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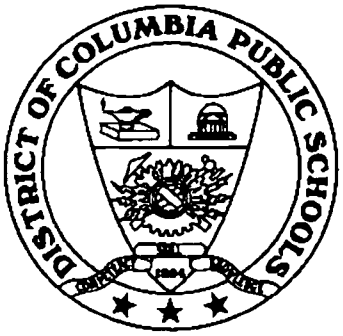
ABSTRACT

The purpose of the Nature Computer Camp (NCC) is to provide sixth-graders in District of Columbia Public Schools an opportunity to explore and appreciate nature in its natural setting. The program also aspires to develop computer proficiency, enhance students' social and interpersonal skills, stimulate group interaction, and strengthen students' self-esteem and group dynamics. Analyses of pre- and posttests on various educational and social factors indicate that students succeeded in strengthening their environmental knowledge and social skills during the 5 days of intensive activities at the camp. The gain in students' technology skills was marginal. In fact, only two of the four performance subgroups (stream ecology and geology) were found to improve significantly, indicating that different strategies are needed to improve other areas. The educational and environmental science explorations were beneficial to urban youth who rarely get a chance to appreciate the outdoors in natural settings. It is recommended that the program be continued on a year-round basis, as it was until it was discontinued due to fiscal constraints, and incorporated into the regular school curriculum. Efforts should also be made to increase the number of student participants. A future study should focus on the impact of NCC on the subsequent school performance of students to determine the long-term benefits of the program. (TD)



DISTRICT OF COLUMBIA PUBLIC SCHOOLS

EVALUATION OF THE NATURE-COMPUTER CAMP

SUMMER 1993

Franklin L. Smith
Superintendent of Schools
Chief State School Officer

September 1994

EVALUATION OF THE NATURE-COMPUTER CAMP: SUMMER 1993

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TABLE OF CONTENTS

	Page
LIST OF TABLES	II
LIST OF FIGURES	II
EXECUTIVE SUMMARY	III
I. INTRODUCTION	1
II. PURPOSE OF THE PROGRAM	1
III. PURPOSE OF THE EVALUATION	1
Objective 1: Determine the scope of the program and identify ways to improve the scope of service delivery: staff duties and responsibilities	2
Objective 2: Assess whether the students achieved the program goals for performance	2
Objective 3: Assess the impact of the overall program as observed by students, teachers and counselors	3
IV. METHODOLOGY	4
A. Administrative Data	4
B. Student Data	4
C. Statistical Analysis	5
V. EVALUATION FINDINGS	
A. Objective 1	
1. Staff Development	5
2. The Scope of Service Delivery	7
3. Students' Activities	9
B. Objective 2	
1. Student Performance	11
2. Social Behavior and Attitude	15
C. Objective 3	
1. Students' Observations	20
2. Counselors' Observations	22
3. Teachers' Evaluations	25
VI. CONCLUSIONS	29
VII. RECOMMENDATIONS	31

LIST OF TABLES

Table		Page
1	Staff Development Workshop Survey	8
2	Distribution of Participating Schools by Wards	9
3	Student Participation Summary by Weeks	10
4	Pre- and Post-test Scores in Basic Computer Skills, Stream Ecology, Woodland Ecology, and Geology	12
5	Girls' Pre- and Post-test Scores in Basic Computer Skills, Stream Ecology, Woodland Ecology and Geology	15
6	Boys' Pre- and Post-test Scores in Basic Computer Skills, Stream Ecology, Woodland Ecology and Geology	16
7	Students' Feelings About the Natural Environment, Computers and Living With Others: Activities Considered Fun	17
8	Students' Evaluation of the Overall Program Activities	21
9	Students' Compliance with Camp's Guidelines	24
10	Students' Mastery of Skills in Computers and Environmental Areas (Teachers' Evaluation Checklist)	26

LIST OF FIGURES

Figures		
1	Overall Mean Correct Response on Pre- and Post-test Achievement Score	13
2	Mean Correct Response by Area, Science on Pre- and Post-test Achievement Score	14

EXECUTIVE SUMMARY

The purpose of the Nature Computer Camp (NCC) is to provide District of Columbia Public Schools (DCPS) sixth grade youngsters an opportunity to explore and appreciate nature in its natural setting. The program also aspires to develop computer proficiency, enhances students' social/interpersonal skills, stimulate group interaction, and strengthen students' self-esteem and group dynamics. Based on these broad objectives, the current evaluation assessed the impact of the 1993 NCC program and sought to identify ways to improve the scope of service delivery.

The data from the program administrator revealed that the 1993 NCC Summer program was implemented as planned and successfully managed. The staff involved in the program was adequate as exhibited by their smooth delivery of the services they were commissioned to fulfill. The general absence of any major problems relating to the staff at the camp site was also an indication that the staff development workshops given prior to the NCC program had fulfilled the objective to train competent staff.

The analyses of pre- and post-tests given to the students on various educational and social factors indicate the youngsters succeeded in strengthening their environmental knowledge and social skills, the impact of which may be felt well beyond their school years. Through group interactions, the students also were able to benefit from the socialization process that took place as the result of positive group interaction and group living in the

five days of intensive activities at the camp.

Although the gain between pre- and post-test scores was marginal, the computer instruction rendered at the camp site further reinforced students' skills in the area of technology which is a focus area of the DCPS. In fact, only two of the four performance sub-groups (Stream Ecology and Geology) were found to improve significantly during the program activities, indicating that different strategies are needed to improve other areas.

Overall, the NCC is a very efficient program in terms of the benefits students were able to achieve in the limited amount of time. The educational and environmental science explorations were beneficial to urban area youth who rarely get a chance to explore and appreciate wilderness in its natural settings. The experience was therapeutic and afforded the youngsters a new perspective that, indeed, life does exist beyond the city limits. Most importantly, the program provided the youngsters an opportunity to utilize their time wisely at a period when alternative programs, such as this, are very scarce.

