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AUTHOR Eddy, Robert John
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ABSTRACT

An investigation was conducted in order to make a comparison of grade-point averages, earned by military-dependent students in Overseas Dependent Schools, with the grade-point averages of a comparable non-mobile student society with whom they graduated in the United States. Data was derived from the permanent record cards of 2,173 graduated students over a period of five graduating classes, in Marin County, California. Students were designated as A) military-dependent or B) non-military. The results indicated that there was no significant difference in mean grade-point average of the two groups. In conclusion, it was recommended that similar studies be conducted in school districts that have a transient military-dependent student body from overseas. To validate the findings of this investigation it was additionally suggested that additional variables, comparable to both groups, be added to measure achievement as proof that mobility affects achievement. (Author/BW)

GRADE-POINT AVERAGES OF OVERSEAS MILITARY-DEPENDENT STUDENTS COMPARED TO GRADE-POINT AVERAGES OF NON-MILITARY STUDENTS

By

Robert John Eddy

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Presented by

Robert John Eddy, BA, MA

Major Advisor 

Darryl D. Laramore, PhD
Coordinator of Vocational Guidance
Sonoma County Office of Education
Santa Rosa, California

Review Committee: Dr. Augustine P. Donoghue
Director of Admissions
University of San Francisco

A designated member of the
Walden University Faculty

Walden University

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INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction and Background

Often a student's poor school achievement is blamed on frequent moves made by parents. An opposing view holds that travel exposes the child to a wide variety of experiences, teaching methods, and cultures, thus enabling him to be more broadly educated, (Bevis & Faunce, 1964).

Over many years of educating children, teachers have said that traveling was educational and helped one gain maturity, while opposing voices repeated the old adage "a rolling stone gathers no moss".

According to Mattson (1966), children of military personnel are characteristically alike in many respects. Their environments are similar in many respects. They are generally the children of military career men. Their lives have become accustomed to the discipline and organization of the military. There are no so-called "pockets of poverty" or environments receptive to anti-social behavior. Most of them have traveled extensively and some have lived in foreign lands, thereby enriching their cultural and educational experiences. A large segment are children of at least one parent who is a college graduate, and all have an awareness of education because the advantage of education is obvious in military life.

In every sense then, these students have a multitude

of advantages over the average stateside student -- who may live in an impoverished area or who may run free of any semblance of discipline. These dependents abroad, collectively, have tremendous academic potential.

The military dependent student spends almost one-half of his life during early education in Labrador, deserts of Ethiopia, fertile farms of Western Germany, in the crowded suburbs of Tokyo, the steaming islands of the Philippines, or possibly on the "edge of war" such as Guantanomo Bay of Cuba (Cardinale, 1966).

Gansberg (1963) has reported that Dr. William G. Carr, former executive secretary of the National Education Association -- as one spokesman for a panel of six educators, who examined overseas schools in the fall of 1962 -- stated, "The schools attended by children of military families are, in relative terms in the horse and buggy era, while the military establishments are geared to an age of space exploration".

The criticism of the Overseas Dependent Schools has been a constant one. Observers have, since the schools inception in 1946, found fault with buildings, teachers, supplies, and constant student turnover. Does the criticism imply that these children obtain a lesser education? From investigation of the problem one gathers an image of school buildings renovated from unusable buildings of the military and local government, to super elegant two-storied structures with revolving doors constructed to accommodate the

mobility change.

How the ninth largest school system of the United States could come under such criticism is understandable, but Derrick (1960), in contradiction to these arguments, says, "The school curriculum is often enriched by kinds of activity seldom available in the United States. How many schools do we have in the States that offer ski instruction? How many sixth grade classes are offered the kind of a field trip such as two sixth grade classes in an elementary school in Munich enjoyed when they traveled for three days to Venice? How many of our high school graduates could say that their graduation exercises were held in a 16th century theater designed by Palladio, as can those students graduating from the high school for military-dependents at Vicenza, Italy?"

The need for overseas dependent education began in October, 1946 with the establishment of 38 elementary and five high schools for 2,800 children taught by 120 teachers, employed in the United States and transported to their European assignments under a transportation contract agreement.

Within ten years (Sefert, 1961), the system had grown to 93 elementary, 12 high schools, and 41 kindergarten classrooms staffed with 1,400 educators.

The curriculum sometimes exceeds the better U.S. school systems. The opportunity for students to "live" their subjects is ever present. Students at the Heidelberg

American High School need only hop on a local bus to visit the University of Heidelberg in the center of town and examine the room in which Professor Bunsen once taught science to learn that the "Bunsen-burners" in their own high school chemistry labs are the result of his educational invention. Students in the Paris elementary and high schools need only descend into the Metro system and take a quick ride to Napoleon's tomb, near the banks of the River Seine, to read of his conquests that ended with exile and death. Such an exposure to cultural, historical, and language learning processes offers poise and maturity to the children of professional travelers.

If, according to Sexton (1959), the high turn-over rate of teachers is a plague on the overseas schools and that a necessity for achievement is residential stability, one could assume that the mobile military-dependent student was and is a doomed achiever.

Students find it difficult to form deep inter-personal attachments necessary to stable personalities. Everywhere they must meet new faces and places with varying sets of expectations enforced in varying degrees (Thomas, 1960).

With regard to perception of one's self, Combs (1964) has said that achievers seem to feel well accepted and integrated, and comfortable as members of a group.

In the Overseas Dependent Schools of Europe all pupils, beginning with first graders, are learning French or

German as part of the regular elementary curriculum. "Turn-over" is a problem and enrollments of slightly more than two years is average. In January and February, in a Munich elementary dependent school, 227 new students arrived and 282 transferred out. In the school year of 1955-56 (ten years later) the same school in September admitted 753 new students but lost 798 former enrollees. Warnock (1956) attributes this amazing adaptability and resiliency to sheer comprehension of the situation by the American Overseas Dependent School's students.

Speaking of college level students, Cleveland (1960) stated, that if studying abroad helps awaken a student to the excitement of using his mind, it may be far more valuable than an equal number of hours in an American College. Rusinaw (1960) felt it was necessary to be up to date on European economics, politics, and culture and found an unusual opportunity to increase his understanding of people and their ways of life.

Does mobility affect achievement in learners? Do the students of overseas military-dependent schools achieve more or less in their educational process? If the overseas experience added to the academic program is effective then we would seem to see a gain in achievement, or if negatively affected by the experience, a decline in grades earned. But, mostly, once these overseas students are returned to a stateside school for completion of their education, do they achieve more or less than their counter-

parts who have been stabilized for the same four year period by schools, community, teachers, and peers?

Statement of the Problem

This investigation was concerned with comparing grade-point averages earned by military-dependent students, while in overseas schools with the grade-point average earned by a comparably selected non-mobile student society with whom they graduated in the United States.

The 1965 figure of projected births was 3.03 as opposed to 2.53 today. This downward trend, as illustrated by a graph in accompaniment to an article, "Growth Rate Down", which appeared in the S. F. Sunday Examiner and Chronicle (November 28, 1971), indicated that the "baby boom" which had started in the early 1940's (war-time) peaked in 1955. It further illustrated the need of overseas dependent schools from 1945 on (occupation forces) and the beginnings of overseas mobility of students.

A study made by Phillips (1957), indicated more pupil mobility in elementary grades than in high school, almost twice as much. He saw the problem as one of helping pupils adjust to new schools and supposed that pupils moving long distances have greater and different problems of adjustment.

Both children and plants have roots (Perlman, 1963). Some plants have been known to nourish and grow better when transplanted, and again, others are better left to their own habitat for consistent growth.

Major questions proposed for the investigation were as follows:

1. In an overall comparison, do overseas military-dependent students achieve better mean grade-point averages than non-military students with whom they are compared?
2. In a comparative study within males, is there a significant difference in the mean grade-point average achievement between the military-dependent males and non-military males?
3. In a comparative study within females, is there a significant difference in the mean grade-point average achievement between the military-dependent females and the non-military females?
4. In a study within the overseas military-dependent students only, is there a significant relationship between area studied and any other variable?
5. In a study within the overseas military-dependent students only, is there a significant relationship between semesters of study overseas and grade-point average?

If an overseas military-dependent student gains an appreciation for the complexities of educational problems, and if by being in an overseas school his own perceptions,

interpretations, and convictions are sharpened so as to enhance the intake value of what he is learning, then one might assume his achievement level would increase.

The overseas military-dependent student living in the present has the excitement of not only reading of the past, but the added advantage of seeing the evidence of it as well.

This investigation attempted to provide new evidence to the continuing studies of mobility and achievement; if there are significant differences in the achievement of overseas military-dependent students, as expressed in mean grade-point averages when compared to their peers in a graduating class of non-military and non-mobile students.

This investigation also attempted to make contributions to the general lack of experimental research to be found in studies on our overseas military-dependent student society.

Definition of Terms

Overseas Military-Dependent Students: Males and females within a graduation class who had studied a minimum of one semester in grades 9-12 in one overseas dependent school.

Non-Military Students: Males and females within the same graduation class who had studied continuously in grades 9-12 within the same school district.

Overseas Dependent Schools: Schools operated by the

Dependent Education Organization (DEO) of the Department of Defense, United States Government.

Areas of Study: Categorizing schools operated by DEO into two areas, for the purpose of the study, (1) Europe and (2) the Pacific.

Overseas Semesters: Number of semesters spent in residency by a military-dependent student in one overseas school.

Mobility: Refers to geographical and school changes experienced by students.

Non-Mobile: Refers to students and their parents who have resided consistently in the same place, especially during the years of high school education.

Stable: Refers to members of society for whom mobility is not a part of, or a way of life.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter was intended to report relevant research completed in any areas that relate in some way to the intent and purpose of this investigation. Studies that relate to mobility, achievement, and overseas military-dependent students have been included as a prelude to the theoretical perspective of this investigation.

The reviewed literature has been placed into three categories followed by a summary. First, the early and contemporary mobility studies which lend credence to the problem of mobility and what effects it had on achievement.

Second, that research which related specifically to achievement, whether the relationship is of socio-economic levels, traits, differences, or parental authoritarian controls that influence it.

Third, literature that deals with specific mobility and consequences for achievement that included overseas military-dependent students in its reporting.

With the exception of three studies reported here, there was a void in the reporting of investigations that include overseas military-dependent students.

Early and Contemporary Mobility Studies

Prior to the end of World War II, a time when military-dependents accompanying career servicemen to overseas assignments was unheard of, a group of students were de-

pendent on what education they could acquire in "bean and cotton" schools. Evans (1942), a man who studied the plight of the children of migrant workers, stated that schools in some areas of the United States were dependent solely on "what was to be picked".

One of the first indications that mobility might have a bearing on intelligence was the study of Smith (1943) who found that migrants from rural areas tended to be somewhat more intelligent than those who do not migrate, and that a slight positive association existed between the amount of mobility and intelligence scores. His findings were that the association between intelligence and length of residence, combined with the size of population of place of residence, differs from one age to another, with the closest association characterizing the ages of 14 to 17 years.

