one's own pace. Limitations of various amounts of time required by a classroom of students is accommodated since the experience does not have to stop at the end of a 45 minute class period. The student can come back to the same point in a lesson at a later time. Likewise, teachers do not have to devote time they do not have to repeatedly individualize rates of instruction or to prepare additional lesson plans. On the

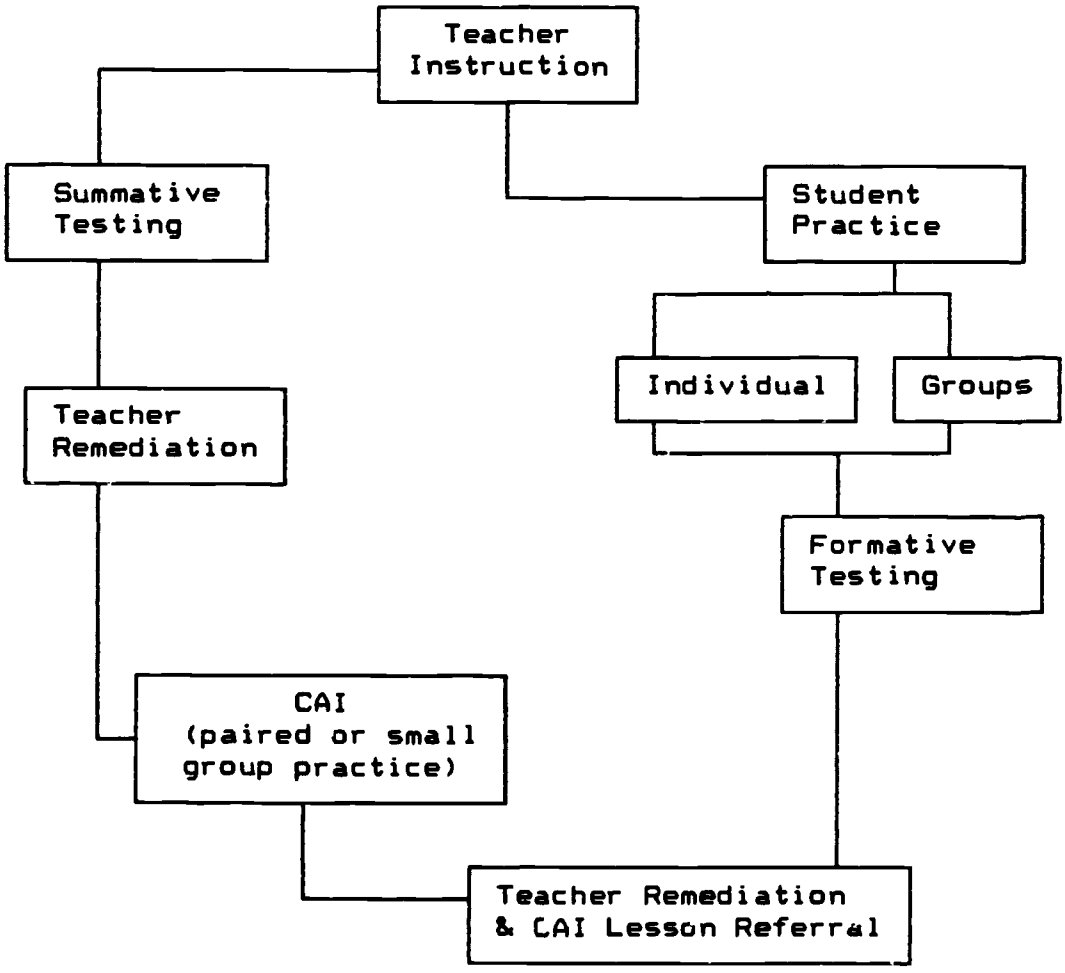
contrary, once the teacher defines the task and objectives, and creates, modifies or selects suitable computer programs, the teacher will have more time to aid the students in the mastery learning process. Also, the schedule of educational institutions can remain unchanged as CAI for mastery learning is assimilated into the system. There are some considerations in the use of CAI as a tool in the mastery learning theory.

Just as any regular classroom situation requires quality instruction, CAI for mastery learning must have quality instructional software. The volumes of literature describing the qualities of good software can be condensed into four necessary qualities for mastery learning (Caissy, 1984). First, the software must be clear and understandable to students at varying levels of ability in the subject-matter. Second, the software must motivate the students actively in drilling the subject-matter, passively in reinforcing all learned subject-matter, and interactively to give fast, positive feedback for students. Third, the software must move consistently through subject-matter and end at a given mastery level of objectives. And fourth, the software must motivate the students by being easy to use with simple directions as well as entertaining with graphics and invertive responses to student questions and answers. Together, these software qualities will guide the student to a successful mastery learning experience despite the student's ability in the subject matter.

CAI cannot replace a teacher or a textbook. A good software program and a good textbook are vastly different. A software program could contain the same textual information as a book, although that alone would defeat one of the major advantages of using a computer--interaction. A computer has the capability of giving individual responses to a variety of inputs. A computer also has the capability of animated graphics. Yet, a book also has its own advantages of ease of use and little cost. A software program and a teacher are vastly different, in that, the teacher humanistically responds in ways the software program cannot. A good software program in an area such as mathematics for example, isn't versatile to the point of translating a students feelings in terms of why the student is suddènly having trouble with a review lesson. CAI is simply a tool.

What the tool does provide is an opportunity for individualized instruction and drill to supplement the teacher and textbook in the classroom. It must be properly implemented with a combination of teacher, textbook, and other student inputs. The following is a model for CAI use in a mastery learning situation.

CAI FOR MASTERY LEARNING APPROACH




This model stresses two major points. First, CAI is incorporated in classroom activities. The teacher begins instruction, the students practice the instruction, the teacher aids in remediation after formative classroom testing, and remediates again after formative CAI testing. Second, the students will continue to be interactive. Student classroom practice is, in part, in groups and practice in CAI is paired or small group.

Aside from the use of CAI, one component has been added to the application of mastery learning to the classroom.

Instead of one formative testing session before remediation and formal testing, students receive an additional formative testing session through CAI. In mastery learning application, time limitations did not permit more than one formative testing period. Since teacher and formal classroom setting are not necessary in CAI use, a second formative testing session is possible. This brings up a final point.

With the intellectually honest and consistent with high level scholarship CAI programs, teachers can apply the mastery system approach in the classroom settings and students can work with materials discussed in the classroom at their own leisure. This provides individualized instruction and appropriate learning time for students and learning becomes a rewarding experience for them. Aside from initially preparing materials, this also frees the teacher to help with remediation of students with greater learning problems.

## REFERENCES

Bloom, B. (1971). **Handbook on formative and summative evaluation of student learning.** New York: McGraw-Hill.

Bloom, B. (1968). **Learning for mastery.** UCLA-CSE. Evaluation Comment. 1, 2.

Caissy, G. (1984). Evaluating educational software: A practitioner's guide. **Phi Delta Kappan,** 66(4). 249-50.

Carroll, J. (1963) **A model of school learning.** Teachers College Record.

Horton, L. (1981). **Mastery learning.** Bloomington, IN: Phi Delta Kappa Educational Foundation.