It is recommended that the program be continued on a yearly basis, and that ways and means should be found to expand the program beyond the summer. One way to fulfill this goal is to incorporate the exploration of the natural environment at NCC into the regular school curriculum in which all students are required to participate. This idea is not new; the program was operating year round until it was discontinued due to fiscal

constraints. Reasonable efforts should also be made for the next planning period to increase the number of student participants. Currently, the facilities at Camp Round Meadow have the capacity to hold one hundred students each session. The data show that the camp was not utilized by DCPS to the full capacity allowed by the National Park Service.

A future study should focus on the impact of NCC on the subsequent school performance of students on such factors as grade point average and social adjustment. The long term benefits of NCC can be ascertained only if such a study is carried out.

I. INTRODUCTION

The District of Columbia Public Schools Nature Computer Camp (NCC) is a program which has been in existence since 1983. The program is conducted at Camp Round Meadow in the Catoctin Mountain Park, Thurmont, Maryland in cooperation with the National Park Service.

II. PURPOSE OF THE PROGRAM

The purpose of the Nature Computer Camp is to provide the District of Columbia Public Schools (DCPS) sixth grade youngsters an opportunity to explore and appreciate nature in its natural setting. Due to the ever expanding urban centers, city children are isolated geographically from the beauty of the natural environment which youngsters in rural and some suburban communities enjoy throughout the year. Opportunities such as NCC can raise the awareness of sixth graders of environmental issues such as water and air pollution. Secondly, the program aspires to develop computer proficiency consistent with the objectives set by the District of Columbia Public School System. Finally, the program is designed to develop students' social/interpersonal skills and group interaction, thereby strengthening their self-esteem and group dynamics.

III. PURPOSE OF THE EVALUATION

The purpose of the current evaluation is to assess the impact of the 1993 NCC program and to uncover ways to improve the scope of service delivery. The evaluation objectives and questions to be addressed follow.

OBJECTIVE 1: Determine the scope of the program and identify ways to improve the scope of service delivery: Staff duties and responsibilities

The main evaluation question for this objective revolves around answering the following:

(1) What was the geographical distribution of the target population by ward? How many sixth grade children registered for the trip, and how many actually participated? What were the factors that contributed to the discrepancy between the number of registered and actual participants?

(2) What were the kinds of services provided by staff members who participated in the program?

(3) Was the number of staff recruited to operate the program adequate to deliver the services smoothly?

(4) Were there staff development workshops to help staff become familiar with physical facilities and nature trails?

(5) Were staff development workshops effective?

OBJECTIVE 2: Assess whether the students achieved the program goals for performance

The major evaluation questions for this objective are as follows:

(1) Was there an increase in the knowledge acquired by the students regarding environmental sciences such as stream ecology, woodland ecology, and geology at the end of the program activities?

(2) Was there any measurable difference in the understanding of the computer lessons given at the camp site compared to the understanding the students had before they arrived?

(3) What was the strength of the NCC program in terms of students' success in computer skills and environmental sciences?

(4) Were there any behavioral or attitudinal changes as a result of group living and social interaction with peers from different schools?

OBJECTIVE 3: Assess the impact of the overall program as observed by students, teachers and counselors

Counselors' and teachers' evaluations of campers' social behavior and competency in computers as well as environmental sciences were examined. In addition, the students' assessment of the overall program was explored.

The major evaluation questions for Objective 3 are as follow:

(1) How did the students rate the skills they learned, their living conditions, food, dormitory, teachers and counselors?

(2) How well did counselors rate the students on following the camp's rules and regulations as well as other social behaviors deemed necessary for group living?

(3) How strongly did the teachers rate the students in the areas of computer skills and environmental sciences?

IV. METHODOLOGY

Instruments: Two types of data were used to evaluate this project: administrative and student.

A. Administrative data: The staff development questionnaire elicited data on the adequacy of the workshops and the extent to which they prepared staff to carry out their tasks at the NCC. Five items, based on a Likert-Scale, were developed to measure the clarity, value, and the climate of the orientation. Documentation of various administrative procedures and activities related to planning and implementation of NCC were examined to assess the strengths and weaknesses of the administrative personnel commissioned to carry out the NCC program.

B. Student data: The data on student campers included: (1) students' knowledge of environmental science, and computer skills; (2) changes in students' attitudes; (3) counselors' observations of students' behavior; (4) teachers' evaluation of students' skills; and (5) students' overall ratings of the NCC program. A survey on the computer and environmental science components included 25 items that elicited data to measure skills achieved before arriving (pre-test) at the camp and at the conclusion of the camping period (post-test). Students also completed a 12 item pre- and post-test developed to measure changes in their attitude about group living and social interactions and rated on a scale of 1-5 regarding activities they experienced during the five-day stay in the camp. The final data consisted of opinions of counselors and teachers regarding

students' attitudes and skills acquired at the camp.

C. Statistical analysis: To examine the pre-test and post-test achievement scores, various statistical measures, such as the mean and standard deviation, showing the distribution of responses on various items were utilized. A statistical test of the hypothesis, known as a t-test, was used to verify the magnitude of differences between the pre- and post-test achievement scores. Since the achievement test scores consist of two parts, namely environmental science and computer skills, this evaluation assessed the relative strength of the NCC program by examining where the highest percentage of gain or loss occurred on pre- and post-test achievement scores. Cross tabulations were also performed to determine whether gender played a significant role in the achievement test scores. To measure changes in students' attitudes, Likert's 1932 method known as the Summated Rating was used.

V. EVALUATION FINDINGS

A. Staff Development

The data revealed that 16 resident staff were involved in all phases of the NCC program activities. They include: one (1) program coordinator, one (1) resident manager/counselor, eight (8) recreational aides, five (5) teachers, and a nurse.

The program coordinator was responsible for planning and implementing all activities related to NCC. These responsibilities included drafting administrative correspondence

to various agencies and divisions in the DCPS; identifying and recruiting staff personnel; organizing orientation/workshops for staff campers; securing logistics and supplies; and, generally, making sure the day-to-day activities of the camp ran smoothly. Based upon informal interviews with the program director as well as the examination of various program memoranda and correspondence, the program coordinator planned, organized and implemented the NCC program without any significant problems.

The resident manager was responsible for supervising teachers, recreational aides, camp counselors, and the nurse. The manager was also responsible for monitoring food service and determining if any additional support services were needed. Generally, the manager was responsible for assuring that the daily schedule of activities was being followed.