Chicago, where the social-class research movement began, has been the scene of many socio-economic studies to determine residential mobility and effects on pupil achievement. Byrne (1958) said that the successful, competent and high-achieving, high-mobility student does exist, but he was found to be the exception. Chicago schools, to better cope with the problem of mobility, used a new supportive educational technique in a 96% transiency setting by moving "senior" teachers to those area schools most affected by mobility (Rogers & Saffir, 1956).

The investigator in search of effects of mobility on

achievement has not overlooked "reading" as significant. The Cincinnati study accomplished by Bollenbacher (1962) measured achievement in reading by means of a standardized test and found that reading was not effected by the number of schools attended.

Intracommunity transfers in the Hartford Public Schools found no significant difference in intelligence and achievement between non-mobile and mobile groups. The findings were based on a study of sixth grade pupils who had moved two or three times within the Hartford schools (Miles, 1962).

Rader (1962) was interested in teacher-student relationships in high-mobility schools of Chicago and found that where students move often, so do teachers. He has asked a very important question related to this investigation: Is continuity necessary for excellence?

Another variable studied in the review of literature concerned the education of parents. Fouty (1964) studied effects of mobility and related factors on the academic achievement of students in a suburban school and found that parents with 13 or more years of education accounted for no significant difference of achievement in the sub-groups of students studied.

More recently (Plath, 1968) in a study of intra-system student mobility within the Phoenix, Arizona schools sought to find the effect upon academic achievement and absences. Transfer and non-transfer students were compared

on a socio-economic level. Phoenix had 10 high schools with 27,000 students enrolled in the school year 1965-1966. What Plath found was a significant difference in academic achievement of transfer and non-transfer students when classified by socio-economic levels, grade and sex.

The use of $\underline{t}$ tests was employed to compare the mean of the least mobile group with the most mobile group by Snyder (1967), and findings indicated the most mobile group superior in achievement to the least mobile group at the five percent level of significance. Snyder's use of Scholastic Aptitude Test (SAT) scores as a variable found the same significant difference between groups.

The citations made of earlier studies in mobility have attempted to show the first concerns of educators in their observations of the mobile student. The post-Depression era, wherein a mass migration was made to the larger cities for employment, focused on problems in adjustment that confronted the "shifting child".

Socio-economic levels, education of parents, and student-teacher relationships have all played their roles in earlier studies measuring the achievement of the mobile student.

What achievement is, how it is measured, and how significant it is to overseas mobility was our next concern.

Achievement: Traits, Differences, and Measurements

As this study concerned itself with the achievement of students who had studied overseas compared to students

who did not, a study by Buswell (1958), was of interest. Buswell made a comparison study of achievement in mathematics in England and in California and discovered that 11 year old English students surpass California students of the same age in mathematics.

Investigating success of military-dependent students in an overseas school setting, one might assume that methods of foreign teachers have at times been absorbed by the observant American teacher while in another country. It might follow, by example, that an American high school teacher in Bushey Park Dependent School, outside of London, could become influenced by the instructional methods of mathematics by his colleague in the English schools, study the method, and consequently change some of his own instructional technique with the overseas dependent students, which then enhances their ability level.

Frandsen (1961) says that we are more concerned with provisions for delayed readiness than with detecting and making provisions for early readiness and that intra-individual comparisons of achievement provide general guidance for learning. A theoretical definition given to self-evaluation and academic achievement, which echoes the earlier philosophy of John Dewey, was stated by Borislow (1962) when he said, "It is the discrepancy between a self-perception and a concept of the ideal."

A significant study with regard to mobility and achievement was made by Tout (1963) with three groups di-

vided into permanent, semi-mobile and mobile students. He tested for no significant relationship between mobility and intelligence. He implied adjustment was not related to mobility and found that permanent students were higher in measured intelligence than the mobile or semi-mobile student; the permanent group had higher achievement and a precise relationship between mobility and intelligence, and mobility and achievement.

Pertinent to achievement investigation was DeSena's (1964) findings. The academic mean grade-point average (GPA) would be most reliable for those students who consistently achieve similar or parallel grades over a three term period, rather than over a one or two term period. DeSena also said that academic success may be directly related to the number of hours per day spent in study, motivation toward future goals, levels of aspiration, and the ability to exercise self-direction and self-discipline.

Business recruiters, in evaluating prospective employees among college students, mention scholastic achievement, communication ability, and personal goals as the three most important attributes they seek, among the interviewed candidates. These findings were based on interviews taken from 109 recruiters of 79 different companies. (Senior Scholasticate, February 1961).

A doctoral study by Lehman (1964) recommended further mobility investigation at the conclusion of his Chicago "Mobiltown" study. In seeking to find the relation-

ships of age, intelligence quotients, and achievement to student mobility, he used several measures: The California Test of Mental Maturity; Kuhlman-Anderson: SRA's Primary Mental Ability; and the Otis Quick Scoring tests. His sampling of eighth graders, including those involved in foreign moves, showed that Intelligence Quotients had a negligible relationship to student mobility.

In his book, The Achieving Society, McClelland (1961) had this to say:

> To begin with, moving up in social status frequently implies the geographical mobility we found to characterize high "n achievement". If people with high "n achievement" are more willing to move about physically in space, they are also more willing to leave home and to adapt themselves to the requirements of upward social mobility.

The experiments of McClelland demonstrated what channels peoples' thoughts turned to under achievement pressure. His "n achievement" tests were simple counts of the number of such achievement-related ideas in stories written under normal testing conditions and could be taken to represent the strength of man's concern with achievement.

McClelland further stated that American males with high "n achievement" often come from the middle class rather than the lower or upper class, and that they have better memory for incompleted tasks, are more apt to volunteer as subjects for psychological experiments, are more active in college and community activities, choose experts over friends as working partners, and are more resistant

to social pressure.

It seemed to the investigator that the search for understanding of what achievement is, and is not, was like weaving a cloth with so many colors that the design is destroyed in the attempt.

In search of "Patterns of Academic Achievement" Kowitz and Armstrong (1965) studied 1,381 cumulative folders of students. They reviewed each folder for such data as teacher grades, scores on standardized tests of achievement, aptitude, and ability. The data was not complete for all pupils, for all schools, nor for all grades. The authors stated:

> "There was some obvious variation in the data. It seemed likely, for example, that teacher grades often were influenced by administrative tracking procedures while test scores were not."

In the search of Kowitz and Armstrong for patterns among successful students they found that teacher grades and achievement test results do not measure the same things. The initial difference was found to be in that two years after teacher's grades declined, test scores declined also. Whether the teachers perceived some prognostic behavior that the tests did not reflect, or whether teacher grades had a deletorious impact on student achievement could not be determined from the data.

For those who work with cumulative records the impact of what teachers write into them can be condemning for a student. Statements such as: "lazy--won't work", "could do better", "not working up to his ability" are

carried over year after year as a student progresses through his elementary years. When academic problems arise in the secondary years, these teachers' remarks are often recalled to substantiate the prognosis of failure. (Steve, 1962).

Jackson and Lahaderne (1966) studied 292 sixth graders only to report that success and satisfaction had no link. In their findings they attribute this discovery to teachers who, in grading, misconstrue attitude as achievement.

In seeking problems that teenagers have in relation to grade achievement, Marshall (1967) studied 115 students in grades 9 - 12 and found that high achievers tend to be more mature, self-confident, intellectually curious, happier in school, and have better morale. In contrast to this, lower achievers tend to be restless, impulsive, and irresponsible.

The investigator for the present study has made these same observations over the years and found the characteristics mentioned by Marshall for high achievers to be characteristic of the overseas military-dependent student who has returned from an overseas military-dependent school. The characteristics arrived at by Marshall for low achievers was typical of the behavior of some of the non-mobile school community members.

The Coleman Report, which deals with equality of educational opportunity (Alsop and Mood, 1967) and strives to explain the minority problem in education, relates to

the military-dependent student who often will find himself doubly categorized in a school. If he is a Negro and a military-dependent in a school with a small percentage of both minority categories, he finds himself apart from the student mainstream with a dual defense problem. As the report found socio-economic factors bear a strong relation to academic achievement, the difference between schools accounted for a small fraction of difference in pupil achievement. Alsop and Mood said:

> "Analysis indicates however, that children from a given family background, when put in schools of different social composition will achieve at quite different levels."

All overseas military-dependent students are required to study a foreign language while residing in a foreign country. Garraty, Adams and Taylor (1969) state in their study abroad guide that:

> "For serious language students an academic year of supervised study abroad provides an unparalleled opportunity for attaining fluency in the foreign language. A period of study abroad can develop a young student's maturity and self-confidence."

Students of a non-mobile society who study foreign languages do not receive the same opportunity in foreign language usage as their overseas military-dependent fellow students.

A proponent for equalizing grade-point values was Dr. V. L. Sternitzke, (1970) senior psychologist at the Fairview State Hospital, California. In an article prepared for the CPGA Journal he proposed a system which would automatically assign a proper numerical value to

each grade assigned, regardless of the grading practices. By use of the "grade-point value calculator" (scaled percentiles of 0 - 99% on the sides and a GPA scale in the middle of the indicator ranging from 4.4 - 0.0) he stated that the use of such a system would be to encourage, without forcing, departments and individual professors to assign more meaningful grades and thereby bring their distributions to the expected values of A=4, etc.

No mention is made concerning differential values according to the difficulty or prestige of various subjects. To do this would involve a great deal of subjectivity with respect to a variety of interests, attitudes, and values. "According to principles of American Education," says Sternitzke, "if we accept agriculture into the curriculum it must be accepted as equal with mathematics."

An article written by the Research Division of the National Education Association entitled "Marking and Reporting Pupil Progress" in Today's Education (November, 1970) stated that when teachers were asked, "What method do you use to report student progress to parents?", 71.6% of the respondents said they used A-F grades. The percentage using classified letter scales on report cards are higher among secondary than elementary teachers. Further indication was given that parents tend to prefer whatever type of reporting system the school is currently using and that they often have unwarranted confidence in the precision with which grades can indicate students' ability or

foretell his future success.

The measure of success, academically, has been and still is reported in many educational institutions in three ways. 1) Grade-Point Averages, 2) Class Ranks, 3) Tests that measure achievement, aptitudes, and intelligence. The second measure, class rank, is slowly losing its value in society. An article entitled "Revolt in the Ranks: Opposition to Class Ranking" appeared in Newsweek (April 17, 1967) reporting that 500 students at Columbia University had enacted a silent vigil of protest over the issuing of class ranks to draft boards. It had been the practice to release names of freshmen in the bottom one-half of their class; the lowest one-third of the sophomore class; the lowest quartile of juniors, thus making them all "draftable". The Trustees of Columbia University abolished rankings (to avoid intrusion into the political arena) in support of some 70 faculty members and administrators who had voted to withhold ranks. Many academicians believe that rankings are unreliable indicators of students' performances. Russell N. Fairbanks, associate dean of the Columbia Law School said, "What the hell, there's not that much difference whether a man is 50th or 150th in his class, there's maybe one-tenth of a point of separation."

