Efficacy of a Computer-Assisted Instruction Program in a Prison Setting: An Experimental Study

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EFFICACY OF A COMPUTER-ASSISTED INSTRUCTION PROGRAM IN A PRISON SETTING: AN EXPERIMENTAL STUDY

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The efficacy of using computer-assisted instruction (CAI) with inmates participating in a prison education program was examined through an experimental study. The researchers sought to address and correct many of the methodological flaws commonly present among studies that compare a CAI-plus-traditional-instruction combination to traditional-instruction alone. Seventy-one inmates were randomly assigned to either an experimental group that received a CAI-plus-traditional-instruction combination, or a control group that received traditional-instruction only. Achievement scores of inmates in the experimental group were not significantly higher than those in the control group.

Computer-assisted instruction (CAI) delivered on a personal computer has been viewed optimistically by many researchers since its introduction in the 1970s. It has been claimed that if judged by a number of criteria that include achievement gains, "CAI may far surpass other forms of instruction" (Fletcher-Flinn & Gravatt, 1995, p. 219). Askar and Kosksal (1993) suggested that the impact of CAI on education is impossible to prevent.

The potential for CAI as a learning tool at all levels of education is anticipated with great optimism. Therefore, the notion that CAI can be used to support and enhance adult learning through a human-computer interaction has not gone unnoticed by those involved in adult education. There is, however, a certain degree of caution that must be taken in the assimilation of this praise. Even though computers may hold great promise for undereducated adults, convincing evidence is yet to be produced to affirm that belief. If it is possible to demonstrate that CAI provides a unique contribution to academic achievement of undereducated adults, then using

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CAI in addition to classroom instruction in education should better ameliorate the negative effects of their academic deficiencies. This is of particular value to adult educators who operate Adult Basic Education (ABE) and General Educational Development (GED) programs if they are considering changes that involve CAI. This is true regardless of whether the clientele base includes inmates or free citizens.

For this reason, reliable experimental results on this question are important to the adult education practice as the controversy regarding the effectiveness of CAI with undereducated adults continues to spark debate. Although CAI enjoys wide acclaim from numerous authors as holding potential for improving student achievement (Askar & Kosksal, 1993; Fletcher-Flinn & Gravatt, 1995), others have come to the conclusion that positive benefits from CAI are yet to be determined (Clark, 1985a, 1985b; Rachal, 1993, 1995). In examining the literature on adult reading achievement and CAI, Rachal (1995) noted that most of the studies he reviewed failed to show a significant difference between CAI and conventional techniques, and only 3 of the 21 studies showed significance favorable to CAI. Rachal (1995) believed that many of the studies were methodologically flawed, leaving questions of efficacy still open.

Some authors have called for future research on this subject to seek stronger controls on the research design (Clark, 1985a, 1985b; Rachal, 1995). Such controls necessarily improve the experimental design and thus provide a more reliable and valid examination of CAI in the undereducated adult setting. Armed with a greater knowledge of CAI's capabilities and limitations, program designers will have a better understanding of the implementation of effective procedures. Furthermore, better designed and more credible studies offer caveats to those who presume that the problems of undereducated adults inevitably yield to technological fixes. Alternatively, those who presume that technology has a negligible role in the teaching-learning transaction stand to gain from such caveats as well.

The key advantage to CAI in any educational setting is reported to be the individualized nature of the method of delivery. As a result, the presumption is that individualized instruction is being facilitated in modern prisons with the use of CAI. However, as in the wider undereducated adult setting, CAI has yet to demonstrate unambiguously that computers will improve inmates' math and reading scores in a controlled experimental setting. Previous studies performed in a correctional environment were not experimental by design and often provided inconclusive results (Diem & Fairweather, 1980; Siegel, 1979; Spivey, 1992).

Researchers are divided on the conclusiveness of CAI studies in general due to the methodological shortcomings and wide variation in procedures used to test the theory that a CAI-plus-traditional-instruction format will produce better results than using traditional classroom instruction alone. These shortcomings include a lack of control over experimental conditions, insufficient treatment length, varying treatment lengths among study and control groups, experimental bias, nonrandomization of study participants, and questionable statistical analysis

procedures. The current study seeks to address some of the previous studies' methodological shortcomings specifically in a correctional institution setting.

