Educational experiences and academic achievement of rural students as compared to suburban and urban students in the United States

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Educational experiences and academic achievement of rural students as compared to suburban and urban students in the United States

by

Michael Dean McDermott

A dissertation submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education

Major Professor: William Wade Miller

Iowa State University

Ames, Iowa

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Graduate College
Iowa State University

This is to certify that the doctoral dissertation of

Michael Dean McDermott

has met the dissertation requirements of Iowa State University

Signature was redacted for privacy.

Major Professor

Signature was redacted for privacy.

For the Major Program

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For the Graduate College
DEDICATION

I would like to dedicate this dissertation to my children Joshua, Nicholas, and Chelsey McDermott.

They serve as a daily reminder of the importance and significance of our educational system and the challenges that lay ahead as our society changes and moves into the future.
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CHAPTER I.
INTRODUCTION

"I believe rural America can and will hold true to the best traditions of our national past." This line taken from an old version of the National FFA Creed, (1977) exemplified the belief the author of the creed had. The author, who was an agriculture educator, believed rural America played an important role in the development of the United States. His view was expressed in 1928 when the creed was originally written and it glorified the "agricultural society" that was predominant at that time.

It is apparent to nearly everyone that our society and population demographics have changed greatly since the settlement of the colonies to the present day. Our society which was "agriculturally" based has evolved into and through the "manufacturing" stage. During this "manufacturing" stage society witnessed the age of mechanization increase our production and efficiency of production in agriculture. One of the results of this new found efficiency of agriculture production was a migration of people from rural America to the cities and into the factories of the manufacturing industry. This initiated the trend that rural America finds itself in currently. The trend is young people from rural areas moving to the city in search of better careers. The effect of this migration on the educational system was pointed out by Sher and Tompkins, (1977). They reported in 1977 that the number of school districts was slightly over 14,000. This number was a drastic decrease from the 128,000 that existed in the United States in 1930. They also pointed out that the demise of over 100,000 school districts was also the demise of the same number of local governments. More was lost from the community than just the school itself. Declining enrollment, limited resources, and the task to provide a well-rounded education describes the challenges facing rural school districts.

With global competition against our manufactured goods and a dismal decade during the 1980's for economic growth, the "manufacturing society" began to concede its predominance, as the "agricultural society" had to it. During the transition from the "manufacturing society" to the
“information society”, the rural manufacturing based economy became depleted. The rise of rural manufacturing plants which flourished under the conditions of rural, nonunion, and low pay accepting laborers, began to decline. Rural factories were closed in favor of the city factories which were near to corporate headquarters. Rural communities, which extended themselves and their city services in return for jobs and a stable economic base other than agriculture, were in instant economic disarray. Coinciding with the loss of the manufacturing economy was a weakened agricultural economy.

Penson, Capps, and Rosson, (1996) discuss in their textbook Introduction to Agricultural Economics, that many rural communities were under severe financial stress during the 1980s when farmers and ranchers experienced declining incomes and property values. Faced with high employment and less tax revenue, the cost of education appeared to loom even larger. School districts which relied partially on a tax base for funding now had even less. A study by Knutson and Fisher, (1989) identified the leading rural development issues. Their study found that one of the most frequently cited rural development issues was the enhancement of educational opportunities. Their study also identified economic opportunities as a major concern for rural development. Stuart Rosenfeld, (1983) raised the question, "What can education do to help rebuild rural economies?" His answer was not school consolidation resulting in a rural community totally void of the community infrastructure a school can provide. He favored school centered economic adventures which would be modeled after vocational agriculture and its methods to build entrepreneurial skills in students.

The current societal stage places great emphasis on the acquisition of information and the transferring of information from one source to another around the globe. Technological advancements in the area of computers, fax machines, and satellite transmission have made it easy and more affordable to disseminate and receive information worldwide. The information network allows the browser the opportunity to peruse and select the information he/she deems valuable. It is the ever
demanding task of our nation's educational system to prepare students for the current stage society is in
and for them to be prepared for what may yet come as our society continues to change.

The public often asks the educational system to perform the previous mentioned task with too
little resources, inadequate training, and with technology that is outdated. This places a great burden
on the schools which are already resource poor or deficient. Many players in the educational reform
movement foresee this as the rural schools' final breaking point. Nathan Weate, (1992) pointed out the
double edge sword of current educational reform. One cutting edge of the reform sword wants stronger
academics and particularly in larger schools with the resources to do it efficiently. The other side of
the cutting edge of reform is that the academics must be taught by stressing the quality of life to teach
the academic subjects more effectively. What is the optimum size school to accomplish this difficult
task?