A shift in ways of evaluating students is occurring within education. The grade-point average remains, for the present, apparently one of the best indicators of achievement. Robert A. Feldmess (1971) in an address be-

fore the 55th Association Meeting of the American Educators Research Association in New York, said, "Grades provide students an evaluation of their general performance and help them to decide whether to continue. Grades can be motivators to achievements". With regard to anxiety and grades he stated, "The excessive anxiety that grades may arouse can be countered by limitations on the uses made by the grade record. The issue over whether grades are valid measures of academic performance can be dealt with by giving faculty members training in making education evaluations."

Today, the high school graduate's future success is measured very much on scholastic achievement. His grade-point average, class rank and college admissions test scores are often the only criteria used for entrance into temples of higher learning. Most college admissions officers indicate that if they had no college aptitude test measurement to go by, they could judge an applicant's suitability and possible acceptance solely on the high school academic record. The grade-point average, based on actual achievement, is still the most accepted measure that makes the difference in being accepted or rejected by the college of one's choice.

The Overseas Military-Dependent Student: His Mobile Life; Family; Overseas Schools; Influences; Achievement

Mobility is a way of life for the career military man and his family. Prior to 1945, overseas assignments were lonely for married military men. With the need of

occupation armies in Japan and Europe in the era of post World War II, came the decision to include families in the dependent overseas program. Assignments might be for one year or four, and it was believed that the American family placed in the midst of a European culture would be a showcase for the democratic way. With this decision came the need for all kinds of dependent support -- schools, teachers, supplies, housing, PX's, commissaries, gas stations, school buses, playgrounds, football fields -- all, to exemplify the American way of life to the subdued.

The military family seems ever prepared to move. It is no shock when the father announces, "I'm getting new orders in 30 days, and we're going to Ramstein, Germany." They know that provisions have been made for their arrival, housing, schooling, and welfare while ensconced in their new European assignment. What kind of parents do children of the military respond to? How might their attitudes differ from children whose parents remain members of the non-mobile society?

Crews and Teahan (1957) studied parental attitudes and academic achievement to decipher differences of permissiveness and authoritarian restrictive home rules. Their findings were that mothers of high achievers were more authoritarian and restrictive than were mothers of low achievers. They found that parents of high achievers seemed to have more punitive attitudes with respect to child rearing.

Tarasuk (1970) conducted a study of the perceptions

of frequently and infrequently counseled senior students in five overseas high schools for military-dependents. The study, conducted in Western Germany, involved seniors with three or more counseling sessions in eight months as compared to students with less than two sessions. A "significant environmental press" was identified for the more frequently counseled student in each of the five high schools.

A military family may move many times within the United States, but once assigned to overseas duty, the assignment is permanent until re-assignment back to the United States. It would be most rare and costly to the government, to change a man's duty station (and as a result the child's school) once his family joins him overseas.

Jean Laird (1971) writing in the Liguorian, "Will Your Child Fail in School?", quotes Professor Stanley Coopersmith of the University of California, Davis: "A child's attitudes toward himself are formed within the home. As his parents see him or as he thinks they see him, so he tends to see himself." And one particular case study of an individual, Cynthia, by Bossard and Sanger (1949) revealed that residence changes caused marked increase in verbalization.

The mobile child is faced with new adjustments periodically in his lifetime of education and accepts the need to adjust rapidly. Often, in the case of the overseas military-dependent student, a child's attitude toward parents is governed by strict discipline measures for which

both parent and child are held accountable together, to command authority. A military parent may be reprimanded by a superior officer for a rule's infraction, and the military-dependent student may also be reprimanded by a school official. Often the errors in conduct of the student become a reflection of the father's "service record", and consequently, the family demands strict adherence and obedience to rules and regulations in school, as well as on the military base.

"Dependent schools are small portions of America transplanted in a foreign country", says Pope (1955), and while serving as Chief of the Dependent School section he noted that many a dependent student averages over two schools a year in the United States, and that one-third of their classroom days are spent outside of the United States in an overseas dependent school. The high school curriculum is mostly college-preparatory due to a lack of space and materials to provide a more comprehensive high school setting.

An article entitled "How Good are Dependent Schools?" in the Army, Navy, Air Force Journal Register, (June 16, 1962) quotes Assistant Secretary of Defense Runge as saying, "NEA and OEA officials tend to minimize the accomplishments and exaggerate the shortcomings of the dependent's education program." The article cites the problems that the schools have faced with regard to transportation, supply, staffing, services, and wages paid teachers, as well as a

myriad of consistent problems to be found in any educational setting.

Caldwell (1965) states that there are increasing resources to support experimental approaches to a curriculum which will more effectively introduce Americans to all of mankind. His "polycultural approach" to education is a direction that many colleges and universities of the United States have taken in recent years. The "third year" study program in Europe is now a definite part of a four year plan offered by many stateside campuses. Even though faculties may be transported, and local teachers hired to teach English speaking students, they know that the environmental influences of the cultures play a major role in shaping the education and academic achievement of the man of liberal arts and sciences.

Mobility and its effect on student achievement was studied by Burget (1965) who compared five groups: 1) semi-mobile military, 2) mobile-military, 3) semi-mobile civilian, 4) mobile civilian and 5) permanent civilians. Using the Iowa Tests of Educational Development scores, he found that children of military parents performed at a significantly higher rate than did their civilian counterparts on the general vocabulary and composite test scores.

Samson (1968) in the Chicopee, Massachusetts school system made a study of relationships of student mobility to achievement, study methods and attitudes of tenth grade students, of which the seventh group was comprised of stu-

dents with overseas school attendance, but he found no significant differences.

Between 1963 and 1965 in the school system located near Fort Lee, Virginia, Partin (1967) conducted a survey study of 262 students who had frequent school changes because of a military (army) parent with a matched control group of students that had not experienced school changes because of non-mobile parents. The two groups were matched for the following criteria: chronological age, intelligence quotient, sex, same grade level, same school, and at the fourth grade level, same classroom teachers. All subjects in the study were selected from the fourth, ninth and eleventh grades. For this investigation, Partin's findings at the ninth and eleventh grades were considered important. Instruments of the survey study were School and College Ability Tests, Sequential Tests of Educational Progress, Lorge-Thorndike Intelligence Tests, and SRA Achievement Series. The statistical design applied $\underline{t}$ tests to all data for comparisons at or above the .05 level of significance. The analysis determined that no significant difference existed in grade-point averages of the two groups, except in the case of males at the ninth grade level. In this case, the difference favored the males from non-mobile families. Significance was found in citizenship grades between males and females in the two groups at the eleventh grade level and males in the two groups at the ninth grade level. The difference was in

favor of the students from the non-mobile civilian families. Since some significant differences were found, Partin suggested further research to determine whether the difference is peculiar to the military as a group.

A study was made in Connecticut by Pepin (1966) which included military-dependent students (navy). Three groups were formed: 1) Students whose parents were in the military service and who had a minimum of three changes of domiciles within the past nine years. Changes included that of school environment. 2) Students whose parents were not associated with the military but were employed in civilian occupations and who had a minimum of three changes of domiciles within the past nine years, including school environmental change. 3) Students whose parents were not associated with the military and were employed in civilian occupations and who had fewer than three changes of domiciles within the past nine years. Among the measurements used to test significant variances was grade-point average. The method of analysis of all data treated at once in the program was a general null hypothesis of no difference among the means of the various groups tested. For the purpose of the study Pepin was to reject the null hypothesis at the five percent level of significance. A rejection was made for group one in the measurement of the effects of mobility upon achievement in mathematics. The military group had higher achievement and aptitude means than the groups with which they were compared. The third analysis of variance conducted, (grade-point average), found

significance at the .05 level of confidence and the null hypothesis was rejected. The compilation of grade-point averages was extracted from the two high schools' permanent record cards at the completion of the academic year's work. Pepin recommended that educators conduct within their own school systems more detailed testing and evaluation of mobile students in order that curriculum practices may be better adapted to their needs. For further research Pepin suggested that the present study be repeated using different population levels and measurement instruments and in a similar community elsewhere in the United States.

Farner (1961) studied the affect of frequent school change on the achievement of military-dependent students in Japan during the school year 1955-56. The population of his study group was 600 students in grades three through six in Yoyogi and Narimasu-Tokyo American Schools.

The data for Farner's study was: Variable X = number of schools per grade for each student. Variable Y = Stanford Achievement Test scores in about six subject areas: language usage, spelling, arithmetic, comprehension, etc. The statistical method was the Pearson product moment correlations, grade-by-grade. A matrix of about 24 coefficients was produced - six measures on students in four grades.

The findings of Farner's research were that all of the 24 coefficients were positive and about 10 were significant at either the five or ten percent level of confidence.

Farner stated in a letter to this investigator:

> These are interesting findings because most people believe frequency of school change is negatively related to achievement while quite the opposite is true for overseas military-dependent students. I emphasize the last three words because I don't believe these findings would apply to children of migrating farm laborers.

Cleveland (1960) has said that the United States Air Force runs the largest single school system in the world. Raising children abroad depends on a happy home, and this is most important to the overseas American. He states that the child does not have much to do outside of the home, and falls heavily back on the home for his direction. Parents, therefore, really have more responsibilities, overseas than in the states. Cleveland's Carnegie project of 1956 also stated that, "Anyone will tell you that work and life abroad are a liberal education."

Summary

The review of the literature for this investigation was most disheartening to the investigator.

In a quest for knowledge of what mobility is and what effect it may have on the achievement of students the earliest mobility studies of migrant workers' children shed very little light on the consequences of their mobility. The Chicago studies of socio-economic levels of students confronted by mobility merely exposed the problem and action taken to remediate the problem, but did not attempt to show any gains or losses in achievement as a result.

The contemporary studies dealing with mobility were more concerned with students in general, but not specifically with geographic mobility, such as the overseas military-dependent student experiences.

Where categories of achievement were investigated, studies revealed attitudes and traits which influence achievement and are described as parental-influenced (behavioristic), teacher-influenced (attitude influences achievement) and major indices of achievement as being grade-point averages, class ranks, and scores on standardized tests measuring intelligence, achievement, and aptitudes.

The manner in which parents regard children, and the image that children feel parents hold of them appeared to be a strong influence and applies to the intent of this study. For the overseas military-dependent student it implies a home that is managed in a military style, with a father responsible to commanders for his actions and the actions of his children. This is in decided contrast to the non-mobile student home, where quite often the parents are absent, and discipline is not a motivator toward greater achievement.

Studies that were found that included the military-dependent student did not consider overseas mobility and the influences of study in a different culture as part of the investigation.

The questions that the investigator hoped the review of the literature would answer were: Has the mobility

of the overseas military-dependent student since 1945 proven that he achieves in school better than his peers because he has had to make more adjustments? Does the saying, "A rolling stone gathers no moss" apply to the concept that mobility deters achievement because of multiple changes? Does the belief, "Travel is educational and broadening in itself" apply when revealed in the academic accomplishment of overseas military-dependent students after they have completed four years of secondary education which included overseas mobility?