A number of studies (Daniels & Hess, 1992; Spivey, 1992; Wilson, 1992) have failed to control various experimental conditions. Although not all were performed in a correctional setting, these studies exemplify common flaws present in CAI research. For example, a preferred condition in comparative research is that of equal treatment and equal treatment time for both the experimental and control groups. However, owing to the unstable nature of participants in adult basic education programs, it is often difficult to coordinate a study under optimum conditions. Participants in a particular treatment group were frequently allowed to complete the treatment time in a shorter period (or longer period) than participants in the alternate treatment group, as was the case in the study conducted by Daniels and Hess (1992). This is problematic because scores on standardized tests had additional opportunities to be impacted by outside influences as the treatment time was increased. This obviously makes the unique contribution of the treatment and the confounding effects of external factors difficult if not impossible to isolate. In many studies, the treatment time was altogether insufficient.

In a study conducted by Spivey (1992), the treatment lasted for only 2 weeks for 1 hour each day. A related problem concerns sample size differential between groups or inadequate overall sample size. In the Spivey study, the experimental group consisted of only 8 participants and the control group only 9.

The researchers in CAI studies will rarely if ever randomly assign the participants to the treatment groups. As was the case in all of the literature reviewed for this study, the study groups either used preexisting groups as control and experimental, or relied on volunteers. Failure to use random sampling does not take into consideration the differences that are present among participants prior to testing.

Another design flaw occurred when experimental groups and control groups were compared on different instruments, as was the case in the study conducted by Wilson (1992). Although scores on standardized tests are often highly correlated among different instruments, it can be argued that the validity of the results is compromised unless care is taken to control for all possible discrepancies between testing conditions. Another design weakness of the Wilson study was that participants from the control group and experimental group were posttested in an unequal manner: All posttesting for both groups was done on the computer. In that case, it can be argued that the experimental group might score higher than the control group by virtue of the fact that those individuals had previous experience on the testing device.

A problem common to nearly all CAI research is attrition, which will frequently reduce the number of participants by 50% or more. The participants in adult basic education classes are usually experiencing a number of difficulties related to the fact that they are undereducated. For that reason, their participation is limited due to financial, transportation, child care, health, legal, or other problems. What may have originally been an adequate sample size often shrinks to the point where the results

cannot be generalized to a larger population. The methodological shortcomings of research that fails to control for these factors make the results spurious at best.

The last problem stems from experimental bias of the researchers in these studies. This may occur when the persons in charge of conducting the research stand to gain from the marketing of the software being used. It may also occur when the researchers are the program administrators who have a considerable investment in hardware and, perhaps unconsciously, wish to justify that investment to others as well as to themselves. Rachal (1984) found that several researchers, despite finding no significant differences between CAI and non-CAI groups, defended CAI and expressed faith in its use. In either instance, the end result is tainted research that does not reflect the actual capabilities of the software being used.

When taken as a whole, conclusions drawn from the studies that compare the effectiveness of CAI to traditional methods comprise an incomplete consensus. If there is a common thread to these examples, it is that they underline the need for methodological revisions in the design of studies comparing these two learning approaches. Specifically, more control is needed to address the differences in participants prior to an educational endeavor by assigning them on a random basis, equalizing treatment times, and equalizing the size of the treatment and control groups. By taking measures to adjust and refine the weak points in experimental design of previous CAI studies, the results from future research can achieve better generalizability and ultimately a clearer assessment of the efficacy of computer use in adult education programs.

