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The value of computer-assisted instruction in secondary science education

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THE VALUE OF COMPUTER-ASSISTED INSTRUCTION IN SECONDARY SCIENCE EDUCATION

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INTRODUCTION

Traditionally, the computer has been recognized as an important research tool. The current advancement in computer technology and the development and availability of the microcomputer have resulted in schools and communities being flooded with computers and "computer-eze". Popular periodicals are full of commercial advertisements for home and business computers. With this influx the computer's potential as an instructional tool has begun to be realized. In June 1980, 18% of the elementary school districts in California were using computers in the curriculum. Of the secondary school districts in California, 61% reported using computers while 56% of the unified school districts reported computer usage in the curriculum.[1] As a result, teachers' journals and professional periodicals are filled with articles discussing the use and implementation of computer-based and computer-assisted instruction.

What is computer-assisted instruction (CAI)? It is the use of the computer to provide remediation and drill and practice within the framework of traditional classroom

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[1] David Cooke, "The Uses of Computers in the Instructional Process in Public Elementary and Secondary Schools in California" (Ph.D. dissertation, University of California, 1981), p.3.

Instruction.[2] Computer-based instruction (CBI) is the use of the computer not only to provide remediation and drill and practice, but also basic instruction.[3] The potential benefits of both systems is dependent on the quality and amount of teacher/student interaction and student interest/motivation.[4]

The effect of CAI is influenced by many factors such as cost, system used, attitudes of administrators, teachers, and students, place in the curriculum, and selection of software.[5] Several studies have been done to measure the relationship between CAI and student achievement (Alderman, Appel and Murphy, 1978; Denton, 1978; Cavin 1981). However, the significance of the results is dependent on whether student achievement or number of objectives mastered is used as a measurement tool.[6]

The purpose of this project is to determine the effectiveness of computer-assisted instruction, using student achievement as a measurement tool, in secondary science education.

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[2]Glyn Holmes, "Computer-Assisted Instruction: a Discussion of Some of the Issues for Would-Be Implementors," Educational Technology 22(September 1982):7-13.

[3]Greg Kearsley, Beverly Hunter, and Robert J. Seidel, "Two Decades of Computer Based Instruction Projects: What Have We Learned?" Technological Horizons in Education 22(February 1983):88-96.

[4]Holmes, p. 10.

[5]Ibid. , P.8-12.

[6]Kearsley, p. 92.

REVIEW OF THE LITERATURE

Johnny Lawton and Vera T. Gerschner conducted a literature review to determine what is and what is not known about children's attitudes toward computers. This paper also included discussions of available literature on computerized instruction and computer literacy, the obstacles in furthering computer literacy, and suggestions for expanding computer literacy. Lawton and Gerschner's sample was composed of ERIC referenced articles written between 1976 and 1982, a manual review of the literature, suggestions from colleagues, and references from bibliographies of similar studies. Their review suggests there is very little agreement on attitudes towards computerized instruction. Since most authors were very cautious in reporting their results, the overall data appeared mixed.[1]

In a similar study by Glyn Holmes more positive results were reported. After studying over 43 projects dealing with the effect of CAI, Holmes reported that student attitudes towards computers and computer instruction improved with exposure to the system. Teachers' attitudes also improved with usage as they became aware that the computer provided more time to devote to individual students and the opportunity to attempt solving some remedial student problems.[2]

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[1] Johnny Lawton and Vera T. Gerschner, "A Review of the Literature on Attitudes Towards Computers and Computerized Instruction," Journal of Research and Development in Education 16(1982):50-55.

[2] Holmes, p. 8.

Student achievement was directly affected by CAI according to the Holmes study. Most of the experiments reviewed indicated that CAI was at least as effective as traditional instruction, and in some subject areas, a curriculum supplemented by CAI lead to improved student achievement. Other studies indicated that with CAI the overall rate of learning improved.[3]

Kearsley, Hunter, and Seidel reported an interesting relationship between teacher/student attitudes and achievement. In the course of their study they reviewed 50 major projects in terms of their theoretical and practical significance to the field of education. Their report emphasized the important role of the instructor in determining whether computer based or computer assisted instruction would have positive or negative effects. A prescribed regime of 10 minutes per day per curriculum showed significant increases in student achievement as measured by gains in standard achievement tests. The Kearsley team concluded that computers can be used to make instruction more effective and efficient in a variety of different ways by making the learning experience much more exciting, satisfactory, and rewarding for both student and teacher. Their final conclusion, however, stressed that the potential benefits of CAI were not inherent in the system, but hinged upon the dedication, persistence, and ability of good teachers and courseware developers.[4]

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[3]Ibid. ,P. 9.