An obvious question to ask is, "can our nation's schools provide students with educational
opportunities which will allow them to fulfill a productive role in this changing society and have the
ability to change with it?" This question may be asked specifically of schools in rural settings. Can an
educational institution, which is separated from the forefront of change by physical distance,
technology, and lack of opportunities, produce students that equal their urban and suburban
counterparts in scholastic achievements? Gary Green and Wanda Stevens, (1988) concluded that there
are many factors which must be taken into consideration when evaluating the effectiveness of a school.
They warrant that school size in itself does not lower academic achievement.

Secondly, can the same rural educational institutions offer to their students the curricular choices
which they may or may not need to be productive in our "information society"? Jonathan Sher, (1983)
cautions against the generalizations of rural schools and their educational potential. He stated that
"diversity is the norm" when considering the quality of education that can be provided by a rural
school. To lump all rural schools into a single category would be a serious mistake.
Can a resource deficient school provide an educational environment which fosters and promotes academic achievement, personal growth, and a sense of values which will allow the student to secure a productive and positive role in society? Proponents of school consolidation prey upon the lack of district resources as a major reason for consolidation. Everett Edington and Helena Martellaro, (1988) pointed out that academic achievement is not the driving force behind school consolidation, rather it is the economics of it that is the major factor. Per pupil cost is more importantly considered than achievement. Faith Dunne, (1983) stated that local schools are vitally important to the self image of many rural communities, but these schools often become the ground for last ditch battles between the "locals" and the "experts". Dunne also raised the questions, "What are the benefits and drawbacks of local control?" "Who does have the final authority in the control of a school?" These are questions educators, educational reform proponents and opponents should ask themselves as they plan and propose educational change for the students of the twenty first century.

Statement of the Study's Purpose

The purpose of this study was derived from the points brought out previously in the text by the researcher and other educators. The purpose of the study was to determine if students in rural areas(schools) are educationally disadvantaged in comparison to students who attend school in urban and suburban areas. Educationally disadvantaged was defined by the researcher as 1) lower academic achievement, 2) fewer course selections (both academic and vocational), and 3) less enrichment activities (extra- and intra-curricular activities).

Statement of the Study's Objectives

The purpose of this study was divided into three objectives.

1. To describe and compare the academic courses taken and participation in school related activities by rural, urban, and suburban students.
2. To determine and compare the academic achievement, as measured by cognitive tests, of rural, urban, and suburban students.

3. To determine the strength and type of relationship between selected student factors and academic achievement, as measured by grade point average, and to create an equation that would predict academic achievement.

The research questions for the study parallel the study's objectives. The first question to be answered by this study is: Does a difference in course taking patterns and participation in school related activities exist between students educated in a rural school setting and those who are not (urban and suburban)?" Secondly, is there a difference in academic achievement among rural, urban, and suburban students? Lastly, what is the type of, and strength of, relationship between selected student factors and academic achievement? Completion of the study's three objectives will provide foundational support for the testing of the hypotheses and the subsequent conclusions that may be made.

Significance of the Problem

As the United States approaches the 21st century, we find our society coping with global competition and dealing with rapid technological change. Graduates, which are outcomes of our nation's educational system, need an enriching educational experience which will prepare them to function in society as an adult. The value one puts on this educational experience is a difficult determination and the value of an education from a rural school is subjected to even more doubt and concern about its quality. Yet, as rural schools are considering or actively involved in consolidation efforts and other sharing arrangements, a price has been placed on these schools and the decision makers have determined that price to be too high for the school to remain as an independent entity. Consolidation often takes place and two or more small rural schools become one larger, more resource rich rural school.
This research is an effort to determine the relative worth of an education delivered by rural schools as compared to the larger urban and suburban schools. Determination of the current academic achievement and the parent, teacher, and school factors which relate to high achievement and a positive educational experience will be conducted. The evaluation of the educational experience is important to be utilized as a quality measurement of the job being done as the students leave school and embark on their journey of lifelong learning in a changing society.

Assumptions

1. Students added to freshen the sample at the different data collection times were not significantly different than the base year subjects which completed the entire study.

2. States' education mandates cause a course of said title to be essentially equivalent to a course of similar title taught in the same state or another.

3. Nonresponse bias will not affect the findings of this study for two reasons. First, high return rates were obtained and secondly, no small subgroups of the sample will be singled out for analysis.