METHOD

This study was conducted using data obtained from inmate test scores, interviews, and educational records at a maximum-security prison. Inmates at the prison who lack a high school education are given the opportunity to volunteer for the "regular" prison education program and are placed on a waiting list. (Eligibility for the program is contingent on conduct and conformity to prison regulations.) Upon entry into the program, the inmates are examined by the institution for academic skill level using the Test of Adult Basic Education (TABE). If the inmates are able to perform at the eighth-grade level on the TABE, they are placed in the GED curriculum. If the inmates perform below the eighth-grade level or possess no functional literacy, they are placed in the ABE curriculum. After passing the GED test, inmates who are within 6 months of completing their sentence are allowed to enter the "Life Skills for Prisoners" program, which is taught in a computer lab adjacent to the education classrooms. This study used only inmates attending the "regular" education classes; no "Life Skills" inmates participated.

The director of the Life Skills class agreed to allow each inmate in the experimental group to receive the GED instructional material for 1 hour per day on 2 of the 10 computers that were normally reserved for use in the Life Skills class. All participants were randomly assigned to either the treatment group or the control

group. By using the members of a group who were being exposed to computers for the first time, who could be randomly assigned, whose treatment duration could be equalized, and whose continued participation was likely, an experimental design could be implemented.

Participants

The participants in this study consisted of 71 male inmates ranging from 19 to 53 years of age; the mean age was 30.5 years. There were only two ethnic groups present among inmates in the sample population: African American inmates (n = 56, 79%) and Caucasians (n = 15, 21%). The study used inmates who were just beginning their prison education program, and none of the participants had had any previous experience with computers.

Procedure

The regular prison education program operates in the following manner: Inmates are assigned to the open-entry, open-exit educational classes as vacancies arise. As one inmate obtains a GED certificate and exits, a vacancy is created. Another inmate who has been on a waiting list fills that vacancy. The new participant in the program is pretested using the TABE. All inmates receive instruction until they are capable of passing the GED test.

During the 8 months the study was in progress, approximately 10 students cycled through the regular education program each month. A random-digit table was used to assign all inmates who entered the program to either an experimental group or a control group. As each inmate entered the program, he was matched with the next consecutive number on the random digit table. If the number was even, the inmate was assigned to the control group; if the number was odd, he was assigned to the experimental (CAI) group. This method of participant assignment ensured a steady flow of participants for the duration of the treatment period. The short yet intensive treatment time of 80 hours over a 4-week period was designed to substantially reduce attrition factors that frequently disrupt studies using ABE and GED students as participants.

The traditional instruction is delivered in the prison for 4 hours each day. Each inmate attends four 1-hour classes in English, mathematics, history, and science, each taught by a different instructor. There were 10 to 15 students in each class. The design of the study facilitated the assessment of the different methods of instruction because every attempt was made to keep the learning experiences separate. The inmates who were assigned to the control group attended their daily classes in sequence. Inmates who were assigned to the experimental group attended three of the four traditional instruction classes each day and then physically left the classroom to engage in CAI in the computer lab during the other hour. Time spent in the computer lab each day was rotated daily among the four classes so that inmates did

not miss any one traditional class more frequently than another. For example, an inmate in the experimental group would be in the computer lab during English class on Monday, during mathematics class on Tuesday, history class on Wednesday, during science class on Thursday, and so on. During the times when the experimental-group inmates were in the computer lab, the traditional instructors were in the classrooms teaching control-group inmates. While in the computer lab, inmates in the experimental group were allowed to ask technical questions about operating the computer, but received no subject-matter instruction. The computer lab was supervised by the director of the Life Skills program, and two inmate helpers provided technical assistance for inmates in the experimental group.

During the 8 months the study was in progress, as each inmate from the waiting list entered the regular prison education program, he was randomly assigned to either the control group or the experimental group for his first 4 weeks of instruction. Upon entering the program, each inmate received the Comprehensive Adult Student Assessment System (CASAS) math and reading pretests, and after receiving the 4-week treatment, each inmate was retested with the CASAS math and reading posttests. (In addition, each inmate received the TABE upon entry to the education program, as that was prison procedure before the experiment began.) The experimental group received 3 hours of classroom instruction per day and 1 hour of CAI per day, making the total treatment time 80 hours. The control group received only traditional instruction for 4 hours per day for 4 weeks, totaling 80 hours. This addressed concerns expressed by previous authors regarding unequal treatment. Of the 75 inmates who enrolled in the education program, 71 completed the 4 weeks of treatment and the posttests.