Plath's socio-economic study and findings in which there was academic gain in transfers of the middle socio-economic level group relates well to the socio-economic level of the military family. DeSena found that grade-point average was most reliable for students over a three term period (the average stay of overseas military-dependents) and relates very much to self-discipline and self-direction, traits often found in students from military families. Tarasuk's perception studies in overseas dependent schools confirmed that "environmental press" exists in each of the five school populations studied. Pepin's investigation included dependent students of navy personnel and indicated that these students had higher achievement and aptitude means at specific age levels. Farner's study, in Japan, of the elementary level military-dependent found frequency of school change not negatively related to achievement.

This investigator has been an educator for military-

dependent students here, in Europe, and on Guam. He has seen, first-hand, many of the schools these students attend and has served in a few of them as teacher, counselor, and administrator. These overseas military-dependent students have comparable motivational drives which military life influences, but the question unanswered in the literature is: Does military life account for greater achievement when compared to the achievement of a non-mobile society of secondary school students with whom they graduate?

Mobility of military people increases the number of social contacts, but this heightens the despair of isolationism when the need to move occurs again. Motivation must have values to germinate more motivation and behavior is intrinsic to motives.

Throughout the review of the literature there has been no study that is of the same intent as this investigation and it is therefore determined to be a new contribution to the field.

CHAPTER III

DESIGN OF THE INVESTIGATION AND EXPERIMENTAL PROCEDURES

Sample and Population

The investigation was carried out during the 1971-1972 school year in the Novato High School.

Novato, California is situated thirty miles north of the Golden Gate Bridge, which connects Marin County and the City of San Francisco. United States Highway # 101 bisects the land area of the population. The community is graced by hills to the north and west. The people of Novato, for the most part, earn their livelihood in the Greater Bay Area, not Novato. In many families, both parents work. The community, with a population of 30,000, is sometimes referred to by realtors as "A bedroom community serving commuters employed in San Francisco".

Incorporated into Novato's population are the citizens of Hamilton Air Force Base. The location of this base is east of Highway # 101 and in Air Force jargon is often referred to as a "plush" or "good assignment", probably because of its grounds, living quarters, proximity to San Francisco, good weather found in Marin County, and because of the good schools of the Novato Unified School District. It is often the "last permanent assignment" for officers and airmen before retirement from active duty.

The Novato Unified School District has 18 schools. Two of these schools are senior high schools (grades 10-12)

with an additional third building which serves as a continuation high school, limited to 35 students, on the average.

The feeder schools for senior high education are three junior high schools (grades 7-9) and twelve elementary schools (grades K-6). Two of the elementary schools are located on Hamilton Air Force Base proper. The school district serves the needs of both the civilian and the military population.

Dependent students quartered on base attending primary and elementary grades are enrolled in Hamilton or Meadow Park Elementary schools. An exception to this is the students whose families are quartered in small bungalow complexes one mile outside the base, referred to as Rafael Village. These students attend the Pacheco Elementary School.

Junior high school students of the two military housing areas are enrolled mainly in San Jose Junior High School. The senior high school students are transported to the Novato High School, in which the investigator is one of four counselors to some of these overseas military-dependent students.

The feeder system is: Hamilton, Meadow Park, Pacheco Elementary Schools, to San Jose Junior high School and the Novato High School.

Novato High School graduated its first class in 1959. In the school year of 1968-69 a second high school was opened and named the San Marin High School, for the locale

it serves, and graduated its first class in 1970. The approximate present enrollment of the two schools is: the Novato High School, 1,432 pupils; the San Marin High School, 930.

The Novato High School enjoys the greatest amount of enrollment change because of the mobility factor of the Air Force dependent students it serves. The military-dependent students are approximately 15-20% of the student body for grades 10-12.

The Problem

The investigator, presently employed in a school that serves military-dependent students, became curious as to the effect of mobility on achievement and the amount of displacement for the stable student group in final class rank, because of grade-point averages earned by the mobile group in overseas dependent schools.

It was understood by many educators that traveling is broadening, educational, and maturing for students, and the investigator wanted to know what bearing the grades earned in overseas semesters of study by dependent students had on their grade-point averages and final class rank when these averages were intermingled with the non-mobile group with whom they graduated.

Rationale for the Design of the Study

The procedures used in the investigation are presented as they related to the following: identification of the population, description of and basis for selecting

the study sample, data used in identifying and comparing groups, and procedures for analysis of the data.

Population Studied

To gather the data needed for the investigation it was decided that the population surveyed would be that of the five graduation classes of the Novato High School in the years covering 1966-1970.

Formation of Groups

It was decided to form two groups for the comparison investigation. Group A would be identified as only those military-dependent students who had studied overseas, and Group B would be the non-military students, non-mobile stable group selected by random sampling from the same graduation class.

The procedure was to recall, examine, and study the permanent record cards of graduated students in the five classes of 1966 through 1970.

The criterion for selection of Group A (military-dependent students) was to identify only those dependent students who had at least one semester of study in grades 9 through 12 in one overseas dependent school.

Exclusions from the first group formed (Group A) would be all military-dependent students who, from the records indicated student mobility with attendance in stateside schools (grades 9-12) but did not reveal that they had studied in an overseas dependent school as a result of their parent's military assignment. The exclusions limited the number that were found, as each graduating class had

only 15-20% identifiable as military-dependents, and of this small grouping, only 8 to 30 met the criterion for selection; overseas mobility. All of the students meeting the criterion (99) were used.

The comparative study group formed, Group B (non-military) were randomly chosen from within the same graduating classes as those of Group A (military-dependents). A table of random numbers (Popham, 1967) was used to indicate which graduates, within the range of the class size, should be used for the comparison group formation. No biases were used in the formation of either group. The smallest number of overseas mobility students found, within a graduating class, was eight graduates of the class of 1966. The largest number of these students found within a graduating class was 30 graduates in the class of 1969.

An example of the number derived at for study of students from the class of 1966 is explained as follows:

Total class size and records read	363
Number of all military-dependents (15-20%)	68
Number of military dependents meeting overseas study criterion	8

The table of random numbers indicated which numbers within the class range of 363 to select as Group B (non-military) participants. Two additional numbers were chosen in the event that one of the random numbers chosen (within the class studied) might be a duplication of the graduate included in Group A (military-dependents). In only two

instances in forming the groups from each class was it necessary to use the additional random number.

Table IV of the appendix includes all participants of the investigation.

Derivation of Data for Formation of Groups

Table 1A indicates the total number of graduated students studied, by class year, including military-dependents who comprise approximately 10 to 20 percent of each class. Of this small percentage only ten percent or less met the criterion of overseas mobility.

TABLE 1A

Military vs Non-Military Students

Formation of Groups

Class Year	Students Graduated	Study Group A	Study Group B
1966	363	08	08
1967	383	16	16
1968	451	19	19
1969	598*	30	30
1970	378	26	26
Total Population Studied	2,173	99 +	99 = 198

* Last Novato High School graduating class before the San Marin High School began its own graduation.

There are certain assumptions which apply to the sample population, treatments, and instruments used.

Assumptions

1. Personal characteristics not assessed in this investigation, which could conceivably influence criterion scores, are normally and randomly distributed among students in the two groups.
2. That the students in each of the two groups are in fact random samples in time of all students who have attended and will attend this school.

Instrumentation

Permanent record cards of all graduates are secured in files of the counseling office of the Novato High School. The most recent class records for a graduation year are held in their original form for one year in upright files. All previous classes have their records, including the permanent record card, photographed on Recordak. This annual task is accomplished by one of the secretaries in the counseling office who has the added title of Registrar. The Recordak reels of permanent record are secured in the safe of the school, and reels are identified by number and contents (graduating class year, alphabetical inclusions).

It was necessary for this investigation, begun in 1971, to examine the records of the total population of five graduating classes, 2,173 student permanent records. The examination of the records was to identify all military-dependent students and isolate those students' records which met the criterion for inclusion in Group A (military) as was described in the section, Formation of Groups.

Upon examination of each record, using the Recordak Viewer, identity was made of overseas military-dependent students by the school attended, from a heading which appears at the beginning of each grade year (9-12). For Group A (military) such headings as these were found: Heidelberg American High School; Paris American High School; Yamato Dependents High School, and in some few instances, only American Postal Office (New York) or Fleet Post Office (San Francisco) was identifiable as an overseas school. In all findings the overseas dependent students had studied in only one overseas school during their parent's tour of duty abroad. Examples of school records (permanent record card) studied, are included in the appendix.

Once Group A (military) had been identified and numbered within each class, random sampling for the same number of students was employed to make the choices of students to be studied from members of the same class for the comparison Group B (non-military) students.

The following information was extracted and recorded from each permanent record in order to establish variables to be used in the investigation. Table 1B, Military vs Non-Military Students, Variables Recorded, illustrates the establishment of variables derived from data in the permanent records.

TABLE 1B

Military vs Non-Military Students

Variables Recorded

Variable Number	Variable Name
1	Class Year
2	Sex
3	Grade-Point Average
4	Area of Overseas Studies
5	Number of Semesters Overseas

Variables 4 and 5 (Area of Overseas Studies and Number of Semesters Overseas) were used for correlation studies within the military, only.

Investigation of the records did not reveal any consistent reports of intelligence, aptitude, or achievement tests for both groups.

The investigator relied upon the unbiased random selection of students, in the study, to determine if a close balance in the distribution by sex would result within each group to allow for testing by sex between the two groups. Table 2, Military vs Non-Military, Groups by Sex, indicates study participants by gender.

TABLE 2

Military vs Non-Military

Groups by Sex

Class Year	Group A Military-Dependents		Group B Non-Military	
	Males	Females	Males	Females
1966	02	06	04	04
1967	11	05	07	09
1968	10	09	09	10
1969	14	16	14	16
1970	17	09	13	13
Group Totals Sex	54	45	47	52
Group Totals	N = 99		N = 99	N = 198

It was noted in Table 2, Military vs Non-Military, Groups by Sex, that employing the random sampling technique did not present any unusual imbalance of sexes by class, or for the total group (N = 198). Comparisons for the class of 1969 were exactly the same; class of 1968 being reversed of numbers of sexes; class of 1970 having the same distribution by sex within Group B (non-military).

Method of the investigation necessitated dividing the variable number 4 (Area of Overseas Study) into two categories and assigning geographically the appropriate area, accordingly: 1) Europe, 2) Pacific.

Table 3, Military vs Non-Military, Area of Overseas Study, indicates where the Group A (military) students

studied, and how the category for each was determined.

TABLE 3

Military vs Non-Military, Students

Area of Overseas Study

Area of Study	Student Numbers	Category Given	
		(1) Europe	(2) Pacific
Pacific	25		25
Germany	22	22	
Japan	20		20
France	10	10	
Spain/Portugal	07	07	
Europe (General)	04	04	
Guam/Philippines	03		03
Alaska/Labrador	03	03	
Ecuador/Panama South Africa Norway/England	05	05	
Total Numbers	99	51	48
Totals	N = 99	N = 99	

It was noted that almost an equal distribution existed for the variable 4 (Area of Overseas Study) between the two categories assigned, 1) Europe and 2) Pacific.

