

COMPUTER-BASED PRECISION LEARNING WITHIN  
THE CENTER FOR INDIVIDUALIZED INSTRUCTION  
JACKSONVILLE STATE UNIVERSITY  
JACKSONVILLE, AL

Claudia E. McDade and Charles P. Olander

**Precis**

Ten years ago the Center for Individualized Instruction (CII) began offering courses and services to students at Jacksonville State University in Jacksonville, Alabama. As a multi-purpose, multi-disciplinary academic support center, the CII integrates the Personalized System of Instruction (Keller, 1968), Precision Teaching (Pennypacker, Koenig, & Lindsley, 1972), and Computer-Assisted Instruction (McDade & Olander, 1987) into a unique learning environment known as *Computer-Based Precision Learning* (McDade, Brown, & Olander, 1988). The Center for Individualized Instruction encourages high student performance in both basic skills and regular curriculum courses, through computer-based precision learning. Students may use the Center for non-credit tutoring or for credit-bearing course work.

**Precision Teaching within the Center for Individualized Instruction**

The Center for Individualized Instruction provides a unique delivery system for any undergraduate course or tutorial service which allows students to work at their own pace, interacting with curriculum materials, tutors, and computers as much as necessary to master material at some criterion established by the instructor. Although students are given guidance in this system, it is unnecessary for them to attend traditional lectures. Some faculty choose to provide optional lectures/discussion groups to motivate students and to encourage critical thinking about concepts.

Pioneered by Ogden Lindsley, based on the work of B.F. Skinner, Precision Teaching requires students to reach high levels of *fluent*, proficient, accurate performance, and to chart their own progress on a daily standard celeration chart (McGreevy, 1983). The emphasis goes beyond accuracy to include fluency of correct responding (i.e., rate of correct responses). Students are required to master material at a minimum frequency of 10--30 correct computer activated or verbal responses per minute.

The Personalized System of Instruction provides the format, that is the procedures through which students master course material. Precision Teaching provides the dependent measure of student progress, as well as the prescribed competency for student performance. Computer-Assisted Instruction provides the mechanism to evaluate student performance. Computer-Based Precision Learning is provided by MacTest™ (Olander, 1986; Olander & Merbitz, 1980), a course authoring system to precision teach various courses. Individual instructors may choose mastery criteria, practice formats, test formats, and feedback conditions for their students. Large test item pools are developed to allow students to repeat testing without penalty until mastery is obtained. MacTest™ allows instructors to gather and maintain files of student responses and to assess item analyses based on student performance. This advanced technology allows rapid, continuous, on-line data collection for tracking performance of both individuals and groups of students.

Students initially are puzzled by the frequency requirement in Center courses, asking for justification of the measure. Most clearly recognize the need to become fluent in vocabulary, syntax, and appropriate sentence structure when studying a foreign language. Faculty draw a parallel between learning a new language and learning the technical language of a given discipline. Competency is presumed when an individual can speak as a Psychologist or a Nurse, can provide appropriate technical answers to questions, and appears to think as a Psychologist or a Nurse. *The basic difference between a person who appears competent and one who does not is their fluency with material (i.e., frequency of correct responses).*

### Precision Teaching as a Measurement Strategy

Research in the Center for Individualized Instruction has shown Computer-Based Precision Learning across several disciplines (e.g., anthropology, basic skills, biology, geography, psychology) to be an effective measurement strategy for determining changes in student performance. Plotting student frequencies of correct and incorrect responses on the standard celeration chart, a semi-log graph, allows both the student and instructor to make recommendations for the individual learning situation (Pennypacker, Koenig, & Lindsley, 1972). Since learning is exponential, the standard chart presents a linear representation of learning. Once several data points are recorded, a prediction of when mastery will occur can be made. If student performance appears erratic on the chart, the student can assess what is happening in

his/her personal or academic life which causes these variations and can make necessary changes. Such decisions encourage students to be responsible for their own behavior.