Software

The software in use at the prison at the time this study was conducted, titled Advanced Instructional Management System (AIMS), can be identified as a "tutorial/drill and practice" software that is reported to allow the learner to see himself or herself as a participant in the planning of their education. It also is reported to offer the advantage of pacing that can be adjusted to the individual learner. It is actually a diagnostic tool that records student progress as the learning sequence unfolds and prescribes lessons to correct the identified deficiencies. The program allows the learner to select the difficulty level and choose the subject (either mathematics or language).

In the mathematics instruction, the learner is asked which type of mathematical operation (addition, subtraction, multiplication, or division) he or she would like to work on, and then is presented with a lesson on the subject chosen. After a lesson is presented, the learner is given several problems to solve. Based on the number and type of errors made, the learner is presented with the correct method of arriving at solutions to the problems missed. He or she is then given the choice of solving similar but alternate problems, matching the same difficulty level of those just

attempted, or solving problems at an increased difficulty level. The learner is then given feedback and allowed to either continue instruction or to terminate the lesson.

In the language instruction, the learner is presented with lessons on common writing errors and then assigned a short essay to correct. Each essay contains a number of errors in sentence construction, punctuation, subject-verb matching, spelling, and tense usage. The software evaluates the proficiency with which the errors were identified and corrected, offers feedback on how to correct any missed errors, and gives the learner a chance for continued practice at the same or an advanced difficulty level.

Instrument

The CASAS was used as an assessment instrument because it measures a broad range of life and literacy skills in math and reading (Rickard, Stiles, & Martois, 1989). According to the instruction literature distributed with the CASAS tests, they are appropriate for use in correctional institutions as an assessment instrument to determine readiness for the GED tests. Stricht (1990), who found that low scores on the CASAS achievement tests were indicative of the need for pre-GED instruction, confirmed this. The CASAS is described as a valuable assessment tool for correctional education administrators because it is used to test a wide array of people, ranging from those who are nonreaders to those who are functioning at the high school level. The test is taken with pencil and paper and is routinely administered by both formal adult education and vocational training programs. The instructional literature distributed with the CASAS tests describes its validation in the area of adult literacy by the National Diffusion Network, U.S. Department of Education. It further explains that all assessment was validated through field testing based on 15 years of assessment data from more than 2 million adult learners (Comprehensive Adult Student Assessment System, 1996).

Results of the CASAS are reported as scaled scores that reflect a range of skill levels from beginning literacy to high school completion. Multiple forms of the CASAS are utilized to ensure accuracy of scores. Examinees can score between 150 and 260 on the test. Scores of 200 and below represent beginning literacy wherein participants have difficulty with the basic literacy skills needed to function adequately in the community and in an employment situation. Despite potential difficulty with simple instructions and safety procedures, adults who score on this level reportedly are able to handle entry-level job assignments. Scores from 200 through 214 represent a level of basic literacy. Respondents scoring within this range reportedly have the ability to complete simple employment applications and can adequately function in entry-level jobs requiring minimal literacy skills. Scores ranging from 215 through 224 represent an intermediate literacy level wherein respondents can reportedly perform basic literacy tasks in an employment setting. Although complex directions may be too difficult for these adults to follow, they can generally function in jobs or job-training programs that provide them with

written instructions or diagrams. If a person scores 225 or above, he or she is performing at the high-school level. According to the CASAS literature, adults scoring within this range who do not have a high school diploma can profit from GED training and have a high probability of passing the GED test within a short period of time. These adults reportedly have the ability to function at a high school entry level for basic reading tasks and can work well with written directions in both familiar and unfamiliar situations (Comprehensive Adult Student Assessment System, 1996). Stricht (1990) agreed with these interpretations and also noted that CASAS results closely corresponded with the reading level determinations found when administering the TABE.