[4]Kearsley, p. 90.

Conflicting results affected the conclusions drawn by Jon Denton and Bob Woods in their study of high school physics students. Their project was to determine if individualized instruction structured by a teaching model which utilized student selected objectives or an instructional guide produced by a computer would change high school student achievement in physics. Results were measured by two methods - student achievement and number of objectives mastered. They also attempted to find a significant increase in students' attitudes towards physics. When student achievement was used as a measurement tool no significant difference resulted between the two methods. However, using number of objectives mastered resulted in a significant increase using CAI. In both cases no significant change in students' attitudes was reported. The inconsistent findings made it difficult for Denton and Woods to make a conclusive statement regarding the effectiveness of CAI.[5]

Cavin, Cavin, and Lagowski had similar findings in their work with college chemistry students. They conducted a study to see whether college students' attitudes toward computers and chemistry would be affected by using CAI materials in a chemistry course. They also hoped to determine whether there would be any difference in attitude toward computers and chemistry for students of different sex. The resulting data showed no significant

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[5] Jon J. Denton and Bob G. Woods, "A Computer-Managed Instructional Program in High School Physics," Southern Journal of Educational Research 9(Fall 1975):188-202.

improvement in overall attitude towards the subject matter. There was a significant improvement in the attitude of female students toward the use of computers however. Cavin , Cavin, and Lagowski observed that nontechnical students appeared to acclimatize rather well to using the computer for CAI. They felt that this indicated students in general would be able to use such materials readily. In conclusion, they reported that if instructors can be satisfied their computer system is efficient and their CAI materials adequate, they need have no hesitation in adopting CAI as part of their curricula.[6]

In a project conducted at Iowa State University, John Boysen and Peter Frances evaluated a computer lesson versus traditional worksheets in a biomechanics course. The lesson was designed to supplement lectures and laboratory work, particularly in topics involving concepts which were difficult to communicate using conventional teaching techniques, and in topics which require repeated drill and practice. The students were informed they were participating in an experiment designed to assess the instructional effectiveness of a computer lesson. Consequently, the Hawthorne effect may have affected the post-test scores for the CAI group. In spite of this factor Boysen and Frances reported both methods to be equally effective in meeting the instructional objectives of the course. Although the statistical analysis of the data approached significance in favor of the CAI

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[6] Claudia S. Cavin, E. D. Cavin, and J. J. Lagowski, "The Effect of Computer-Assisted Instruction on the Attitudes of College Students Toward Computer and Chemistry," _Journal of Research in Science Teaching_ 18(1981):329-333.

group, no evidence indicated that the CAI lesson contributed significantly to the learning of the students when compared to the worksheet group.[7]

Results similar to those reported by Boysen and Frances[8] were also reported by Alderman, Appel and Murphy in their evaluation of PLATO (Programed Logic for Automatic Teaching Operations) and TICCIT (Time-shared, Interactive, Computer-Controlled, Information Television) systems as implemented in community colleges. The comparison began in the fall term of 1975-76 academic year. The TICCIT program involved 5,000 students while the PLATO program involved approximately 4,000 students. Student exposure to the PLATO system had no consistent impact on either attrition or achievement. However, student exposure to the TICCIT system resulted in significant effects on course completion rates and student achievement. Students stayed with the TICCIT program, but failed to complete all the lessons required in order to earn college credits. PLATO students showed significantly more favorable attitudes toward computers than non-PLATO students. Student reactions toward TICCIT were generally favorable, but compared to attitudes toward traditional teaching methods the TICCIT program was often less preferred.[9]

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[7]John P. Boysen and Peter R. Francis, "An Evaluation of the Instructional effectiveness of a Computer Lesson on Biomechanics," Research Quarterly for Exercise and Sport 53(September 1982):232-235.

[8]Ibid.

[9]Donald L. Alderman, Lola Rhea Appel, and Richard T. Murphy, "PLATO and TICCIT: An Evaluation of CAI in the Community College," Educational Technology 18(April 1978):40-45.