Value of the Investigation

Because the Novato High School is situated in an impacted area which contains a military defense air base, the curiosity of the investigator was aroused to deter-

military-dependent students brought to the high school resulted in higher grade-point averages than that group of students who had not experienced any mobility for the same four years.

Did the added advantage to mobility of being in another culture, within Europe or the Pacific, as a student afford opportunities to achieve more? Assuming that course work attempts were similar between the two groups of students, did the overseas military-dependent student studying such course work as art, language, geography, history and international relations excel higher when grade-points were averaged?

Although it was assumed that there was no significant difference between Group A (military-dependent) and Group B (non-military) students' mean grade-point averages; it was decided to test the acquired data according to an established method of educational research for statistical analysis of the null hypothesis.

Hypotheses to be Tested

Statistical hypotheses derived from main effects associated with the design of the investigation included the following:

1. There is no significant difference in mean grade-point averages of Group A (military-dependent) and Group B (non-military students).
2. There is no significant difference in the mean grade-point average achievement between the

military-dependent males and non-military males.

3. There is no significant difference in the mean grade-point average achievement between the military-dependent females and non-military females.

4. There is no significant relationship, within the military, as to the area in which students studied, Europe or the Pacific and any other variable, particularly grade-point average.

5. There is no significant relationship, within the military, between number of semesters overseas and any other variable, particularly grade-point average.

Plan for Data Analysis

It was decided by the investigator to transpose the gathered data to IBM cards for the purpose of the statistical analysis by computer.

The design of the cards was for testing variables previously stated: 1) Class Year, 2) Sex, 3) Grade-Point Average, 4) Area of Overseas Study, 5) Number of Semesters Overseas. This information was transcribed to 99 IBM cards with the student's identity number within the group for those of Group A (military-dependents).

For Goup B (non-military) students, the identification of variables was the same for 99 IBM cards with the exception of the variables 4 and 5 (Area of Overseas Study

and Number of Semesters Overseas) which did not exist for this group.

Table 4, Military vs Non-Military, Students, Groups and Variables, is an item by item reproduction of IBM card information for each of the 198 students in the investigation, by group, with the applicable variables shown. This table is included in the appendix.

Tests Used in the Analysis

The resources of the University of California, Berkeley, Computer Center, were employed for the tests to be performed.

The G4 CAL T TEST (McNemar, 1962) was used on the CDC 6400 computer to perform the following task:

It compared two independent groups of individuals on each of a set of variables by means of the t statistic.

The correlation tests performed were two-tailed t tests on the quantity

$$r_{ij} \sqrt{\frac{N-2}{1-r_{ij}^2}}$$ with N-2 degrees of freedom.

The G4 CAL T TEST analysis basic formula is given in the appendix.

CHAPTER IV

FINDINGS OF THE INVESTIGATION

Introduction

The presentation of results has been organized into three sets of tables, each set representing the findings for the null hypothesis tested.

The first set of tables, numbered 5 through 7, was the overall comparison of Group A (military-dependents) and Group B (non-military) students.

The second set of tables, numbered 8 through 10 was the within males comparison of Group A (military-dependent) and Group B (non-military) students.

The third set of tables, numbered 11 through 13, was the within females comparison of Group A (military-dependent) and Group B (non-military) students.

Two additional tables, numbered 14 and 15, show the correlations within the military-dependents only.

This investigation did not intend to investigate the mean grade-point average difference between male and female, and concerned itself with the prime purpose of seeking differences between military-dependents and non-military students, only. In the case of sex making a difference, to that difference the investigator studied "that" difference within the sex.

For the analysis G4 CAL T TEST (McNemar) required a matrix of the observed values of each variable for each

subject and two lists which singled out the subjects in each group by their indices in the matrix. A list of selected variables may also be given if the analysis is not wanted for all variables in the matrix.

The primary output printed for each variable is the t-ratio, its degrees of freedom, the significance level, if any, of the t-ratio, and the mean, standard deviation and effective sample size for each group of subjects. The two-tailed t tests were used for the data submitted in the investigation and the degree of freedom for significance at the .05 level of confidence was 1.980. The basic formula, as stated in Chapter III, is given in the appendix area of the investigation.

TABLE 5

Military vs Non-Military, Overall

Grade-Point Averages

t tests	Group A Military-Dependents N = 99	Group B Non-Military N = 99
Mean	2.5408	2.3365
Standard Deviation	.5744	.6493
Variable 3 Grade-Point Average *	T-Ratio = 2.3453	df = 196

* Significant at the .05 level

Findings Associated With Overall Grade-Point Averages

There were significant findings at the .05 level of confidence when Group A (military-dependents) and Group B (non-military) were compared for grade-point averages. Table 5, Grade-Point Averages, Overall shows that the mean for Group A (military-dependents) was 2.5408 and the mean of Group B(non-military) was 2.3365. The standard deviation for Group A (military-dependents) was .5744 and for Group B (non-Military) was .6493. The T-Ratio was 2.3453 with the degrees of freedom at 196.

The null hypothesis No. 1: There is no significant difference in mean grade-point averages of Group A (military-dependents) and Group B (non-military), was rejected.

TABLE 6

Military vs Non-Military, Overall

Total Means

Variable 3 Grade-Point Average	
Mean	2.439
Standard Deviation	.618

Findings Associated With Overall Total Means

Table 6, Military vs Non-Military, Overall, Total Means, reports the means and standard deviation for variable three, grade-point average. The mean for variable 3, grade-point average, is 2.439 and standard deviation is 618.

TABLE 7

Military vs Non-Military, Overall

Total Correlations

	1	2	3
1		-.056	-.063
2			.118
3			

Key

Variable 1 = Class Year

Variable 2 = Sex

Variable 3 = Grade-Point Average

Findings Associated With Overall Total Correlations

Table 7, Military vs Non-Military, Overall, Total Correlations, indicates the correlations found between the variable of grade-point average (variable 3) and the two variables of sex and class year with no significant relationships found.

TABLE 8

Military vs Non-Military, Within Males

Grade-Point Averages

t tests	Group A Military-Dependents Males N = 54	Group B Non-Military Males N = 47
Mean	2.4957	2.2200
Standard Deviation	.5824	.6482
Variable 3 Grade Point Average*	T-Ratio = 2.2519	df = 99

* Significant at the .05 level

Findings Associated Within Males Grade-Point Averages

The t tests of Table 8, Grade-Point Averages, Within Males, illustrates that Group A (military-dependents, males, had a mean of 2.4957 and a standard deviation of .5824 on grade-point averages. Group B (non-military) males had a mean of 2.2200 and a standard deviation of .6482. With the degrees of freedom at 99 the T-Ratio of Variable 3 (grade-point average), was 2.2519. These findings were significant at the .05 level of confidence.

The null hypothesis No. 2: There is no significant difference in mean grade point average achievement between the military-dependent males and non-military males was rejected.

TABLE 9

Military vs Non-Military, Within Males

Total Means

	Variable 3 Grade-Point Average
Mean	2.367
Standard Deviation	.623

Findings Associated Within Males Total Means

Total Means and Standard Deviations for Variable 3 (grade-point average) are shown in Table 9, Military vs Non-Military, Within Males, Total Means.

The Mean Grade-Point Average was 2.367 and the Standard Deviation was .623.

TABLE 10

Military vs Non-Military, Within Males
Total Correlations

	1	2	3
1		NA	-.053
2			NA
3			

Key

Variable 1 = Class Year
Variable 2 = Sex
Variable 3 = Grade-Point Average
NA = Not Applicable

Findings Associated Within Males Total Correlations

Table 10, Military vs Non-Military, Within Males, Total Correlations, indicates the correlations found between the two variables of grade-point average (Variable 3) and class year (Variable 1). There was no significant relationship to be found in this correlation.

TABLE 11

Military vs Non-Military, Within Females
Grade-Point Averages

t tests	Group A Military-Dependents Females N = 45	Group B Non-Military Females N = 52
Mean	2.5949	2.4417
Standard Deviation	.5665	.6382

Variable 3
Grade Point Average ** T-Ratio = 1.2412 df - 95

** Not significant at the .05 level

Findings Associated Within Females Grade-Point Averages

The Group A (Military-Dependent) females was comprised of 45 in number. Group B (Non-Military) females numbered 52. In the t tests between the groups, Table 11, Military vs Non-Military, Within Females, Grade-Point Averages, no significant difference was found at the .05 level. The mean for Variable 3 (grade-point average) of Group A (military-dependent females) was 2.5949 and the standard deviation was .5665. Group B (non-military females) mean was 2.4417 with a standard deviation of .6382. The T-Ratio was 1.2412 at 95 degrees of freedom.

As the findings were not significant at the .05 level of confidence, the null hypothesis No. 3: There is no significant difference in mean grade-point average achievement between the military-dependent females and the non-military females was accepted.

TABLE 12

Military vs Non-Military, Within Females

Total Means

	Variable 3 Grade-Point Average
Mean	2.513
Standard Deviation	.605

Findings Associated Within Females Total Means

Total Means and Standard Deviations for Variable 3 (grade-point average) are shown in Table 12. Military vs

Non-Military, Within Females, Total Means.

The Mean Grade-Point Average was 2.513 and the Standard Deviation .605.

TABLE 13

Military vs Non-Military, Within Females

Total Correlations

	1	2	3
1		NA	-.061
2			NA
3			

Key

Variable 1 = Class Year
Variable 2 = Sex
Variable 3 = Grade-Point Average
NA = Not Applicable

Findings Associated Within Females Total Correlations

Table 13, Military vs Non-Military, Within Females, Total Correlations, indicates the correlations found between the two variables of Grade-Point Average (Variable 3) and Class Year (Variable 1). There was no significant relationship to be found.

TABLE 14

Correlations, Within Military

Means and Standard Deviations

	No. 3 Grade-Point Average	No. 4 Area of Studies	No. 5 Semesters Overseas
Mean	2.541	1.495	3.737
Standard Deviation	.572	.500	1.425

Findings Associated Within Military
Means and Standard Deviations

Table 14, Correlations, Within Military, Means and Standard Deviations, summarizes the means and standard deviations for Group A (military-dependents) of three variables: grade-point average (Variable 3), area of study (Variable 4), and semesters overseas (Variable 5).

There was no significant relationship found in the area in which a student studied (Variable 4) and any other variable studied, particularly grade-point average (Variable 3).

There was no significant relationship found in the mean number of semesters spent in overseas schools (Variable 5) and any other variable studied particularly grade-point average (Variable 3).

TABLE 15

Correlations, Within Military
Matrix

1	2	3	4	5
1	-.092	-.157	-.028	.080
2		.086	.070	-.145
3			.173	-.037
4				.225
5				

Tested at the .05 level with 97 degrees of freedom

Key

Variable 1 = Class Year Variable 2 = Sex

Variable 3 = Grade-Point Average Variable 4 = Area of Study

Variable 5 = Semesters Overseas

Findings Associated Within Military Correlations Matrix

Table 15 Correlations Within Military, Matrix, illustrates the findings between all variables, within the military-dependent group, only.