Limitations

1. This study will not analyze the change in academic achievement over time, rather it will make a comparison of academic achievement at a given point in time.

2. This study examined a limited number of variables involved in the educational process in comparison to the large number of complex variables that may or may not affect academic achievement.

3. The limitation of the statistical analysis of the data is determined by the constraints of the study.

This study defined rural as any area outside of a Metropolitan Statistical Area, (MSA). An MSA is defined by the Office of Management and Budget to include counties containing a city of fifty
thousand or more people and a total area population of one hundred thousand. This study also divided the MSA population into two groups which are more familiar to the average person. An urban group which was the central city with a population of fifty thousand or more and a suburban group which was the area surrounding the central city.

The concept of freshening the sample is explained by this excerpt taken from the second follow-up user manual, (1994). The freshening procedure is an essentially unbiased method for producing a probability sample of students who were enrolled in the twelfth grade in 1992 but were not enrolled in the eighth grade in the U.S. in 1988. There is a very small bias introduced by the omission of eligible twelfth graders attending schools that included no students who were eighth graders in 1988. There is an additional small bias introduced by not freshening on the members of the sample of base year ineligibles. All other 1992 twelfth graders who qualify for the freshening sample had some chance of selection. Because each 1988 eighth grader added through first follow-up freshening had a calculable, non-zero probability of selection into the base year sample, we can calculate the selection probabilities for all students eligible for the freshening sample. Thus, the freshening procedure produces a sample that meets the criterion for a probability sample.

The freshening procedure was carried out in four steps:

1. For each school that contained at least one base year twelfth-grade student selected for interview in 1990, a complete alphabetical roster of all twelfth-grade students was obtained.

2. For each base year sample member, the next student on the list was examined. If the base year student was the last one listed on the roster, the first student on the roster was examined.

3. If the student who was examined was enrolled in the eighth grade in the U.S. in 1988, then the freshening process terminated. If the designated student was not enrolled in the eighth grade in the U.S. in 1988, then that student was selected into the freshened sample.

4. Whenever a student was added to the freshened sample in step 3, the next student on the roster was examined and step 3 was repeated. The sequence of steps 3 and 4 was repeated (adding
more students to the freshened sample) until a student who was in the eighth grade in the U.S. in 1988 was reached on the roster.
CHAPTER II
REVIEW OF LITERATURE

During the literature search it became apparent to the researcher that much of the educational research completed has been utilized to give direction to educational reform and to act as a catalyst to keep the refinement of America's educational system dynamic. Change in the educational process has never been truly stagnant. Research has always been carried out in an effort to improve the public school system. Educators and administrators have known for years that student achievement scores on standardized tests have been falling. The question may be asked, "if this is true, why the most recent outcry for educational reform?" Technology has provided the educational sector the opportunity to compare their results to the educational systems across the world. The global competition which exists for our manufactured products emphasizes the point that America's workers and factories have fallen behind. This last point may be seen as a societal problem and true it is, but which party is responsible for developing our youth so they may become productive members of society? The answer is our educational system. President George Bush, (1990) supported this point when he announced the educational goals for the year 2000. The goals were not announced just because of low test scores, rather they were pronounced to put American businesses, workers, and educators back at the top of this global perspective. The fanning of the educational reform fire was taking place in the early 90's. As the next presidential administration stepped into office, were these fires of reform doused? Absolutely not, President Bill Clinton, (1997) reiterated the same basic national education goals. This brings us back to where educational reform is right now. What can educators do to enrich the educational experience of all students?: rural, suburban, or urban?

This study's three objectives are linked to the betterment of the educational experience. One question educators have is the quality of education received in rural schools. Can our nation's rural schools compete in our present society and produce students that can succeed? The first objective is to
describe and compare the academic courses taken and participation in school related activities by rural, urban, and suburban students. The second objective is to determine and compare the academic achievement, as measured by cognitive tests, of rural, urban, and suburban students. The final objective is to determine the strength and type of relationship between selected student factors and academic achievement, as measured by grade point average, and to create an equation that would predict academic achievement. Educational studies and essays were selected from the literature which would address one or more of the study's three objectives. The literature reviewed provides foundational support for this study.

The most abundant educational research available for review are descriptive studies which describe the schools' learning environments and students in different types of school settings. Vast amounts of demographic information has been collected about students and school districts. The second type of educational research reviewed falls into the category of comparison studies between groups of students usually a rural group and an urban or suburban group. A common goal of these studies is the comparison of academic achievement between groups. Other comparisons are made concerning the students' affective thoughts concerning desire to attend college, get a job, ... etc. The third type of educational research is the comparison of academic achievement between students who are grouped by different variables. The following reviews provide insight and support the research purposes of this study.