Castleberry, Culp, and Lagowski made a significant statement regarding CAI. They conducted an experiment involving the use of CAI techniques in a general chemistry course at the University of Texas at Austin. Students from two traditional general chemistry courses were used for comparison with the experimental computer course. The results of the statistical analysis of the data showed (a) the grades achieved in the experimental computer section were significantly higher than in both non-computer sections, (b) there was no significant difference between the grades of the two traditional classes, and (c) there was no significant difference between any of the variables for the three classes on basis of sex. In this experiment it was evident that the use of supplemental CAI techniques exerted a positive influence upon student performance. A comprehensive comparison of the exam scored from the three groups suggested a degree of correlation between achievement and access to CAI techniques. In conclusion, the research team felt the data supported the fundamental concept that CAI techniques have the potential to increase both the degree and rate at which learning occurs.[10]

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[10] S. J. Castleberry, G. H. Culp, and J. J. Lagowski, "Impact of Computer-Based Instruction Methods in General Chemistry," Journal of Chemical Education 50(July 1973):469-472.

The document,"Computers in Education: Goals and Content, a report to the California Legislature," makes a fundamental assumption:

> "the computer should be viewed as an essential educational tool, one which can enhance student learning at all levels and which can be used to expand the scope of the curriculum. This assumption is based on the fact that a rapidly growing number of teachers and administrators, with valuable assistance from individuals in the computer industry, have demonstrated that computers (and the expanding array of computer based peripheral equipment and educational software) can be used in effective ways to enrich the school curriculum and promote student excitement and success with learning in preparation for life and careers."[11]

Unfortunately, the document did not present statistical evidence to support these statements.

Richard Yarbo, author of "Don't Get Trampled in the Computer Stampede", suggests that instead of enhancing the learning environment for the public school student, the computer may in fact detract from his progress. Factors such as distracting noise, time on task, computer response time, student eye strain, and teacher attitudes have received little attention and should be investigated more deeply before the effectiveness of the computer in the classroom is determined.[12] Various educational computer programs have been developed to entertain while teaching using noise as an attention device. However, these noises may create distraction for those students not involved with the computer and certainly could be a nerve stimulus for the teacher. The microcomputer is being viewed by

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[11]Bill Honig,"Computers in Education: Goals and content," Report to the California Legislature as required by Section 226 of Senate Bill 813 (July 1984):1.

[12]Richard Yarbo, "Don't Get Trampled in the Computer Stampede," Report to the U.S. Department of Education (1983):3.

many as the answer to an individualized instructional program. Since time on task has been shown to be a variable closely correlative with achievement, the question might be asked as to how much drill and practice time will be available for thirty students in ratio to one or two computers? The next factor mentioned, computer response time, needs to be studied to determine the ideal response time for student motivation, attention, and academic achievement. Some program response time is time lagging which may create student frustration. We need to pause and take a look at the realities of utilizing this technology on a down-to-earth, day-to-day basis.[13]

Dr. A. Daniel Peck, professor of Education at San Francisco State University, suggest:

> "There is definitely a role for the computer in education. But, suddenly, only because its manufacturers have told us so, it is being proposed as an instructional aid for basic skills. I say this is overkill at its worst and someone has to begin questioning it before massive sums of money are spent prematurely."[14]

As suggested in the review of the literature, there is mixed evidence regarding the value of CAI and CBI. Some researchers report measureavle differences between students receiving CAI and those not using CAI. Other researchers report no significant improvement by students using CAI as compared to students not using CAI. Researcers also vary in their report of factors affecting the outcome of some projects. Some report the types of computer systems used as creating the greatest effect, while

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[13]Ibid.

[14]A. Daniel Peck, "Citizens Committee Attacks Use of Computers to Teach Basic Skills," Educational Technology 100 (July 1982):7-9.

others report the age and academic level of the students participating in the study as having the greatest effect.

STATEMENT OF PROBLEM

The purpose of this study is to determine the effectiveness of computer-assisted instruction with low achieving junior high students, using student achievement as a measurement tool, in science education.

STATEMENT OF HYPOTHESIS

There is no significant difference in student achievement between eighth grade biology students receiving traditional classroom instruction and those receiving CAI. The hypothesis will be tested at the .05 level of significance.

PROCEDURE

Two classes, of thirty-six low achievement level students each, in eighth grade biology will be compared in terms of pre- and post-test scores in order to measure achievement. The eighth grade biology course consists of an overview of several topics within the field of life science. Topics to be covered will include matter and energy, the cell, functions of living things, taxonomy of classifying living things, the protist kingdom, and the plant kingdom. Pre- and post tests, two forms of the same test, will be taken from standard semester exams accompanying the curriculum materials, Focus on Life.[1] One class will be randomly selected to be the control group and one the experimental group. Both the experimental group and the control group will receive classroom instruction from the same teacher. This may introduce a degree of unconcious bias.