There were five teachers providing lessons in computer technology and environmental sciences that included woodland ecology, stream ecology, and geology. Teachers also provided supervisory services during outdoor recreational activities and meals, breakfast and dinner.

In addition to the resident manager and five teachers, there were eight recreational aides assisting teachers in their instructional programs, and supervising student campers on nature trails during recreation activities and during evening programs. The nurse on duty administered first aid to student campers as well as helped students with prescription drugs brought from home by the students. She also cooperated with "on-call" doctors when

the need arose for any emergency services at the camp.

The staff was given a three-day orientation at Camp Round Meadow, Thurmont, Maryland. The objective of the orientation was to give staff members an opportunity to (1) get to know each other; (2) become familiar with the physical facilities and nature trails; (3) review the logistics of the camp operations; (4) plan and develop instructional activities for campers; (5) receive computer orientation; and (6) review first aid and safety procedures.

The survey of workshop participants revealed that the overwhelming majority benefitted from the orientation (Table 1). All of the participants rated the manner in which the information was presented as either "good" or "exciting." The overwhelming majority (85%) also gave high marks to the clarity of the presentation. Most importantly, the majority (77%) of the participants asserted that the workshop brought about, maintained or increased their interest in the Nature Computer Program, and that the workshop's objectives were met (69%). Viewed from the positive responses to the survey, the staff development workshop was very successful.

B. The Scope of Service Delivery

The transcript from the NCC administrative office revealed that 391 sixth grade students from 77 participating D.C. Public Schools, representative of all eight Wards in the District of

TABLE 1
Staff Development Workshop Survey

Survey Items:	Responses	
The manner in which the information was presented was:	Good 46%	Exciting 54%
The clarity of the presentation was:	Clear 15%	Very Clear 85%
The value of the workshop to me was:	Useful 54%	Very Useful 46%
The workshop brought about, maintained or increased my interest in the nature computer program:	Somewhat 23%	Very much 77%
The workshops objective were met:	Somewhat 31%	Very much 69%

Columbia, attended the 1993 NCC program (Table 2). The geographical distribution of the target population was fairly representative of the DCPS population with the highest number of schools participating from Ward 8, which included 14 schools; Ward 3 had the fewest participants with five schools. There were slightly more schools and students in the 1992 NCC program than in 1993. In sum, there were 84 schools and 408 students in 1992 compared to 77 schools and 391 students in the 1993 NCC program.

The facilities at Camp Round Meadow can accommodate up to 100 students each session. However, only a weekly average of 78 (that is 391/5=78.2) students took advantage of the NCC program. Table 3 displays the number of student participants from July 12, 1993 to August 13, 1993, and the desired number of participants for the upcoming year.

TABLE 2
Distribution of Participating Schools by Wards

Geographical Distribution	NCC PARTICIPATING SCHOOLS	NUMBER OF STUDENT CAMPERS
Ward 1	6	24
Ward 2	8	27
Ward 3	5	13
Ward 4	12	44
Ward 5	9	52
Ward 6	11	69
Ward 7	12	68
Ward 8	14	81
At Large Schools	Not Available	13
TOTAL	77	391

C. Student Activities

Beginning with students' arrival at Camp Round Meadow, the planned activities were followed meticulously. On the first day, students participated in orientation on general rules and regulations of the camp, kitchen policies and dorm assignments. They also took pre-test exams administered by camp teachers on computer skills, environmental sciences and on their opinions regarding social interactions and group living. The outcomes of these pre-test exams were compared with the post-test exams that students took at the completion of the five-day stay at the camp.

For camp activities, students were organized into four groups that were given names such as Trailblazers, Backpackers, Loopers and Micro-Chips. All classroom instruction and nature

Table 3
Summary of Student Participation

1993 Summer Sessions	Registered Number of Students	Actual # of Partic-ipants	Desired # of Partic-ipants	Additional Students Needed
7/12 to 7/16	119	80	100	20
7/19 to 7/23	117	81	100	19
7/26 to 7/30	141	102	100	0
8/2 to 8/6	115	55	100	45
8/9 to 8/13	137	73	100	27
Average	126	78	100	22
Total	629	391	500	109

trails were carried out in these groups except for breakfast, lunch and dinner where all groups, including staff, were gathered in a dining hall. The major activities of the camp day started on Tuesday morning at 7:00 a.m. The first 15 minutes of the day were devoted to aerobic exercise, followed by breakfast at 7:45, dormitory cleaning and finally classes which commenced at 8:50. When the first class began at 9:00 a.m., two of the groups remained at the camp site for computer lessons in basic computer programming, while the remaining two groups explored nature trails in their study of woodland and stream ecology. Alternately, groups who stayed behind to study computers in the morning engaged in science activities in the afternoon while the other groups remained at the camp site for computer lessons and lab. All classroom activities and nature trails exploration were given equal time.

The woodland ecology nature trail exploration entailed

studying and collecting samples to observe how green plants make their food, how organisms decompose, and how plants and animals coexist as partners in nature because of their interdependence on each other. The student campers also measured the acidity and alkaline content of soil to determine the PH level.

The nature trail in stream ecology involved exploring the life cycle of insects, amphibious creatures that spend their lives in the water and part on land. The campers also spent time measuring relative humidity of weather temperature, direction and speed of wind and streams. On their geology nature trail, the students collected and examined different types of sedimentary, igneous, and metamorphic rocks. The full-day activities were repeated in a similar manner for the duration of time the youngsters were at the camp.