Size and Effectiveness of the Learning Environment

Jerry G. Horn, (1988) Dean of the College of Education at East Texas State University reported on a study conducted in the state of Kansas while he was the Director of the Center of Rural Education and Small Schools at Kansas State University. The purpose of the study was to identify characteristics perceived by students, educators, school board members, and the community to be the most important indicators of school quality and effectiveness. The second purpose was to determine the degree to
which these characteristics are present in selected small/rural schools, and lastly to provide a profile of
the districts perceived to be the most effective. This was to be carried out in two phases with 25
schools participating in each phase.

Phase one was intended to determine the perceived importance of each of the 76 indicators of
school effectiveness which were extracted from the research literature. Based on the responses from
phase one, a second instrument for perceptions of school quality and effectiveness was developed for
phase two. For an item from phase one to be included on the phase two instrument it must have been
rated higher than the mean (>3.90 on a 5 point scale), and not duplicate any similar item with a higher
rating. Thirty one items were included on the phase two instrument.

The results of this study were that only four of the original 66 school effectiveness indicators
were rated below the midpoint of the scale by the respondents. Of the thirty one indicators on the phase
two instrument, no indicator of school effectiveness was rated below the midpoint of the scale. The
different groups of respondents felt their school district did have the effective school indicators present
in their districts. From additional comments provided by the respondents, it was concluded that
students have a higher need for emotional support. The citizens in the community saw a need to
improve the work ethic of students, and the teachers and administrators felt that parents might not feel
like part of the educational partnership.

This study also collected educational demographic data from the state education department. In
the area of academic achievement, the rural schools in this study out performed the state average in all
areas of the Kansas Competency Test. The same students who were products of these schools pursued
post-secondary education at a higher rate than the state average. In the discussion of the study's
findings, Horn pointed out that the small schools while they were very effectively educating students,
did so at a per pupil cost greater than the average for the state. He points out that there are many
things in society that the general public (taxpayer) has subsidized. The higher cost of education in
rural areas may have to be another, but in return we will get an educational system that does a better job.

**Academic Achievement Comparisons**

A study by Edington and Martellaro, (1988) asked specifically does school size have any relationship to academic achievement? To answer this question they used the total scale score on the Comprehensive Tests of Basic Skills (CTBS) to measure academic achievement. They then performed a simple correlation of school size with the school average CTBS test score. The school average scores for the years 1978 through 1981 for grades fifth, eighth, and eleventh in the state of New Mexico were utilized. The second question the study asked was, "is there a relationship between school enrollment size and student achievement when corrections have been made for certain other predictors of achievement?" The second research question was to be answered through a regression analysis. The researchers point out that in the state of New Mexico per pupil cost is nearly constant across the state.

A positive correlation between school size and academic achievement was found for five of the twelve tests. Fifth grade scores for 1978, 1979, and eleventh grade 1978 through 1981 had correlation coefficients ranging from .01 to .30. The limitation of a correlational study is the coefficients only indicate the direction and the strength of the relationship but cannot explain why the relationship exists.

When the researchers controlled for other predictors of academic achievement through a regression analysis, school size was found not to be a factor. As a result of pursuing their second question, the results found reinforced the assertion that socioeconomic status is the greatest predictor of academic achievement and ethnic and cultural background are big predictors of academic success as well.

Joyce Stern, (1994) wrote in a government report about the comprehensive data collection process which has gone on since 1969. She reported on the effort to measure student progress over time. In 1969, the National Assessment of Educational Progress, (NAEP) was established to
periodically measure student achievement on a national scale. The NAEP is operated by the National Center for Educational Statistics, (NCES). The student scores on academic achievement tests was converted to a proficiency scale which ranges from 100 to 500. This standardized proficiency scale allows for the cross comparisons by groups, age levels, and year of assessment.

During the decade of the 1970's, the NAEP made comparisons between students of extreme rural areas, county population below 10,000, and the national mean on the different tests. The results of the comparison was the rural educated student scored below the national average in every academic area. Rural students' reading scores in 1971 were below the national average for all three age groups, nine, thirteen, and seventeen.

In 1986, the NAEP assessments showed an improvement in the rural educated students and/or a decline in the achievement of the rest of the nation. Rural students matched the national average in math, reading, and science. This improvement has persisted and in 1990 the rural scores for history equaled the national mean score as well.