### Precision Teaching as an Instructional Strategy

In addition to being an effective way to measure student performance, Precision Teaching is an effective instructional strategy. Many students use MacTest™ as a personalized tutor, choosing to continue testing past minimum mastery requirements. In a typical course with a minimum frequency correct criterion of 30 correct responses per minute, students average 15 trials per unit, with two of these trials past the minimum mastery level. The average highest frequency correct/unit reaches 52 correct responses per minute. Obviously, students evaluate MacTest™ as reinforcing because they use it even beyond course requirements. Their performances generally improve on each successive trial.

The Center for Individualized Instruction provides opportunity for faculty research into instructional processes. Dissertation research of five doctoral candidates from two other universities has been conducted in the CII, as well as approximately four research studies per year conducted by Center faculty.

The Center for Individualized Instruction is a unique academic support center because it emphasizes student outcomes. Students required to reach high levels of fluent, accurate performance--regardless of their presenting skills levels--simply do so. They leave the CII confident in their competence in any discipline they study. The Center for Individualized Instruction is also unique because it emphasizes empirical evaluation of each intervention made.

### Evidence of Program Effectiveness

The Center for Individualized Instruction's success is reflected by the sheer numbers of students seeking its courses and services. Initially funded in 1978 by Title III of the Higher Education Act of 1965, the Center served fifty students with no University fiscal support. Today, however, over 4,200 students use the Center with total funding by the University. During this period of time, the cost per student per year fell from a high in 1978 of \$935 to \$42 in 1988. A recent survey of student users of the Center for Individualized Instruction cited the major strength of the Center as its supportive atmosphere (Bailey, 1987). Students indicated that they liked immediate feedback, no penalty for repeated testing, and the one-on-one relationship they develop with their peer tutors and Center faculty. They said they felt they had choices in the Center and could control their own destinies.

Empirical data are taken with each intervention made within the Center for Individualized Instruction and used for data-based curricular decisions. Tracking of students after they leave the Center is also maintained in several areas. Generalizations can be made regarding student performance on subjective exams, improvement in student performance on specific skills, student performance in subsequent courses, and student retention of material.

### Generalization and Retention of Precision Taught Material

Precision taught material appears to generalize well to essay composition and word problem solution. Students who are precision taught write more succinct and accurate essays (McDade, Rubenstein, & Olander, 1983). They also participate more in class discussions (McDade & Olander, 1986). Students who are precision taught basic terms, concepts, symbols, and formulae in statistics can correctly solve more word problems (McDade, Willanzheimer, and Olander, 1981; McDade and Olander, 1987). Long term retention of academic material at high fluencies has been found among Center for Individualized Instruction students, some as long as thirteen months after completing the course (Olander, et.al., 1986; Olander & McDade, 1983; Olander & McDade, 1982). In one study, a retention test was given to two groups of students eight months after they finished a course. One group had been precision taught, while the other had been traditionally taught by the same instructor with the same text.



Those who were precision taught wrote more succinct, accurate essays, generating more correct concepts per minute than students taught the course traditionally (Olander, et. al., 1986). This particular class of precision taught students did not write essays during the course examinations, while the traditionally taught class did. Even without essay composition experience, the precision taught students wrote better organized, more fully developed content essays than the traditionally taught students.

### Precision Teaching Specific Skills

All students taking the freshman level study skills course within the Center are given reading diagnostic evaluations at the beginning and end of the semester. All are also required to do a one-minute timing of their reading rates each day. Students plot their reading rates on the standard celeration chart and submit their charts to the instructor for evaluation at least once a week. Students whose rates are not improving are provided with a personalized program for improvement from a reading specialist. The average increase in reading rate is 1.15 times per week. In six weeks time 92% of students improve their reading rate from a mean of 201 to a mean of 341 words per minute. Reading comprehension and vocabulary scores improve as well--an average of more than one one grade level in six weeks.