The control group will receive traditional classroom instruction supplemented by worksheets for drill and practice for one semester. The experimental group will receive traditional classroom instruction supplemented by CAI for drill and practice for one semester. The computer-assisted instruction program included the following software provided for the Apple II/e micro-computer:

1. "Addison-Wesley Information Laboratory for Life Science",by Addison-Wesley. This program provides research experience and practice with investigative skills, encourages creativity, and can be used for remediation and review. It is designed to supplement the Addison-Wesley Life Science program, but also supplements other life science texts adequately.

2. "Biology", by American Educational Computer. The program helps students master biology facts and vocabulary. Students match words and phrases at their own pace.

3. "Discovery Lab", by MECC. Students learn experimental methods and biological concepts using this program. Students carry out simulated experiments on ficticious organisms to discover their reaction to a number of stimuli.

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[1]Charles H. Heimler, Focus on Life Science, (Columbus: Charles E. Merrill Publishing Co., 1977).

4. "Genetics", by MECC. Students experiment with imaginary insects as they discover how dominent, semi-dominent, and recessive traits are passed from generation to generation.

5. "Science 1 - The Human Body: an Overview", by Brainbank. The program helps develop an understanding of the main body systems: skeletal, muscular, digestive, respiratory, circulatory, and nervous.

6. "Science 2 - The Skeletal System", by Brainbank. Five lessons in the program covering major skeletal bones, joints, ligaments, and cartilage.

7. "Operation Frog", by Scholastic. Introduces students to fundamental of biology and anatomy, demonstrates use of the computer as a sophisticated simulation tool, encourages scientific thinking and logic, and reinforces knowledge acquired through real dissection experiences.

8. "Exploring That Amazing Food Factory, the Leaf", by Thoroughbred. The program identifies and explains the biological structure of the leaf.

9. "Photosynthesis : Unlocking the Power of the Sun", by Thoroughbred. Explains photosynthesis. Covers light as energy, characteristics of light, wavelength of light used by chloroplasts and variables and controls.

10. "Cardiovascular Fitness Lab", by HRM Software. Program is designed to monitor pulse rate, print out heart rate data, and help users study how hearts function under different conditions.

11. "Discovery Lab", by MECC. Students design and observe their own experiments and form hypotheses as they try to

determine the chartacteristics of imaginary organisms. Program provides an introduction to the scientific process.

12. "Classification", by MECC. Program allows students to observe how computers help in the classification process as they use a simple database inquiry system to enter, search, and sort data.

Pre- and post-test scores will be processed statistically using an independent t-test. Should the results show a significant difference in achievement by the CAI group then a dependent t-test will be applied to determine if the CAI group made a staticticaly significant gain.

SUMMARY AND DISCUSSION

The purpose of this project, as previously stated, is to determine the effectiveness of computer-assisted instruction, using student achievement as a measurement tool, in secondary science education. Students were selected for this study through random assignment. Low achieving students were selected for two reasons: 1) lack of previous exposure to computers for educational purposes, perhaps eliminating some bias either for or against computers, and 2) the tester's belief that these students would benefit most from the experience.

Kolb Junior High students are grouped according to achievement level. Selection for groupings are based on CTBS (California Test of Basic Skills) scores, teacher recommendation, and counselor evaluation. Incoming seventh grade students scoring below grade level on the CTBS are usually placed, at the sixth grade teachers' recommendation, in a level 1 (low achievers) grouping. Students scoring at grade level are placed in level 2 (average achievers) grouping, at the teacher's recommendation, and students scoring above grade level are placed in level 3 (above average achievers) grouping, at the teacher's recommendation. At the end of the seventh and eighth years, teacher recommendation and counselor evaluation of performance determine if students continue at a given grouping or if adjustments are made. The data is then fed into the district main frame computer where students are randomly placed into classes following the recommendations given.