A. Student Performance

The pre- and post-test data obtained from the students at the camp site during the week of program activities were used to determine the scope of the students' performance. Table 4 shows the summary of students' achievement scores (mean number of correct responses) on basic computer skills, stream ecology, woodland ecology, and geology. As shown, the students' overall achievement judged by the difference between pre- and post-test scores was significant. They scored a total of 237 out of a possible 391 correct points on the pre-test and scored 271 on the

TABLE 4
PRE- AND POST-TEST SCORES ON BASIC COMPUTER SKILLS, STREAM ECOLOGY, WOODLAND ECOLOGY AND GEOLOGY

Areas of instruction	Mean Correct Response	Mean Difference	Std.Dev	t-Value
Computer: Pre-test Post-test	248 274	27	62.2	1.37
Stream Ecology Pre-test Post-test	269 302	33	29.98	2.46*
Woodland Ecology Pre-test Post-test	239 231	-9	26.94	-0.77
Geology Pre-test Post-test	164 284	115	61.46	3.74**
Overall Score Pre-test Post-test	237 271	34	60.1	2.74**

*Significant at alpha <.05
**Significant at alpha <.01

post-test (Figure 1). This difference represents a gain of 34 points directly attributable to the lessons given at Camp Round Meadow. The post-test improvement was statistically significant ($t=2.74$, $p<.01$).

In the environmental sub-areas, student campers improved their mean correct response in stream ecology from a pre-test result of 269 to a post-test score of 302 points ($t=2.46$, $p<.05$), which amounted to a net increase of 33 points for the mean correct responses. Improvement was also observed in geology where the gain increased from a pre-test mean of 164 to a post-test mean of 284 ($t=3.74$, $p<.01$).

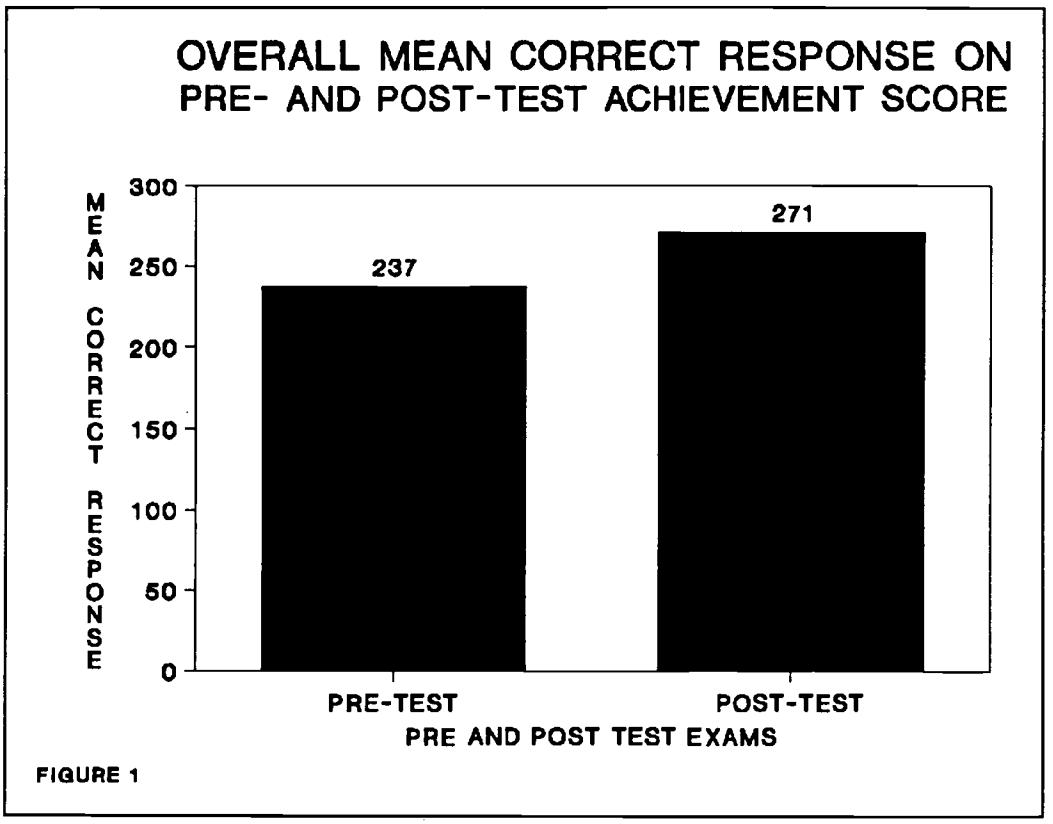

FIGURE 1

Stream ecology and geology were the two natural science areas where students demonstrated the most gain. Based on the significant gains the students made, it was determined that the relative strength of the camp activities lies in geology and stream ecology. Computer skills was another area where there was an overall gain between pre-test and post-test achievement scores, but the gain was not statistically significant. In contrast, the only subject where gain was not realized between pre- and post-test achievement scores was woodland ecology (Figure 2). In fact, the students had a post-test average 9 points below their pre-test average.