Study skills students are also required to reach a minimum mastery of 25 correct responses per minute on four word part (e.g., prefix, word root, suffix) tests. The average highest frequency correct actually reached is over 41 correct per minute. Students successfully completing this study skills course earn an average of .5 higher grade point (on a 3 point scale) than students with the same entering characteristics who do not take the course.

Students in developmental English composition are precision taught. Timed writings allow students to become more familiar with parts of speech, correct written word choice, and organization of coherent thought. Words come more easily to students as they progress into paragraph development. Timed practice sheets result in rapid association of correct word usage. All of these interventions have resulted in student writing improvements, particularly in comma splices, fragments, run-on constructions, and clarity of expression in phrasing. Eighty-five percent of students successfully completing this course earn a "C" or better in their subsequent English composition and speech courses.

## Conclusion

Students in the Center for Individualized Instruction reach high levels of performance, regardless of their presenting characteristics, in the courses or services they take. They *learn* material thoroughly demonstrated by the fact that they can retain it for months or years. An outstanding side effect of Center courses and services is the personal growth students experience as a result. Students learn to take responsibility for their own learning--rather than blaming a teacher. They come to realize that a teacher doesn't "give" grades; students "earn" grades. They become masters of their own fate because they know what is expected and choose their course grade by performing at prescribed levels for given grades. They learn "how to learn" and that alternate strategies are required for different courses. Students report that they often precision teach themselves material from other courses--particularly those courses where they have experienced the most problems.

Center staff attribute the phenomenal growth and success of computer- based precision learning within the Center for Individualized Instruction to the fact that the Center provides the mechanism for student learning, exceptional performance, and personal growth.

## References

- Bailey, S. (1987). Student evaluation of the Center for Individualized Instruction. Report to the VPAA. Jacksonville State University, Jacksonville, AL.
- Keller, F.S. (1968). Goodbye teacher....., Journal of Applied Behavior Analysis, 1, 79-89.
- McDade, C.E., Brown, J. M., and Olander, C.P. (1988). Computer-assisted precision teaching: Effective education technology for developmental students. Invited presentation. National Association for Developmental Education, Orlando, FL.
- McDade, C.E., and Olander, C.P. (1987). Precision teaching in college: An umbrella for achieving excellence. Association for Behavior Analysis, Nashville, TN.
- McDade, C.E., and Olander, C.P. (1987). Precision management of instructional technology: A program update. Educational Technology, 27 (3), 44-46.
- McDade, C.E., and Olander, C.P. (1986). Where has all the learning gone? Invited address. First National Conference of Exemplary Programs in Developmental Education, Atlanta, GA.
- McDade, C.E., and Olander, C.P. (1986). PSI and PT: A marriage of mastery and proficiency. Invited address. Association for Behavior Analysis, Milwaukee, WI.
- McDade, C.E., Rubenstein, S.B., and Olander, C.P. (1983). Parallel between frequency testing and performance on essay questions in a theories of personality course. Journal of Precision Teaching, 4 (1), 1-5.
- McDade, C.E., Willanzheimer, L.A., and Olander, C.P. (1981). Precision teaching in a psychological statistics course: Parallels between frequency testing and performance on word problems. Invited paper in poster format. Association for Behavior Analysis, Milwaukee, WI.
- McGreevy, P. (1983). Teaching and learning in plain English. University of Missouri - Kansas City: Plain English Publications.
- Olander, C.P. (1986). MacTest documentation, version 3.1 Center for Individualized Instruction, Jacksonville State University, Jacksonville, AL.
- Olander, C.P., and Merbitz, C.T. (1980). Using technologies to teach: A CAI, A/V, PSI course. Educational Technology, 10 (5), 50-52.
- Pennypacker, H.S., Koenig, C.H., and Lindsley, O.R. (1972). Handbook of the standard celeration chart. Kansas City: Precision Media.
- Spann, M.G., and Thompson, C.G. (1986). The national directory of exemplary programs in developmental education (2nd ed.). National Center for Developmental Education, Appalachian State University.