Two classes of level 1 (low achieving) ability were selected for the study. One class received traditional classroom instruction. This group was called the control group. The other class, called the lab group, also received traditional classroom instruction. In addition they spent one 50 minute period per week in the computer lab using computer programs for drill and practice as well as instructional style programs. Each group was given a pre-test at the beginning of the semester and a post-test at the end of the semester. Both pre- and post- test consisted of fifty multiple choice questions which were electronically graded. The pre- and post-test scores were then compared for degree of achievement based on number of items answered correctly. This data was then analyzed statistically for significant difference. A t-test for independent means was applied to determine the degree of significance for any variation or difference in achievement between the two groups. The entire procedure was repeated with two new groups of students the following semester. A t - test was also applied to each groups pre-test scores to determine whether the study groups were in fact comparable.

The results of the first semester t - test comparison for comparable groups resulted in a score of .56 indicating no significant difference between the two groups. Similarly, the second semester groups showed a t - score of 1.56. This score also indicates no significant difference between the two groups. A significant difference would have been indicated by a t - score of 1.69 or greater showing a .05 or greater degree of significance.

Demographically, both groups were very closely matched males and females both semesters. Similarly, the percentage of male and female white, black, hispanic, and other racial groups were fairly evenly matched also. (See demographic charts for specifics.)

The results of the first two groups tested showed an average gain of 5.58 in number of items answered correctly for the lab group and 1.64 for the control group resulting in a t - score of 2.29. The t-score is outside the range of a .05 level of significance, therefore the hypothesis may be rejected, indicating that CAI does produce a significant difference in student achievement.

Results of the second semester groups were opposite to the first semester. The average gain in number of items answered correctly was 3.37 for the lab group and 2.41 for the control group. The t - score of 1.95 indicates that there is no significant difference in the number of items answered correctly by the two groups. These results correspond with those reported by Jon Denton and Bob Woods in their study of high school physics students.[1] Cavin, Cavin, and Lagowski reported similar findings in their work with college chemistry students.[2] Both studies reported no significant difference when achievement was used as a measurement tool.

Although there is no significant difference in gain between the groups in the second semester there is significant gain within each group. A t - test was applied to pre and post test scores within each group. The second semester lab group's scores resulted in a t - score of 6.12 indicating a significant gain within the group. The control group scores also showed a significant gain with a t - score of 4.55. The t - scores also indicate a greater degree of gain within the lab group as compared to the control group. This would suggest that CAI had a positive affect on these students even though there was no significant difference in overall gain between the groups.

There are some limiting factors in this particular project which must be taken into consideration when determining the validity of the results reported. Although normal average class size is thirty-six students, attrition created unbalanced numbers taking both pre- and post tests, as indicated by the statistical analysis. This fluctuation may have created a gross distortion in t-scores.

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[1]Jon J. Denton and Bob G. Woods, "A Computer-managed Instructional Program in High School Physics," Southern Journal of Educational Research 9 (Fall 1975):188-202.

[2]Claudia S. Cavin, E.D. Cavin, and J.J. Lagowski, "The Effect of Computer-assisted Instruction on the Attitudes of College Students Toward Computers and Chemistry," Journal of Research in Science Teaching 18 (1981):329-333.

The amount of time the lab group spent in the computer lab may also be a limiting factor. Is one fifty minute period per week sufficient time to reasonably measure the effect of CAI on pre- and post-test scores? Would a greater number of periods with the computer create a significant difference? These questions are not addressed in this project. Further study and project design would be necessary to investigate these issues.

As reported, the findings of this project imply there may or may not be a significant gain in number of items answered correctly, making it impossible to accept or reject the hypothesis. These results are limited to the small sampling of the total population of students at Kolb Junior High School in Rialto, California. It should also be considered that low achieving students tend to lose academic motivation as the end of spring semester approaches. This attitude could significantly contribute to the change in t-scores reported for the second semester groups.

IMPLICATIONS

The conflicting results of this study would appear to limit the field and public school situations to which it may be applied. However, it is the researcher's opinion that CAI could make a difference in student performance, as indicated by the first semester results. The conflicting results for the two semesters nullify each other. The study should be repeated perhaps using average achievers instead of low achievers in order to avoid possible attitudinal distortions. Greater control of the quality and quantity of lab time may also improve the accuracy and validity of results. In addition, curriculum and program adjustments may need to be made to avoid the possible attitude slump some students experience in the spring. Finally, consideration should be given to the possibility that low achieving students may have a small growth potential compared to the potential growth of higher level students. This raises the question: Would CAI be better used with higher level students, especially from the stand point of cost and time expenditures?