The relationship between area of study (Variable 4) and grade-point average (Variable 3) is equal to zero and the investigator accepted the null hypothesis No. 4: There is no significant relationship between area of study (Variable 4) and any other variable studied, particularly grade-point average (Variable 3).

The relationship between semesters overseas (Variable 5) and grade-point average (Variable 3) is equal to zero and the investigator accepted the null hypothesis, No. 5: There is no significant relationship between semesters overseas (Variable 5) and any other variable studied particularly grade-point average (Variable 3).

The tests performed were two-tailed t tests on the quantity

$$r_{ij}\sqrt{\frac{N-2}{1-r^2_{ij}}}$$

with N-2 degrees of freedom.

TABLE 16

Summary Table

Overall Tests			
	Group A	(Total)	Group B
Mean	2.5408	(2.439)	2.3365
SD	.5744	(.618)	.6493
Within Males			
	Group A	(Total)	Group B
Mean	2.4957	(2.367)	2.2200
SD	.5824	(.623)	.6482
Within Females			
	Group A	(Total)	Group B
Mean	2.5949	(2.513)	2.4417
SD	.5665	(.605)	.6382

	Variable	Mean	Standard Deviation
Grade-Point Average	3	2.541	.572
Area Studied	4	1.495	3.737
Semesters Overseas	5	.500	1.425

Summary

This chapter presented the statistical treatment of the data, plus the essential findings of the investigation.

The purpose of the investigation was to compare grade-point averages to ascertain whether overseas military-dependents achieved better than non-military students with whom they graduated. Only those military-dependents who had studied in one overseas dependent school for one

or more semesters of their high school years were included in the investigation.

The group with whom they were compared were non-military, non-mobile students who had resided in the same school district and attended the same high school consistently for four years. The comparative group was chosen by means of a table of random numbers within the same graduation class.

It was not the case that a greater degree of mobility (number of semesters overseas) was relevant. There was no relation to the variables.

It was not the case that the area of study (Europe or Pacific) was relevant. There was no relation to the variables.

No other variables were available, given at the same grade level, because of the mobility involved.

Two-tailed t tests were employed in the analysis of the statistics for all null hypotheses tested.

The other research concern was whether, within males and again within females, there was a difference in achievement between mobile and non-mobile groups. The tests were designed to test differences between groups but not between sexes.

As a result of the statistical analysis the following statements regarding the null-hypotheses were made:

1. There is no significant difference in mean grade-point averages of Group A (military-dependents) and

Group B (non-military) students.

Reject the null hypothesis.

2. There is no significant difference in mean grade-point average achievement between the military-dependent males and non-military males.

Reject the null hypothesis.

3. There is no significant difference in mean grade-point average achievement between the military-dependent females and the non-military females.

Accept the null hypothesis.

4. There is no significant relationship within the military, between Area of Study (Variable 4) and any other variable studied, particularly Grade-Point Average (Variable 3).

Accept the null hypothesis.

5. There is no significant relationship within the military, between Semesters Overseas (Variable 5) and any other variable studied particularly Grade-Point Average (Variable 3).

Accept the null hypothesis.

CHAPTER V

SUMMARY, IMPLICATIONS FOR EDUCATION, AND SUGGESTIONS FOR FURTHER RESEARCH

Introduction

The major purpose of this investigation was to compare grade-point averages of overseas military-dependent students with randomly selected students of a non-mobile group in the same graduating classes.

The investigation was conducted during the 1971-72 school year in the Novato High School, Novato, Marin County, California. The Novato High School is one of two senior high schools in the Novato Unified School District and the Novato High School has, for several years, been the place of high school graduation for many military-dependent students who had studied in overseas dependent schools, prior to their parent's assignment to military duty at Hamilton Air Force Base, which is located within the city limits of Novato, California.

Educators have for years been perplexed by the problem of achievement when mobility may be a deterring factor. Studies have been made with regard to the mobility of students within school districts and within the United States. The Review of the Literature, Chapter II, did not indicate to the investigator that sufficient research had been conducted to determine whether studies in a foreign land, though under the instruction of American teachers, had enhanced the process of learning because of the cul-

tural advantages, coupled with study.

In the course of the investigation a major question presented itself: Do military-dependent students achieve more in grade-point averages than non-military students with whom they are ranked in their graduating class?

Since it has been said often that travel is broadening and educational, another question presented itself: Does the number of semesters spent in an overseas dependent school contribute to the amount of achievement? Would the area in which one studied, Europe or the Pacific, hold any significance?

Does the opportunity to travel in a foreign country, study and speak the language with natives, and observe first hand the cultural heritage of the land one is living in, raise one's level of academic achievement?

The major research questions were five which served as the focus for the investigation:

1. In an <u>overall</u> comparison, do overseas military-dependent students achieve better mean grade-point averages than non-military students?
2. Is there a significant difference in the mean grade-point average between the military-dependent males and the non-military males?
3. Is there a significant difference in the mean grade-point average between the military-dependent females and the non-military females?
4. Is there a significant relationship within the mili-

tary between area of study and any other variable particularly grade-point average?

5. Is there a significant relationship within the military between semesters overseas and any other variable particularly grade-point average?

Tests Used in the Analysis

The G4 CAL T TEST was employed for analysis of all data. Three blocks of two-tailed t tests were performed for variance findings with the .05 level of confidence established as being significant for findings.

Overall tests, tests within males, tests within females, and correlation tests within military only, were made by the Computer Center of the University of California, Berkeley.

The permanent record cards, as they appeared on Recordak film, were read of all graduates in the five graduating classes of 1966-1970. Criterion for identifying military-dependent students to be used for the first group studied was that they had completed at least one semester of study in one overseas dependent school during grades 9 - 12.

In the five classes of graduates investigated, 99 student records meeting the criterion for selection were found, and the group was identified as Group A (Military-Dependent) students. Employing a table of random numbers, the comparative group of students, 99 non-military, was selected from the same five graduating classes. This latter group was identified as Group B (Non-Military) stu-

dents.

Information extracted from the records and used as variables was identified as: 1) Class Year, 2) Sex, 3) Grade-Point Average, 4) Area of Study Overseas, 5) Number of Semesters Overseas.

Summary of Major Findings

The questions proposed generated five null hypothesis tested:

1. There is no significant difference in the mean grade-point averages of Group A (Military-Dependents) and Group B (Non-Military) students.

The table in Chapter IV which contains the information pertinent to testing this hypothesis is Table 5. Significant difference was found at the .05 level of confidence and the hypothesis was rejected.

2. There is no significant difference in the mean grade-point average achievement between the military-dependent males and non-military males.

The table in Chapter IV which contains the information pertinent to testing this hypothesis is Table 8. Significant difference was found at the .05 level of confidence and the hypothesis was rejected.

3. There is no significant difference in the mean grade-point average achievement between military-dependent females and non-military females.

The table in Chapter IV which contains the information pertinent to testing this hypothesis is Table 11. There was no significant difference to be found at the .05

level of confidence and the hypothesis was accepted.

4. There is no significant relationship within the military between the area of study and any other variable studied, particularly grade-point average.

The table in Chapter IV which contains the information pertinent to testing this hypothesis is Table 15. There was no significant difference to be found at the .05 level of confidence and the hypothesis was accepted.

5. There is no significant relationship within the military between semesters overseas and any other variable studied particularly grade-point average.

The table in Chapter IV which contains the information pertinent to testing this hypothesis is Table 15. There was no significant difference to be found at the .05 level of confidence and the hypothesis was accepted.

Conclusions

In view of the findings reported in Chapter IV, the following conclusions to the major research questions asked in the investigation seem warranted for the population to which results of the investigation were intended to be generalized.

Research Question 1: There is no significant difference in the mean grade-point averages of Group A (Military-Dependents) and Group B (Non-Military) students.

It was concluded that overseas military-dependent students, who study at least one semester in one overseas dependent school, in grades 9 - 12, do attain higher grade-

point averages at the time of graduation, than those students in their graduation class who are not military-dependents and have been members of non-mobile society for the comparable four years prior to graduation.

Research Question 2: There is no significant difference in the achievement between the military-dependent males and the non-military males.

It was concluded that overseas military-dependent males, who study at least one semester in one overseas dependent school, in grades 9 - 12, do attain higher grade-point averages at the time of graduation, than those students in their graduation class who are not military-dependents and have been members of a non-mobile society for the comparable four years prior to graduation.

Research Question 3: There is no significant difference in the achievement between the military-dependent females and the non-military females.

It was concluded that overseas dependent females, who study at least one semester in one overseas dependent school, in grades 9 - 12, do not attain higher grade-point averages at the time of graduation, than those students in their graduation class who are not military-dependents and have been members of a non-mobile society for the comparable four years prior to graduation. The analysis indicated no significant difference at the .05 level of confidence between females.

Research Question 4: There is no significant re-

lationship within the military, between area of study and any other variable particularly grade-point average.

It was concluded that there is no significant relationship between the area of study and any other variable studied, particularly the variable grade-point average.

Research Question 5: There is no significant relationship within the military, between semesters overseas and any other variable studied particularly grade-point average.

It was concluded that there is no significant relationship between semesters spent overseas and any other variable studied, particularly the variable, grade-point average.

Other conclusions as a result of the investigation were:

It was not the case that a greater degree of mobility (number of semesters overseas) was relevant. There was no relation to the variables. No other variables were available, given at the same grade level, because of the mobility involved.

The investigation was a concern whether, within males, and again, within females, there was a difference in achievement between mobile and non-mobile groups. The tests were designed to test differences between groups, but not between sexes.

Limitations of the Study

It was hoped by the investigator that other achieve-

ment variables could have been included in the investigation. Due to the mobility, the permanent record cards revealed no consistency in intelligence score reporting, achievement tests of any similarity to the two groups, nor was class rank (consistent on all records) reported because of its dependency on grade-point average for its existence (relatively, the same kind of measurement).

Because of the frequency with which military-dependent students are registered into this school from overseas schools, as well as records prepared for those leaving during the school year, the investigator assumed that past graduation records would reveal a large number of students who had studied in overseas dependent schools. The population of military-dependent students fluctuates constantly, but at no time does it approximate more than 15 - 20% of the total school population. Of the military-dependent population, a lesser percentage have had transfers to this school from overseas; many records studied revealed mobility, but only within the United States.

Implications for Education

As a result of this investigation, it is the opinion of the investigator that there is a lack of mobility studies when compared with the vast amount of research literature in other areas of education. The review of the literature did not adequately relate achievement to mobility.

If, as the literature revealed, the Overseas Dependent Schools is the ninth largest school district operated

for American students, then there should be more studies regarding the greatest amount of mobility of students since 1945.