The overall pre- and post-test achievement scores were

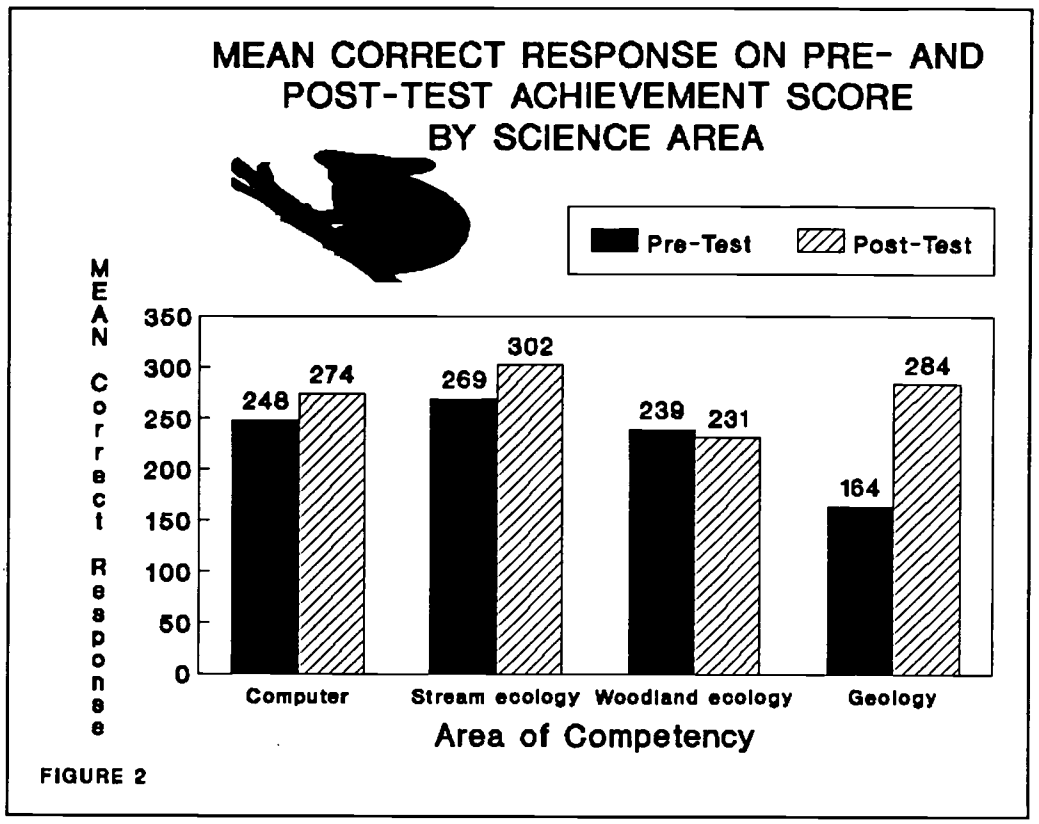

FIGURE 2

further partitioned by gender to examine differences in the mean correct responses. Table 5 shows that girls had a significant gain between pre- and post-test achievement scores in computer skills ($t=2.44$, $p<.05$). As demonstrated in Table 6, the boys registered some improvement in computer knowledge, but the gain was not statistically significant. Using the statistical information provided in Tables 5 and 6, the pre- and post-test gains between boys and girls were further examined to determine if there was a difference in the mean gain due to gender. The results indicate that gender played a significant role only in the performance on computer skills where girls had significantly higher gains than boys ($t=3.85$, $p<.025$); (see Appendix). Both

TABLE 5
GIRLS' PRE- AND POST-TEST SCORES ON BASIC COMPUTER SKILLS, STREAM ECOLOGY, WOODLAND ECOLOGY AND GEOLOGY

Area of Instruction	Mean Correct Response	Mean Difference	Std. Dev	t-Value
Computer:				
Pre-test	129	25	32.7	2.44*
Post-test	154			
Stream Ecology:				
Pre-test	140	26	19.7	2.95*
Post-test	166			
Woodland Ecology:				
Pre-test	129	-1	13.5	-0.15
Post-test	128			
Geology:				
Pre-test	82	75	34.4	4.34**
Post-test	157			
Overall Girls Score:				
Pre-test	125	25	35.8	3.56**
Post-test	150			

*Significant at alpha <.05
**Significant at alpha <.001

Tables 5 and 6 show that within each gender, there was a lack of improvement between pre- and post-test achievement scores in woodland ecology.

B. Social Behavior and Attitude

One of the objectives of this evaluation was to determine how changes in students' learning environment, with regard to living and working in groups or socializing with students from other schools during the five-day stay in the Catoctin Mountain Park, changed their attitudes and perceptions (Objective 2). The appropriate statistical technique chosen to measure students'

TABLE 6

BOYS' PRE- AND POST-TEST SCORES ON BASIC COMPUTER SKILLS, STREAM ECOLOGY, WOODLAND ECOLOGY AND GEOLOGY

Area of Instruction	Mean Correct Response	Mean Difference	Std. Dev	t-Value
Computer:				
Pre-test	113	7	27.3	.85
Post-test	121			
Stream Ecology				
Pre-test	125	8	11.9	1.58
Post-test	133			
Woodland Ecology				
Pre-test	107	-5	15.1	-0.84
Post-test	102			
Geology				
Pre-test	83	43	28.7	2.96*
Post-test	126			
Overall Boys Score				
Pre-test	109	10	26.3	1.93*
Post-test	119			

Significant at alpha <.05

attitude is known as summated rating developed by R. Likert.[1] The summated rating is designed to evaluate the intensity with which an attitude is expressed.[2]

Table 7 shows the summary of pre- and post-test scaled responses designed to measure students' attitude. Columns 2 and 3 list the percentage of responses to various activities that students judged to be fun. Columns 4 and 5 display total scores

[1]Likert, Renisis A. 1932, "A Technique for the Measurement of Attitudes," Archives of Psychology, No 140.

[2]The logic behind Likert's attitude measurement is that individuals who possess attitudes more strongly than others will occupy a different position along the attitudinal continuum from high to low. The intensity of a given attitude is then determined in part by weighing the responses a person gives to each statement. It is a measure of psychological distance (intensity) between each response. For example, a phrase "very strongly" has a greater positive weight than "strongly", and this provides the basis for interpreting scaled responses.

TABLE 7

STUDENTS' FEELINGS ABOUT THE NATURAL ENVIRONMENT, COMPUTERS AND LIVING WITH OTHERS: ACTIVITIES CONSIDERED FUN
(Attitude measurement)

It is fun to:	Pre test (%)	Post test (%)	Likert's score pre-test (rank)	Likert's score post-test (rank)
Make friends with students from other school				
Agree a lot	68.8	80.5	1499	1564
Agree a little	23.3	15.8	(1)	(1)
Undecided	5.2	2.4		
Disagree a little	1.8	0.7		
Disagree a lot	1.5	0.2		
Collect small animals from a stream:				
Agree a lot	57.6	80.9	1358	1542
Agree a little	19.4	11.9	(5)	(2)
Undecided	8.8	2.7		
Disagree a little	5.5	2.7		
Disagree a lot	8.8	1.8		
Use computers:				
Agree a lot	73.4	79.6	1483	1512
Agree a little	18.0	13.9	(3)	(3)
Undecided	4.0	3.7		
Disagree a little	2.5	0.6		
Disagree a lot	1.9	2.2		
Learn about animals that live in the forest:				
Agree a lot	59.1	68.6	1418	1490
Agree a little	25.8	22.0	(4)	(4)
Undecided	6.1	6.1		
Disagree a little	4.5	1.8		
Disagree a lot	3.9	1.5		
Learn about computers:				
Agree a lot	73.8	71.8	1493	1489
Agree a little	17.8	19.6	(2)	(5)
Undecided	4.0	4.6		
Disagree a little	2.5	1.5		
Disagree a lot	1.8	2.5		
Live & work with students from other schools:				
Agree a lot	41.2	60.6	1339	1440
Agree a little	37.0	28.2	(6)	(6)
Undecided	12.4	3.3		
Disagree a little	5.2	2.7		
Disagree a lot	4.2	5.2		