RESULTS

A paired-sample *t* test comparing pretest scores to posttest scores was conducted to determine if enrollment in the education program during the 4-week treatment period had any impact on achievement scores. Then, ANCOVA was used to determine the independent contribution of CAI on CASAS posttest scores. ANCOVA makes use of the pretest scores as a covariate to account for any achievement differences among inmates prior to the treatment, thus better isolating the effect of CAI on posttest scores.

The general purpose of the study was to discover whether there were statistically significant differences in CASAS achievement scores between inmates who were treated with a CAI-plus-traditional-instruction combination and inmates who were treated with only traditional instruction. In addition, the researchers sought to discover if these differences were related to educational classification (ABE or GED), the number of years of formal education before incarceration, and pretest scores. An alpha level of .05 was used for all statistical tests.

Table 1 shows the CASAS pretest and posttest means for all inmates in both the ABE and GED levels of instruction, as well as mean years of age and mean years of previous education. As expected, inmates at the GED level performed consistently higher than inmates at the ABE level. However, several comparisons showed declines from pretest to posttest, and gains made between both math and reading pretests and posttests were minimal.

Table 2 shows the intercorrelation matrix of the predictor variables and the criterion variables pretest and posttest scores. As expected, math and reading scores were highly correlated. Interestingly, age was negatively correlated with education prior to incarceration as well as all of the achievement variables.

A paired-sample *t* test was conducted to test the assumption that regardless of the treatment group, there would be a significant increase in achievement scores. There was not a statistically significant increase in overall CASAS math scores between pretest and posttest $t(70) = .47$, $p = .641$, nor was there a statistically significant increase in overall CASAS reading scores between pretest and posttest $t(70) = -.66$, $p = .508$. After 80 hours of participation in the prison program, the inmates in the

TABLE 1
Mean Test Scores, Age, and Years of Previous Education for Treatment Types and Classification Groups

Group	*Mean*	SD	n
CASAS math pretest			
Group 1: Experimental	221.1	14.4	36
Group 2: Control	218.8	15.3	35
Class 1: ABE	210.1	19.1	25
Class 2: GED	225.4	7.9	46
For entire population	220.0	14.8	71
CASAS math posttest			
Group 1: Experimental	221.9	12.3	36
Group 2: Control	217.0	17.9	35
Class 1: ABE	208.8	18.2	25
Class 2: GED	225.3	9.7	46
For entire population	219.5	15.4	71
CASAS reading pretest			
Group 1: Experimental	225.3	12.9	36
Group 2: Control	223.2	26.4	35
Class 1: ABE	207.4	17.9	25
Class 2: GED	233.4	15.7	46
For entire population	224.3	20.6	71
CASAS reading posttest			
Group 1: Experimental	227.4	13.5	36
Group 2: Control	223.4	17.5	35
Class 1: ABE	212.7	17.4	25
Class 2: GED	232.4	8.8	46
For entire population	225.5	15.6	71
Age of inmate			
Group 1: Experimental	32.3	9.0	36
Group 2: Control	28.7	7.9	35
Class 1: ABE	34.9	9.1	25
Class 2: GED	28.2	7.4	46
For entire population	30.5	8.6	71
Years of formal education			
Group 1: Experimental	9.0	1.9	36
Group 2: Control	9.6	1.6	35
Class 1: ABE	8.2	1.9	25
Class 2: GED	9.9	1.3	46
For entire population	9.3	1.7	71

Note: CASAS = Comprehensive Adult Student Assessment System; ABE = Adult Basic Education; GED = General Educational Development.

study, regardless of the treatment type, did not score significantly higher or lower on the math or reading posttest than they did on the math or reading pretest.