STATISTICAL ANALYSIS
Control First Semester

	Pretest	Postest	Diff	$Diff^2$
1	4	5	1	1
2	4	6	2	4
3	5	6	1	1
4	6	4	-2	4
5	8	10	2	4
6	9	7	-2	4
7	9	10	1	1
8	9	10	1	1
9	10	12	2	4
10	10	11	1	1
11	11	11	0	0
12	11	13	2	4
13	12	13	1	1
14	12	15	3	9
15	12	13	1	1
16	13	14	1	1
17	13	15	2	4
18	14	17	3	9
19	14	16	2	4
20	16	17	1	1
21	16	18	2	4
22	16	19	3	9
23	17	18	1	1
24	17	21	4	16
25	18	19	1	1
26	18	25	7	49
27	19	24	5	25
28	22	25	3	9
		TOTAL	46	168

Mean Difference = 1.64
Standard Deviation = 1.78

STATISTICAL ANALYSIS
Lab First Semester

	Pretest	Postest	Diff	$Diff^2$
1	7	11	4	16
2	7	9	2	4
3	8	10	2	4
4	11	12	1	1
5	11	13	2	4
6	12	14	2	4
7	12	15	3	9
8	13	18	5	25
9	13	17	4	16
10	14	19	5	25
11	14	18	4	16
12	14	20	6	36
13	14	19	5	25
14	15	23	8	64
15	15	21	6	36
16	16	23	7	49
17	16	26	10	100
18	16	25	9	81
19	17	26	9	81
20	18	29	11	121
21	18	27	9	81
22	19	30	11	121
23	22	30	8	64
24	26	27	1	1
		TOTAL	134	984

Mean Difference = 5.58
Standard Deviation = 3.07
t - score = 2.29

STATISTICAL ANALYSIS
Control Second Semester

	Pretest	Postest	Diff	$Diff^2$
1	7	11	4	16
2	8	8	0	0
3	10	13	3	9
4	11	15	4	16
5	12	14	2	4
6	13	16	3	9
7	13	15	2	4
8	14	20	6	36
9	14	17	3	9
10	15	19	4	16
11	15	18	3	9
12	17	17	0	0
13	18	20	2	4
14	18	28	10	100
15	18	23	5	25
16	19	21	2	4
17	20	22	2	4
18	20	21	1	1
19	21	25	4	16
20	21	27	6	36
21	22	28	6	36
22	23	29	6	36
23	24	21	-3	9
24	25	31	6	36
		TOTAL	81	435

Mean Difference = 3.37

Standard Deviation = 2.59

STATISTICAL ANALYSIS
Lab Second Semester

	Pretest	Postest	Diff	$Diff^2$
1	11	12	1	1
2	11	12	1	1
3	12	15	3	9
4	13	17	4	16
5	14	19	5	25
6	15	18	3	9
7	15	18	3	9
8	17	19	2	4
9	17	19	2	4
10	17	20	3	9
11	17	20	3	9
12	17	19	2	4
13	17	24	7	49
14	18	19	1	1
15	18	19	1	1
16	19	19	0	0
17	19	22	3	9
18	20	24	4	16
19	23	25	2	4
20	24	27	3	9
21	25	25	0	0
22	25	25	0	0
23	28	28	0	0
24	31	36	5	25
		TOTAL	58	214

Mean Difference = 2.41
Standard Deviation = 1.75
t - score = 1.95

DEMOGRAPHICS

Lab First Semester

Males		52.8%	Females		47.2%
Other	1	7.7%	Other	1	9.1%
Hispanic	3	23.1%	Hispanic	1	9.1%
Black	2	15.4%	Black	3	27.3%
White	7	53.8%	White	6	54.5%
Total	13		Total	11	

Control First Semester

Males		50.0%	Females		50.0%
Other	1	7.2%	Other	0	0.0%
Hispanic	3	21.4%	Hispanic	3	21.4%
Black	3	21.4%	Black	3	21.4%
White	7	50.0%	White	8	57.2%
Total	14		Total	14	

Lab Second Semester

Males		55.6%	Females		44.4%
Other	0	0.0%	Other	1	9.1%
Hispanic	3	23.1%	Hispanic	3	27.3%
Black	3	23.1%	Black	3	27.3%
White	7	53.8%	White	4	36.3%
Total	13		Total	11	

Control Second Semester

Males		56.2%	Females		43.8%
Others	1	7.7%	Others	0	0.0%
Hispanic	2	15.4%	Hispanic	3	27.3%
Black	3	23.1%	Black	2	18.2%
White	7	53.8%	White	6	54.5%
Total	13		Total	11	

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