(continued)

Table 7 (continued)

STUDENTS' FEELINGS ABOUT THE NATURAL ENVIRONMENT, COMPUTERS AND LIVING WITH OTHERS: ACTIVITIES CONSIDERED FUN
(Attitude measurement)

IT IS FUN TO:	Pre test (%)	Post test (%)	Likert's score pre-test (Rank)	Likert's score post-test (Rank)
Learn about rocks and soils:				
Agree a lot	34.4	54.6	1231	1407
Agree a little	34.0	31.9	(11)	(7)
Undecided	13.5	6.4		
Disagree a little	11.0	4.6		
Disagree a lot	7.1	2.5		
Learn about plants in the forest:				
Agree a lot				
Agree a little	41.2	53.0	1323	1403
Undecided	35.2	33.5	(7)	(8)
Disagree a little	12.1	6.1		
Disagree a lot	6.4	2.7		
	5.2	4.6		
Be taught by different teachers:				
Agree a lot				
Agree a little	47.1	57.5	1288	1373
Undecided	28.3	30.5	(8)	(9)
Disagree a little	15.3	6.3		
Disagree a lot	6.1	1.9		
	3.2	3.8		
Learn at an outdoor school:				
Agree a lot	34.3	45.5	1245	1370
Agree a little	29.4	33.9	(9)	(10)
Undecided	17.0	10.6		
Disagree a little	9.4	4.5		
Disagree a lot	10.0	5.5		
Collect rocks and soils:				
Agree a lot	34.2	45.5	1216	1351
Agree a little	29.4	33.9	(12)	(11)
Undecided	17.0	10.6		
Disagree a little	9.4	4.5		
disagree a lot	10.0	5.5		
Solve science Problems:				
Agree a lot	33.1	44.5	1234	1324
Disagree a little	33.1	32.9	(10)	(12)
Undecided	16.1	10.1		
Disagree a little	10.9	6.7		
Disagree a lot	6.7	5.8		

derived from Likert's attitudinal measurement technique. The range of theoretical scores for this evaluation are from 1650 to 330 points, 330-being the lowest[3]. However, the actual empirical scores ranged from 1564 to 1234. The scores represent

[3]Each statement in the Likert's measurement has a successive response ranging from "agree a lot" which carry a weight of 5, to "disagree a lot" which carry a weight of 1. The maximum points obtainable assuming that participants respond to "agree a lot" would be 1650 (when sample size is 330 and the weight 5, the total score would then be 330 X 5 = 1650). Similarly, the minimum number of points per statement would be 330 X 1 = 330. Therefore, the range of scores is between 330 and 1650.

the varying degree along the attitudinal continuum of activities that students considered as fun. The higher the Likert score, the greater the intensity expressed in terms of measurable attitude.

From a technical point of view, Likert's score has an added advantage in that it allows horizontal and vertical interpretation of Table 7. The horizontal interpretation compares the absolute values of pre- and post-test results across each item and determines whether or not any perceptible changes in students' attitude have taken place. The vertical interpretation of pre- and post-test results compares changes in the rankings of each item. As shown in Table 7, the change in the ranking reflects how the students value each item after having stayed at the NCC for a week. For example, the highest ranked item was "making friends with students from other schools" with 1499 points on a pre-test exam and 1564 points on post-test exams. On this particular item, the rank did not change, which suggests that the youngsters had the same strong feelings about friendship before they came to the NCC program as they had at end of the NCC program.

Generally, the post-test scores were higher than pre-test scores on the survey items indicating that students had a positive change in their attitude as the result of the five-day camp activities. The changes in students' attitude scores were higher on eleven of the twelve individual survey activities (see Table 7). The only item which did not change from pre- and post-

test surveys was "learning about computers."

The "fun" activity that ranked second on the post-test was "collecting small animals from a stream," which had a score of 1542; the pre-test score was 1358 with a rank of 5. The activity with the lowest ranking was "solving science problems," with a total score of 1324 on the post-test exam and 1234 points on the pre-test exam. The one reversal, "learning about computers," indicated the total pre-test score was higher than the post-test score; the pre-test score was 1493 as compared to a 1489 post-test score. The decrease was slight and does not represent a significant change between the pre- and post-tests.

A. Students' Observations

Table 8 shows the summary of students' evaluations of the overall program activities and their ratings of each component on a scale of 1 to 5. The upper end of the rating scale, 4 and 5, represented the students' judgments of a favorable or highly favorable propensity towards the overall program. The overwhelming majority of students rated the overall activities between 4 and 5. Based on the combined percentage distributions for students with favorable and highly favorable opinions (listed in column 6), it appears that the overwhelming majority of students had favorable opinions of the activities at the camp. The two activities students seemed to enjoy the most were stream

TABLE 8

STUDENTS' EVALUATION OF THE OVERALL PROGRAM

(Rating scale 1-low 5-high)

Survey Items	1	2	3	4	5	COMBINED 4 and 5
New Things I Learned	1.6	3.0	10.4	28.8	56.0	84.8
Stream Ecology	1.4	1.9	4.3	14.9	77.6	92.5
Woodland Ecology	2.4	3.5	14.9	23.4	55.7	79.1
Geology	3.3	2.7	12.0	30.2	51.9	82.1
Computer Class	4.9	7.9	9.8	28.5	48.9	77.4
Counselors	4.1	2.7	11.3	26.1	55.5	81.6
Dormitory	5.5	5.7	14.5	32.8	41.5	74.3
Food	12.0	13.9	22.1	28.6	23.4	52.0
Mini Olympics	2.7	1.9	3.8	13.9	77.6	91.5
Scavenger Hunt	3.0	6.3	17.8	26.8	46.2	73.0
Nature Bingo	4.9	4.6	13.6	23.7	53.1	76.8
Skits	3.3	3.3	12.1	25.5	55.9	81.4
Computer Practice	7.3	8.2	13.6	28.0	42.9	70.9
The Whole Camp	3.0	2.5	11.5	30.4	52.2	82.6
Teachers	3.0	2.4	13.6	26.3	54.7	81.0
Camp Manager	6.0	5.4	14.7	22.3	51.5	73.8

ecology (92.5 percent) and mini-olympics (91.5 percent).