Although there was not a significant increase in achievement scores between pretest and posttest, there was still a reasonable expectation to have observed a

TABLE 2
Intercorrelations Between Pretests and Posttests, Age, and Previous Education

	GED	*Post Math*	*Post Read*	*Pre Math*	*Pre Read*	*Age*	*Education*
GED	1.00						
Post math	.51**	1.00					
Post read	.61**	.72**	1.00				
Pre math	.49**	.83**	.67**	1.00			
Pre read	.61**	.63**	.68**	.62**	1.00		
Age	–.38**	–.24*	–.23	–.30*	–.27*	1.00	
Education	.46**	.19	.40**	.28*	.34**	–.50	1.00

Note: GED = General Educational Development.
*$p < .05$. **$p < .01$.

significant gain difference between treatment and control groups given the enthusiasm many educators have had for technological aids in reading and math. For that reason, ANCOVA was used to test the effect of CAI on CASAS posttest scores. ANCOVA makes use of adjusted mean scores by taking into account the differences individuals have prior to pretesting to more accurately isolate the effects of the treatment. The pretest observed or actual mean is adjusted up or down to take those differences into account.

The achievement scores on the CASAS math posttest of inmates in the experimental group were slightly higher than scores of inmates in the control group, but not significantly higher, with $F(1) = .36$, and $p = .548$. The same is true of the CASAS reading posttest scores where $F(1) = 2.81$, and $p = .098$. Both the observed (221.9) and the adjusted (220.9) math posttest means for the experimental group were higher than the total population mean (219.5). The observed and adjusted means for the control group were 217.0 and 218.0, respectively. For the reading posttest, the observed (227.4) and the adjusted (226.9) means for the inmates receiving traditional instruction combined with CAI were higher than the total population mean (225.5). The observed and adjusted means for the control group were 223.4 and 224.0, respectively.

As displayed in Table 3, the data show that there was not a statistically significant difference, $F(1, 70) = 2.02$, $df = 1$, $p = .16$, on the mean CASAS math posttest scores between the experimental and control groups. The strength of association for this test produced an Eta square of .029 with an unadjusted effect size of .16. For the CASAS reading posttest, there was not a significant difference between the experimental and control groups, $F(1, 70) = 1.15$, $df = 1$, $p = .287$. This test yielded an Eta square of .017 with an unadjusted effect size of .26.

The hypotheses were tested using a univariate ANCOVA approach to compare the effects of the treatment type and the effects of educational classification (ABE or GED). A multivariate analysis of variance approach was not appropriate for this

TABLE 3
Change in Score From Pretest to Posttest

	df	MS	F	M *Pretest*	M *Posttest*
CASAS Math					
Group	1	14.50	.36		
ABE				210.1	208.8
GED				225.4	225.3
CASAS reading					
Group	1	315.34	2.81		
ABE				207.4	212.7
GED				233.4	232.4

Note: CASAS = Comprehensive Adult Student Assessment System; ABE = Adult Basic Education; GED = General Educational Development.

data set due to the small cell size and an inability to achieve homogeneity of variance; therefore, univariate tests were conducted. Analysis of data revealed that the CAI-plus-traditional-instruction combination was not significantly more effective than traditional instruction in improving either the CASAS math or reading scores of inmates in this study.

The data were also used to test if there was a significant independent relationship between both math and reading posttest scores and the independent variable, years of formal education before incarceration, while holding constant treatment type and educational classification. The data show that the independent relationship between previous education and CASAS math posttest scores was not significant, $F(1, 37) = .034$, $p = .854$, neither was it for CASAS reading posttest scores, $F(1, 37) = 3.37$, $p = .07$.

It should be noted that there were no statistically significant gains in either subject area made by either the experimental group or the control group during the 4-week treatment time. Therefore, not only did the experimental group fail to show greater gains than the control group, leading to the conclusion that one technique cannot be identified as more effective than the other, but participation in the education program itself did not produce significant gains for either group during the first 4 weeks.

DISCUSSION

A review of the available literature indicated that previous attempts to measure the effectiveness of CAI have been fraught with shortcomings, inconsistencies, and curious omissions. The purpose of this study was to determine the effect of CAI on adult inmates who are participating in a prison education program.