This study attempted to find whether or not overseas mobility is related to greater achievement. The conclusions of two of the five research questions indicate that it is, but not related to where it is accomplished or for how long. Individual students and entire families are more mobile today than in any other time in our history since the Westward Movement began. Although mobility for some few includes movement overseas, for many more it means moving every three or four years, either from house to better house, city to the suburbs, or state to state because of employment or transfer.

The new generation of the "moving" student must adjust to different curriculum, grading practices, and requirements for graduation. The need for some standardization of educational practices is more apparent each year; this is within the realization that the students themselves often tend to minimize their academic abilities in all curriculum divisions, and in so doing reflect an American goal of achievement without effort.

For counselors, the implication of this study is that these new "migrant students" of the "space age" are re-integrating themselves into our stateside schools armed with higher earned grade-point averages from studies in foreign countries. Their good grades may shift the posi-

tion in grade-point averages for some who have not been afforded the same opportunity of overseas learning experiences.

Implications for Research

It was stated that there is a need to know if students with overseas mobility achieve higher grade-point averages than their non-mobile counterparts with whom they graduate.

Mobility and achievement studies reported in Chapter II of this investigation seemed contradictory in their attempts to show whether mobility does affect achievement.

This investigation studied overseas mobility to determine the affect on achievement as expressed in grade-point averages and did find that significant differences existed between mobile and non-mobile groups of students at the .05 level of confidence.

The tests between groups indicated higher achievement for mobile students, in overall tests, and mobile-males achieving higher than non-mobile males.

Females within the groups studied had higher grade-point averages than males but no significant difference was found at the .05 level of confidence in the tests between the groups of females.

Similar studies should be performed which can include other variables, consistent for both groups, that measure the achievement value gain as a consequence of mobility.

A number of American corporations owning subsidiary firms in foreign lands are transporting their top executives and families to these lands for years of supervisory work. Where do the student members of these families obtain their education? If they return to graduate with a class of non-mobile students do they achieve higher grade-point averages as a result of their overseas mobility?

Citizens of the United States are somewhat like the nomads of history or migrant workers of years past, moving to an area where the living is. Today, men are transferred from coast to coast with thirty days notice. What emotional factors are involved for adolescents, achievement withstanding?

According to real estate statistics married people seldom live in the same house longer than five years. New home purchases mean uprooting children from friends, familiar school environments, and established securities found in their "old neighborhood". What significant needs are there in the education of these students in this upward, social status conscious, mobile society of today?

APPENDIX A

SAMPLE, PERMANENT RECORD CARD, GROUP A

NOVATO UNIFIED SCHOOL DISTRICT

☒ NOVATO HIGH SCHOOL — 625 ARTHUR STREET
☐ SAN MARIN HIGH SCHOOL — 15 SAN MARIN DRIVE

NAME ENGLE, STEPHEN GARY

ADDRESS 108 W. Kelly Drive, HAFB PHONE 838-4534

BIRTH DATE January 26, 1952 PLACE Merced, California

PARENT OR GUARDIAN Mr. & Mrs. Robert L. Engle

DATE OF ENTRY September 8, 1969 DATE LEFT

DATE OF GRADUATION JUN 13 1970

GRADUATION REQUIREMENTS		COUNSELOR	Eddy
ENGLISH: (2) (3) (4)		SCIENCE	COMPLETED
MODERN WORLD HISTORY	COMPLETED	MATH	COMPLETED
U.S. HISTORY	COMPLETED	FIRST AID	COMPLETED
AMERICAN GOVERNMENT	COMPLETED	DRIVER EDUCATION	COMPLETED 2/18/68
PHYSICAL EDUCATION: (2) (3) (4)		DRIVER TRAINING	

OTHER

10TH

Yamato Dependents H.S.
APO San Francisco 96323

Fall 1967

English 10 Honors	B	5
P.E. 10	C+	2.5
Algebra 2	B	5
Chemistry	B	5
French 2	B+	5
Art 2	C	5
Driver Educ	B-	1.25
		28.75

Spring 1968

English 10 Honors	B+	5
P.E. 10	B+	2.5
Algebra 2	C	5
Chemistry	B	5
French 2	B-	5
Art 2	B	5
		27.5

11TH

Yamato Dependents H.S.
APO San Francisco 96323

Fall 1968

English 3 Honors	A-	5
U.S. History	B	5
P.E. 11	C	2.5
Math Analysis	B	5
Physics	C	5
French 3	B	5
		27.5

Spring 1969

English 3 Honors	B	5
U.S. History	C	5
P.E. 11	D	2.5
Math Analysis	A	5
Physics	B	5
French 3	B	5
		27.5

12TH

NOVATO HIGH SCHOOL

65910 FALL 69	GR	CR
BOYS PE 12	P	5.0
TRIG/CAL	B	5.0
FRENCH 4	C	5.0
UTOP/SCI FICT	A	5.0
CULT ANTHRO	A	5.0
SCH SERVICE	B	5.0
23277038		30.0

65910 SPR 70	GR	CR
LIT/PHILOS	A	5.0
TRIG/CAL	C	5.0
FRENCH 4	B	5.0
AMER GOVT	B	5.0
BOYS PE 12	P	5.0
23277038		25.0

81

THIS STUDENT RANKED 102 IN A GRADUATING CLASS NUMBERING 378 WITH A GRADE POINT AVERAGE OF 2.81

DATE THIS CERTIFICATE ISSUED _____

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT.

(SIGNED) _____
PRINCIPAL

NOVATO UNIFIED SCHOOL DISTRICT
1015 SEVENTH STREET, NOVATO, CALIFORNIA 94947

NOVATO UNIFIED SCHOOL DISTRICT

☐ HILL JR. HIGH SCHOOL ☐ SAN JOSE JR. HIGH SCHOOL ☐ SINALOA JR. HIGH SCHOOL

74

NAME ENGLE, STEPHEN GARY

ADDRESS PHONE

DATE OF BIRTH January 26, 1952 PLACE Merced, California

ELEMENTARY SCHOOL ATTENDED PARENT OR GUARDIAN

DATE OF ENTRY DATE LEFT

DATE OF COMPLETION OF 8TH GRADE

JR. HIGH GRAD. REQUIREMENTS COUNSELOR

ENGLISH: 7TH GRADE, 8TH GRADE, 9TH GRADE

SCIENCE: ONE YEAR, TWO YEARS

PHYSICAL EDUCATION: 7TH, 8TH, 9TH

SOCIAL STUDIES: 7TH, 8TH, 9TH CONSTITUTION TEST

MATH: 7TH, 8TH, 9TH

7TH GRADE

8TH GRADE

9TH GRADE

Yamato Dependents High School
APO San Francisco 96323

Fall 1966		
English 9 Honors	B	5
Western Civiliz	B	5
P.E. 9	D	2.5
Geometry	B-	5
Biology	B	5
French 1	A-	5
		27.5
Spring 1967		
English 9 Honors	B	5
Western Civiliz	B	5
P.E. 9	D	2.5
Geometry	C-	5
Biology	B	5
French 1	A	5
		27.5

OTHER

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APPENDIX B

SAMPLE, PERMANENT RECORD CARD, GROUP B

Date of Birth 11-11-52 Place Great Lakes, Ill

Date Entered 9-10-64 School San Jose Intermediate

Counselor -Jr. High _____ Sr. High ROBERT EDDY

Soc. Stud. 1 2 3 4 5 6 7 8 Math 1 yr COMPLETED

P. E. 1 2 3 4 5 6 7 8 Science 1 yr COMPLETED

Driver Educ. COMPLETED 11/15/66 Driver TRAINING COMPLETED

8th Grade Constitution _____

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NOVATO HIGH SCHOOL

FALL 1966-67	GR	CR
ALGEBRA 1 B	C	5
LIFE SCIENCE	B	5
BOYS P E 1	C	5
BEG I A	B	5
GEOGRAPHY-Y	B	5
ENGLISH 1Y	D*	5
65-91 22350		*30.0

SPRING 1966-67	GR	CR
ALGEBRA 1 B	C*	5
LIFE SCIENCE	B	5
BOYS P E 1	B	5
BEG I A	B*	5
GEOGRAPHY-Y	B	5
ENGLISH 1Y	D	5
65-91 22350		*30.0

NOVATO HIGH SCHOOL

FALL 1967-68	GR	CR
GERMAN 1	D	5
BIOLOGY	C	5
GEOMETRY	B	5
ENGLISH 10Y	C	5
MOD WLD HIST	B	5
BOYS PE 10	B	5
65-91 22350		*30.0

SPRING 1967-68	GR	CR
GERMAN 1	D	5
BIOLOGY	C	5
GEOMETRY	C	5
ENGLISH 10Y	A	5
MOD WLD HIST	B	5
BOYS PE 10	A.	5
65-91 22350		*30.0

NOVATO HIGH SCHOOL

65-91C FALL 6[illegible]	GR	CR
HOMEROOM		
BOYS PE 11	A	5.0
MACH WOOD 1	C	5.0
*GERMAN 1	A	N/C
U S HISTORY	A	5.0
ENGLISH 11X	B	5.0
ACCOUNT 1	A	5.0
*Repeat		
22898108		25.0

65910 FALL 6[illegible]	GR	CR
FAMILY LIFE	A	5.0
BOYS PE 12	P	5.0
AMER GOVT	B	5.0
HIST OF CALIF	A	5.0
SCH SERVICE	B	5.0
ACCOUNT 2	C	5.0
22898108		30.0

6591C SPR 6[illegible]	GR	CR
HOMEROOM		
BOYS PE 11	A	5.0
MACH WOOD 1	B	5.0
*GERMAN 1	B	N/C
U S HIST	A	5.0
ENGLISH 11X	C	5.0
ACCOUNT 1	A	5.0
*Repeat		
22898108		25.0

65910 SPR 70	GR	CR
BOYS PE 12	P	5.0
PERS FINANCE	B	5.0
PERSONAL TYP	P	5.0
CULT ANTHRO	B	5.0
22898108		20.0

84

Date of Graduation JUN 13 1970 Rank In Class 62 Number in Class 378 Grade Point Av. 3.00 I certify that the above information is

Date and Reason for Withdrawl _____

Principal - Registrar

APPENDIX C

TABLE 4, MILITARY VS NON-MILITARY, STUDENTS, GROUPS AND VARIABLES

TABLE 4

Military vs Non-Military, Students

Groups and Variables

Group A Military						Group B Non-Military			
				Variables					
Stu I.D. No.	YEAR	SEX	G.P.A.	AREA	SEM	Stu I.D. No.	YEAR	SEX	G.P.A.
(A)	(1)	(2)	(3)	(4)	(5)	(B)	(1)	(2)	(3)

Class Year, Sample Number

Total Class Number

Studied Group
Class of 1966 N=8
Class N=363

101	66	1	2.20	1	2	101	66	2	3.28
102	66	2	3.02	1	6	102	66	2	3.15
103	66	1	2.56	1	4	103	66	1	2.49
104	66	2	2.72	2	2	104	66	1	3.31
105	66	2	2.35	1	4	105	66	2	2.05
106	66	2	3.60	1	6	106	66	1	2.83
107	66	2	3.15	2	6	107	66	2	1.97
108	66	2	2.67	2	4	108	66	1	1.34

Studied Group
Class of 1967 N=16
Class N=383

109	67	1	1.41	1	4	109	67	2	3.13
110	67	1	3.30	1	4	110	67	1	2.41
111	67	1	2.78	1	2	111	67	2	2.33
112	67	1	1.51	2	4	112	67	2	2.56
113	67	1	3.19	1	2	113	67	2	3.29
114	67	1	1.90	2	4	114	67	2	2.81
115	67	2	2.66	2	4	115	67	2	2.36
116	67	2	1.07	2	4	116	67	2	2.36
117	67	1	3.29	2	4	117	67	1	1.37
118	67	1	3.62	1	2	118	67	1	2.15
119	67	1	2.64	2	1	119	67	2	1.29
120	67	2	2.76	1	2	120	67	1	3.05
121	67	2	2.68	2	4	121	67	2	2.31
122	67	2	2.48	1	3	122	67	1	2.40
123	67	1	2.86	2	4	123	67	1	3.02
124	67	1	1.71	1	4	124	67	1	1.83

Studied Group
Class of 1968 N=19
Class N=451

125	68	1	2.96	1	4	125	68	1	1.40
126	68	2	1.95	1	4	126	68	2	1.76
127	68	2	2.68	2	4	127	68	2	1.62
128	68	2	2.17	1	4	128	68	1	2.95
129	68	1	1.71	1	4	129	68	2	1.93
130	68	1	3.62	2	2	130	68	2	1.79
131	68	1	2.45	2	4	131	68	1	1.84

Class of 1968 (Cont.)