The students had a high opinion of the new "learning" (84.8 percent), which included environmental lessons in woodland ecology (79.1 percent), geology (82.1 percent), computer classes (77.4 percent) and computer practice (70.9 percent). Students had favorable opinions on all activities relating to socialization and group living which were designed to strengthen group vitality and interaction. These activities included dormitory life (74.3 percent), scavenger hunting (73.0 percent), nature bingo (76.8 percent) and skits (81.4 percent).

The students also rated their counselors (81.6 percent), attending teachers (81.0 percent) and camp manager (73.8 percent) as highly favorable. Among the overall program activities, food service received the lowest rating. The combined favorable opinions regarding the food included 52 percent of the students. Owing to the limited information on why students rated the food "less favorably" than other activities, any definitive suggestion may be premature. However, the low rating is an indication that food service delivery needs improvement.

B. Counselors' Observations

The final segment of this evaluation assessed counselors' and teachers' evaluation checklists completed for each student. Counselors' checklists examined the extent to which the students followed the guidelines established at the camp. The strict adherence to the camp's rules and regulations was designed to

build strong character. Table 9 shows counselors' observations of students who followed prescribed standards of social behavior at the camp. The counselors' checklist scale ranged from observing these social behaviors **"all of the time"** to **"never."**

The counselors indicated that the majority of students followed camp rules and regulations (83.5 percent), and kept camp facilities and grounds clean (92.6 percent). They also felt students used camp equipment with care (93.7 percent); obeyed the camp manager's and other caretakers' rule to remain within the camp boundaries at all time (92.6 percent); and stayed away from unsupervised areas (87.5 percent). The counselors also indicated that students were well behaved in that most were never verbally abusive (95.4 percent) nor were they ever physically abusive (95.3 percent) to their fellow students or teachers. The counselors further indicated that the demeanor of the students was excellent in that they were able to complete their assignments on time (87.3 percent), and punctual in that they reported to camp activities on time (87.2 percent). In general, the counselors felt students were cooperative (83.9 percent) and maintained a good relationship with other campers (88.3 percent). Counselors also felt students sought to maintain similar relationships with teachers and counselors (89.0 percent).

TABLE 9

STUDENT'S COMPLIANCE WITH CAMP'S GUIDELINES
(Counselor Checklist)

GUIDELINES:	All of the time	Most of the time	Some of the time	Never	Don't know
Follows camp rules and regulations	83.5	11.4	4.8	0.0	0.3
Keeps camp facilities and grounds clean	92.6	5.4	1.7	0.0	0.3
Uses camp equipment with care	93.7	4.3	1.7	0.0	0.3
Remains within the camp boundaries at all times	92.6	4.8	2.0	0.0	0.6
Practices safety rules on trails and at the camp site	91.2	6.3	2.0	0.0	0.6
Stays away from unsupervised areas	87.5	10.0	2.3	0.0	0.3
Participates in camp activities	88.9	8.5	2.3	0.0	0.3
Reports to camp activities on time	87.2	9.4	3.1	0.0	0.3
Completes assignments on time	87.3	7.1	5.1	0.3	0.3
Follows instructions of camp personnel	78.1	13.6	7.4	0.6	0.3
Is verbally abusive	0.9	0.9	2.6	95.4	0.3
Is physically abusive	1.1	1.1	2.0	95.3	0.3
Is cooperative	83.9	10.3	4.9	0.6	0.3
Maintains a good relationship with other campers	88.3	8.0	3.4	0.0	0.3
Maintains a good relationship with teachers and counselors	89.0	7.8	2.9	0.0	0.3

C. Teachers' Evaluations

The teachers' evaluation checklist assessed student competencies in computer skills and basic identification and measurement of environmental sciences in woodland ecology, stream ecology and geology. Table 10 shows the percentages of students who were observed to have mastered or not mastered the various activities rendered at the camp. As shown, teachers perceived that 100 percent of the students had mastered all the competencies and skills indicated on the checklist for each subject area: computer, woodland ecology, stream ecology and geology.

TABLE 10
PERCENTAGES OF STUDENTS WHO MASTERED COMPUTER SKILLS AND ENVIRONMENTAL SCIENCES
(Teacher Checklist)

Areas of Competencies and Skills	Camp Activities	A	B	C
		Mastered	Not Mastered	Not Observed
COMPUTER	Set-up computer for operation	100.0	0.0	0.0
	Turn computer on and off	100.0	0.0	0.0
	Identify components and functions	100.0	0.0	0.0
	Distinguish between commands and statements	100.0	0.0	0.0
	Locate points on CRT	100.0	0.0	0.0
	Graph a rectangle	100.0	0.0	0.0
	Write a program for plotting a rectangle	100.0	0.0	0.0
	Construct a scrapbook on computer literacy	100.0	0.0	0.0
Woodland Ecology	Name and identify at least three different trees found on the trail	100.0	0.0	0.0
	Give examples of plant and animal interdependence	100.0	0.0	0.0
	Name a producer and tell what it produces	100.0	0.0	0.0

(continued)

TABLE 10 (Continued)

PERCENTAGES OF STUDENTS WHO MASTERED COMPUTER SKILLS AND ENVIRONMENTAL SCIENCES (Teacher Checklist)

Areas of Competencies and Skills	Camp activities	A	B	C
		Mastered	Not Mastered	Not Observed
Woodland Ecology	Name three consumers in a woodland community	100.0	0.0	0.0
	Describe the role of a decomposer	100.0	0.0	0.0
Stream Ecology	Measure the rate of flow, temperature and depth of a stream	100.0	0.0	0.0
	Use collected stream specimens to help describe the kinds of organisms that populate a stream	100.0	0.0	0.0
	Name and distinguish the various stages of metamorphosis	100.0	0.0	0.0
	Describe at least one example of interdependence in streams	100.0		0.0
	Infer how factors such as temperature, velocity, PH and light can affect the numbers and kinds of organisms in a stream	100.0	0.0	0.0