Several threats to validity were addressed:

1. Traditional-instruction treatment differences were addressed by using the same traditional instructors for both the experimental and control groups, and by conducting the study in a manner that was the least disruptive to the conduct of the current educational routine at the prison.
2. Treatment duration (Rachal, 1993) was addressed by allowing both treatment and control groups precisely the same number of hours of total instruction time per day and the same number of treatment days in a 4-week period.
3. The impact of attrition on sample size (Daniels & Hess, 1992; Rachal, 1993, 1995; Vockell & Sweeny, 1994) was addressed by administering the posttests to the participants in the study after a predetermined treatment time of 4 weeks. The relatively short period of time that each inmate was in the study in combination with the intensive treatment of 80 total hours was designed to determine actual differences between the two groups, if any existed.
4. Randomization of participants (Rachal, 1995) was addressed by assigning each inmate to either the experimental group or to the control group immediately upon entering the program using accepted randomization procedures.
5. Vagueness in the reporting of results (Rachal, 1995) was addressed by using ANCOVA to discover the independent effect of the treatment while using pretest scores to equalize individual differences prior to treatment.
6. The size of the experimental and control groups (Rachal, 1995) was addressed by having adequate numbers for each group and approximately the same number of individuals in each group.

Several previous studies have found no significant difference between CAI and traditional methods. It is not unfair to say that all of those studies have had at least one, if not several methodological weaknesses that made the findings tentative. Based on the findings of the present study, CAI, used in an experimental setting with prison inmates as an augmentation to traditional classroom techniques, produces no statistically significant different achievement than traditional methods alone for either better or worse after 80 hours of contact time.

Some factors unique to inmate education could have influenced our results, and these should be considerations for future research in a prison setting. Inmate attitude toward evaluation is generally problematic because inmates rarely share the enthusiasm of researchers regarding the use or effectiveness of the research. The fact that they were being requested to take multiple tests was not well received by inmates in either the experimental group or the control group. It is suggested that the testing of inmates be limited to a single pretest and posttest format. Although the data may not be as voluminous, economy of testing will probably produce more accurate results.

Another problem with measuring inmate achievement concerns their motive for participating in the education program in the first place. Although some may have self-improvement in mind when placing themselves on the waiting list to be in the program, it is the opinion of many staff members and inmates alike that some are there simply for a chance to be in an environment removed from the cell-block. Inmates who complete the program quickly should be rewarded, and those who procrastinate should be removed.

Many inmates had difficulty with the lack of teacher support during the CAI treatment time. Second only to learner motivation, teacher enthusiasm may be the single most important aspect of an effective CAI program. By providing that support, the program's success is likely to be improved. In addition, any CAI program is only as strong as the quality of the software utilized. It would be dangerous to assume that all CAI is equivalent, because of the limitations of the varying software programs available. The software used at the prison during this study, titled AIMS, was a tutorial/drill and practice type that exposed the student to a learning "module," questioned the student on material presented, identified weaknesses in learning, and provided drill and practice based on those areas that need work. Frequently mentioned by CAI researchers is the distress they have over software that is child-designed. One distinct limitation to the results of this study is that the software used was geared for an adolescent mind-set. The use of software with a mature theme would at least ameliorate the infantilization that pervades most other aspects of prison life.

CAI may bring additional opportunities to the undereducated inmate, but clearly it will take the efforts of inmates and staff alike to produce meaningful improvements to the math and reading skills of the nation's undereducated offenders. This study lends support to the suggestion made by several researchers that computer-assisted instruction will not produce the intended advancements in achievement if used in the absence of active teacher enthusiasm and support.

It would be obviously untenable to generalize about the adult basic- and secondary-education general population from a sample of inmates. However, despite anecdotal support in this and other studies for the use of CAI in various adult basic- and secondary-education settings, the present study's finding of no significant differences between control and experimental groups fits the pattern of research with other undereducated adult populations. Clearly some of those studies were methodologically flawed in ways that the present study sought to correct. Yet, collectively, these studies, including the current one, point to the emerging conclusion that CAI is neither an inferior nor a superior methodology as compared to non-CAI, traditional methods of teaching the undereducated adult. The present study, like others, does suggest other possible benefits of CAI, but the achievement of superior reading and mathematics skills is not among them. Thus, expectations for a computer "fix" for the basic-skills needs of undereducated adults is a fond illusion and a false promise.

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