132	68	2	2.72	2	2	132	68	2	1.64
133	68	2	2.70	1	2	133	68	1	2.32
134	68	2	2.75	2	6	134	68	2	3.46
135	68	1	2.86	1	2	135	68	1	1.16
136	68	2	1.85	2	4	136	68	2	2.83
137	68	1	3.23	2	2	137	68	2	3.50
138	68	1	2.86	2	6	138	68	2	1.47
139	68	1	2.78	1	6	139	68	1	2.30
140	68	2	2.74	2	2	140	68	1	1.47
141	68	1	1.83	2	2	141	68	1	1.61
142	68	2	2.93	2	2	142	68	1	2.76
143	68	1	2.86	1	2	143	68	2	1.71

Studied Group
Class of 1969 N=30
Class N=593

144	69	2	3.52	2	4	144	69	1	1.90
145	69	1	1.51	2	7	145	69	1	2.00
146	69	2	3.27	2	3	146	69	2	2.78
147	69	1	1.86	1	2	147	69	2	1.79
148	69	1	3.70	2	4	148	69	2	2.20
149	69	2	3.43	1	2	149	69	1	1.47
150	69	2	3.56	2	4	150	69	1	2.22
151	69	2	3.48	2	4	151	69	1	2.50
152	69	2	2.61	2	5	152	69	1	2.10
153	69	1	2.52	2	6	153	69	2	2.40
154	69	2	1.88	1	2	154	69	2	2.68
155	69	1	2.21	1	2	155	69	2	1.73
156	69	2	2.19	2	5	156	69	2	3.25

Class of 1969 (Cont.)

157	69	2	1.79	1	2	157	69	1	3.32
158	69	2	2.51	2	2	158	69	2	2.09
159	69	2	3.14	1	4	159	69	1	1.84
160	69	2	2.47	1	2	160	69	2	1.59
161	69	1	2.72	2	6	161	69	2	1.83
162	69	1	3.33	2	6	162	69	1	2.22
163	69	2	2.57	2	4	163	69	1	2.86
164	69	2	2.77	2	4	164	69	2	2.41
165	69	1	2.17	1	4	165	69	1	1.40
166	69	1	2.07	2	4	166	69	2	2.54
167	69	1	2.60	2	6	167	69	2	1.98
168	69	1	2.70	1	4	168	69	2	3.83
169	69	2	2.08	1	4	169	69	2	2.73
170	69	2	3.37	1	4	170	69	2	3.49
171	69	1	2.41	1	4	171	69	1	1.43
172	69	1	2.39	2	4	172	69	1	1.19
173	69	1	2.40	1	5	173	69	1	1.86

Studied Group
Class of 1970 N=26
Class N=378

174	70	1	1.70	1	4	174	70	1	3.31
175	70	1	2.07	1	4	175	70	2	2.96
176	70	2	2.33	1	2	176	70	1	2.14
177	70	1	2.81	2	6	177	70	1	3.82
178	70	1	2.00	1	5	178	70	1	1.59
179	70	1	2.99	1	4	179	70	2	2.46
180	70	1	1.98	2	5	180	70	1	2.89

Class of 1970 (Cont.)

181	70	2	2.89	2	2	181	70	2	3.39
182	70	2	2.68	1	2	182	70	2	3.00
183	70	1	2.55	1	2	183	70	1	2.67
184	70	2	2.81	2	2	184	70	2	2.82
185	70	1	2.17	2	2	185	70	2	2.83
186	70	1	1.65	2	5	186	70	2	2.48
187	70	1	2.75	2	6	187	70	2	2.11
188	70	2	2.18	2	6	188	70	1	2.30
189	70	1	2.73	2	4	189	70	1	2.43
190	70	2	1.82	1	6	190	70	2	2.27
191	70	2	2.00	1	2	191	70	1	1.57
192	70	1	3.00	1	4	192	70	1	2.00
193	70	2	1.56	1	4	193	70	1	2.07
194	70	1	2.81	1	4	194	70	2	1.14
195	70	2	2.21	1	2	195	70	2	2.15
196	70	1	2.30	1	4	196	70	2	2.69
197	70	1	2.13	1	3	197	70	1	2.29
198	70	1	3.29	2	6	198	70	2	2.75
199	70	1	2.11	1	5	199	70	1	2.94

Columnar Key*

A = Student Identity Number
1st = Class Year of Graduation
2nd = Sex (1=Male, 2=Female)
3rd = Grade-Point Average
4th = Overseas Area of Study (1=European, 2=Pacific)
5th = Number of Semesters Overseas
* As prepared on IBM cards

Columnar Key*

B = Student Identity Number
1st = Class Year of Graduation
2nd = Sex (1=Male, 2=Female)
3rd = Grade-Point Average

* As prepared on IBM cards

APPENDIX D

BASIC FORMULA FOR G4 CAL T TEST

T TEST Analysis

1. Basic Formulas

The formulas, logic and application of the T TEST analysis are described in McNemar 1.

Let X be the vector of observed values taken on all subjects for a variable included in the analysis. For the comparison of changes case, an observed value will be taken to mean the difference between the observed values of the paired subjects. This value is "missing" if the value of either of the paired individuals is missing.

In this section "Group A" (or simply "A") and "Group B" (or simply "B") refer to the lists specifying the indices (in the vector X) of the two groups of subjects being compared. For the correlated means case "A" and "B" are the lists of paired subjects, that is the first subject of A is paired with the first subject of B, etc. For the comparison of changes case "A" and "B" will be considered (in this section) to be the indices of the two groups, where differences between paired subjects have already been taken.

In the following, if no formula is given for Group B, it is identical to that for Group A with "A" replaced by "B".

Effective group sample size. The effective sample size is the number of non-missing observations in the group.

For independent groups,

$$n_A = \sum_{i \in A,\ x_i \neq \Omega} 1$$

For correlated means,

$$n = n_A = n_B = \sum_{x_{A_i}, x_{B_i} \neq \Omega} 1$$

Mean of group.

$$\bar{x}_A = \frac{1}{n_A} \sum_{i \in A,\ x_i \neq \Omega} x_i$$

Standard deviation of group

$$s_A = \sqrt{\frac{\sum_{i \in A,\ x_i \neq \Omega} (x_i - \bar{x}_A)^2}{n_A - 1}}$$

Correlation of paired observations (for correlated means only)

$$r_{A,B} = \frac{\sum_{x_{A_i}, x_{B_i} \neq \Omega} (x_{A_i} - \bar{x}_A)(x_{B_i} - \bar{x}_B)}{(n-1) s_A \cdot s_B}$$

$$= \frac{\sum_{x_{A_i}, x_{B_i} \neq \Omega} x_{A_i} \cdot x_{B_i} - n \bar{x}_A \bar{x}_B}{(n-1) s_A \cdot s_B}$$

Mean difference (for correlated means only). The mean of the difference between the paired observations is

$$\bar{x}_d = \frac{1}{n} \sum_{x_{A_i}, x_{B_i} \neq \Omega} (x_{A_i} - x_{B_i}) = \bar{x}_A - \bar{x}_B$$

Standard deviation of difference (for correlated means only)

$$s_d = \sqrt{\frac{\sum_{d_i \neq \Omega} (d_i - \bar{d})^2}{n-1}}$$

$$= \sqrt{s_A^2 + s_B^2 - 2r_{A,B}\, s_A\, s_B}$$

where $d_i = (x_{A_i} - x_{B_i})$

Standard deviation of mean difference (for correlated means only)

The standard deviation of the mean of the differences between paired subjects is

$$s_{\bar{x}_d} = \frac{s_d}{\sqrt{n}}$$

T-ratio

For independent groups,

$$t = \frac{\bar{x}_A - \bar{x}_B}{\sqrt{\frac{1}{n_A} + \frac{1}{n_B}} \sqrt{\frac{\sum_{1 \in A,\ x_i \neq \Omega} (x_i - \bar{x}_A)^2 \sum_{1 \in B,\ x_i \neq \Omega} (x_i - \bar{x}_B)^2}{n_A + n_B - 2}}}$$

For correlated means,

$$t = \frac{\bar{d}\sqrt{n}}{s_d} = \frac{\bar{x}_A - \bar{x}_B}{\frac{1}{\sqrt{n}} \sqrt{s_A^2 + s_B^2 - 2r_{A,B}\, s_A\, s_B}}$$

Degrees of freedom

$$N = \begin{cases} n_A + n_B - 2, & \text{for independent groups} \\ n - 1, & \text{for correlated means} \end{cases}$$

2. Test of Significance

The t-ratio computed is checked for significance at the .01, .05 and .10 levels of significance. This is done as follows:

If $|t| > t_{\frac{\alpha}{2};N}$, where $t_{\frac{\alpha}{2};N}$ is the $100 \cdot \frac{\alpha}{2}$

percentage point of the t distribution for N degrees of freedom, then the variable is denoted "significant" at the α level. If $t > 0$, the significant group is flagged as "A"; otherwise it is flagged "B".

3. Comment on Numerical Method

To reduce round-off errors, the sums and sums of squares needed for the formulas in B.1 above are first calculated about an assumed mean and then adjusted appropriately for the formula involved. The assumed mean is the first non-missing (non-null) datum in the group. Thus, for example, the mean of Group A is actually computed as

$$\bar{x}_A = \frac{1}{n_A} \sum_{i \in A} (x_i - x^\circ) + x^\circ,$$

where x° is the first non-null datum in the group. The other formulas are adjusted similarly.

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