(continued)

TABLE 10 (Continued)

PERCENTAGES OF STUDENTS WHO MASTERED COMPUTER SKILLS AND ENVIRONMENTAL SCIENCES (Teacher Checklist)

Areas of Competencies and Skills	Camp Activities	A	B	C
		Mastered	Not mastered	Not Observed
GEOLOGY	Classify rocks-igneous, sedimentary or metamorphic	100.0	0.0	0.0
	Name at least three characteristics of rocks and minerals	100.0	0.0	0.0
	Describe three characteristics that make soils different	100.0	0.0	0.0
	Identify and describe some evidence of weathering and erosion	100.0	0.0	0.0
	Use a compass to locate different directions	100.0	0.0	0.0
	Describe and infer evidence of the earth undergoing constant change	100.0	0.0	0.0

VI. CONCLUSIONS

The 1993 NCC Summer program was managed and implemented successfully as planned. Overall, the students demonstrated an increase in their knowledge during the program activities as indicated by significant gains between pre- and post-test performance scores. In the environmental sub-areas, students did well in geology and stream ecology. In computer skills, however, there was a net increase in the performance test score, but the gain was not statistically significant. In woodland ecology, students showed a decline in their performance score.

The result of partitioning the pre- and post-test scores by gender showed that girls achieved a significant gain in computer skills. The boys, however, registered some improvement in their performance, but the gain was not statistically significant. In addition, it was found that girls scored significantly higher than boys on the acquisition of computer skills.

These analyses of pre- and post-test scores of the students on the various educational and social factors indicate that students succeeded in strengthening their environmental knowledge and social skills, the impact of which may be felt well beyond their school years. Through group interactions, the students benefitted from a socialization process that occurred through positive group formations in the five days of intensive activities at the camp. Students scored higher on eleven of the twelve individual activities, indicating changes in their behavior as a result of group living and social interactions with

peers from different schools.

The NCC program provides an excellent opportunity for students to gain an understanding and appreciation of their natural environment, enhance their knowledge in computer technology and learn about positive interactions and group living. Most importantly, the program provides students an opportunity to utilize their time more wisely at a period where alternative programs such as this are scarce.

Generally, the educational and environmental science exploration was beneficial to the city youth who rarely get a chance to explore and appreciate wilderness in its natural settings. The experience was therapeutic in that it afforded students a new outlook that, indeed, life does exist beyond the city limits.

Overall, the staff identified to help implement the 1993 NCC program was adequate as demonstrated by the smooth delivery of camp services. The general absence of any major problems at the camp site relating to the staff was also an indication that the staff development workshop given prior to the NCC program fulfilled its objective in training a competent staff.

VII. RECOMMENDATIONS

The NCC is a very effective program in terms of the benefit students received in the limited time period. Therefore, it is recommended that:

I. The program **should** be continued, and ways and means **should** be found to expand the program beyond the summer months. One way to fulfill this goal is to incorporate the exploration of the natural environment at NCC into the regular school curriculum in which students are required to participate.

II. Reasonable efforts should be made for the next planning period to increase the number of student participants. Two possible ways suggested to increase participation to full capacity are as follows:

A) The NCC announcements and news release to the parents and students should be disseminated earlier in the school year, prior to June 3rd when the principals are usually notified. This would permit all the concerned parties--students, parents or guardians and local school officials--to have ample time for planning participation in the NCC program. Principals, teachers and parents at each participating school should also receive more information about the advantages of the NCC so they can

encourage students to participate. Typically, information about the upcoming NCC program is disseminated in the form of a "news release" and bulletin board, and more effective avenues for program information should be explored.

B) Move the starting date of the NCC program to the beginning of July, approximately two weeks after the close of the regular academic year. This movement changes the last date of the NCC program from mid-August to the first of August. The evaluation revealed the number of participants precipitously declined during weeks four and five, indicating that as the summer months advanced, student participation declined. Therefore, it is likely that moving the starting date of the camp up by two weeks, would increase the number of participants.

III. Different strategies should be implemented at NCC in the areas of computer knowledge and woodland ecology to enhance students' performance scores. Also, closer attention should be given to boys in the computer class since boys performed consistently lower in the pre- and post-test achievement scores than girls.

VI. The teachers' evaluation checklist should be completed by an

outside observer to ensure that it reflects variations in the true skills mastered by the students at the camp site. As it stands, the teachers' checklist depicts monolithic or identical responses for all students. The absence of any variations in the teachers' observations raises suspicions as to the validity of the data.

V. A future study should focus on the impact of NCC on the subsequent school performance of students as measured by the grade point average and social adjustment. The long term benefit of NCC can be ascertained only if such study is carried out.

APPENDIX*

To examine whether there was any difference between boys and girls in their pre- and post-test performance, overall, the following hypothesis was posed:

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_a: \mu_1 - \mu_2 \neq 0$$

where: μ_1 = the mean gain for girls
μ_2 = the mean gain for boys

To test the equality of the two means, the following t-statistic was conducted:

$$t_{\alpha/2} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

where $\bar{X}_1$ is the sample mean gain for the girls, and $\bar{X}_2$ = the mean gain for the boys. N_1 = 183 is the sample size for the girls and N_2 = 147 the sample size for the boys. S^2_1 and S^2_2 are the sample variances for the girls and boys respectively. The following two tailed t-value is calculated based on the combined sample size (N=330-2=228 df):

$$t_{.05/2} = \frac{25-7}{\sqrt{\frac{(32.7)^2}{183} + \frac{(27.3)^2}{147}}} = 3.85$$

Since the calculated value of 3.85 is greater than the theoretical value (alpha level .001), the equality of the two means the null hypothesis, H_o for the girls and boys is rejected, and significant gender differences are noted in the overall performance scores by boys and girls.

*The statistical information shown in the Appendix is taken from: Morris Hamberg 1983, "Test for difference between Means: Two-tailed Test," Statistical Analysis for Decision Making, p. 276

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