The official finding of the NAEP is that extreme rural areas are now comparable to the national mean proficiency levels when only academic achievement is measured.

A research project conducted by the NCES, (1988) reported student comparisons when rural students' achievement scores were compared to urban students' scores rather than the national mean. The rural student definition stayed the same as it was for the earlier comparison which was schools in areas of population less than ten thousand. The urban schools were divided into two categories. The first category was called the advantaged urban school and the second was named the disadvantaged urban school. The definition between the two was determined by the socioeconomic status. The disadvantaged urban school had a high percent of students which came from welfare families and the parents were not regularly employed. The advantaged urban school had a high percentage of parents who were employed in professional or managerial positions.
The comparison between the rural educated students and the two urban groups were done for three different grade levels. The grade levels chosen were fourth, eighth, and twelfth. The achievement scores for six different NAEP achievement tests were compared. Science, math, reading, writing, civics, and history were the academic areas tested. The results of the comparison between the rural and the disadvantaged urban educated students showed that rural students outscored their disadvantaged urban counterpart by an average of 21 points for the 18 different age and test combinations. All but two of the 18 comparisons were statistically significant. The single largest difference between the two groups was at the twelfth grade level where the rural students' mean score was 40 points higher than the disadvantaged urban score for the subject area of science. The second subject area which had a large difference between scores was civics. For the three different grade levels, the rural students outscored the disadvantage urban student by an average of 25 points.

When the comparison was made between rural students and the advantaged urban students, the tables were turned. The advantaged urban group out scored the rural group in all 18 comparisons. However, only 12 of the 18 comparisons among the three grade levels and six subject areas were statistically significant. The rural students' score, on average, was 13 points less than the advantaged urban group. While there were apparent swings in the degree of differences between the two groups for the three grade levels and the six subjects, the difference in mean scores leveled out for the twelfth-grade year. At the completion of these students' high school education, the results of the six tests showed the rural students averaged an 11 point deficit in comparison to the advantaged urban students.

Data in this study indicated that the positive aspect for the rural educated student was that their margin over the disadvantaged urban student was greater than their shortfall to the advantaged urban student.

Another national study conducted by the National Center for Educational Statistics, (1991) made comparisons among rural, urban, and suburban students on four academic achievement tests. The data
for the comparisons came from the NELS:88 base year study. The comparisons were made between eighth-grade students for the subjects of math, science, reading, and history/government. The definition of rural by the NELS:88 study is more broadly defined than the previous NAEP definition. The NELS:88 defines rural as any area outside of a Metropolitan Statistical Area, (MSA). An MSA is defined by the Office of Management and Budget to include counties containing a city of fifty thousand or more people and a total area population of one hundred thousand. The NELS:88 study also divided the MSA population into two groups which are more familiar to the average person. They have an urban group, meaning central city and a suburban group meaning the area surrounding the central city.

The comparison results of the data from the NELS:88 eighth-grade students academic achievement concluded what the NAEP data indicated. The rural educated students' mean score exceeded the national mean science score, but not by as much as the suburban students' mean score, (+.14 compared to +.49). The urban students' mean score fell short of the national mean by 1.05.

For the other three academic areas for which comparisons were made, the rural students' mean score fell short of the national mean by an average of -.31. The rural students may have been out scored by their suburban counterparts, but not by as great of a margin as the margin between the rural students' mean scores and the urban students' mean scores. These studies suggest that educational researchers should look into the factors which may cause the academic achievement disparity to exist.

Student Choices and School Size

The question of whether or not students suffer because they attend a small school has been debated and researched. Barker and Gump, (1964) concluded from their study of non-academic outcomes in small and large schools in Kansas, that there was clear evidence of affective advantages for students in smaller schools. The non-academic outcomes included such items as student participation in extra-curricular activities and student youth groups. Fowler, (1992) also found increased participation by students in rural schools in activities such as band, chorus, plays,
newspaper, and sports. In addition to greater participation, he also found the students had greater personal satisfaction. If these findings are true, why the trend of school consolidation? Fowler contended that the consolidation of rural schools into larger districts was the result of recommendations made by administrators who's administrative training and educational philosophy was bigger is better. Cited as a specific example to support his point was James Conant, president of Harvard University and the author of the book The American High School. In 1967, Conant preached that high school classes of 100 students were needed in order for instruction to be comprehensive. Consolidation of rural districts continued bringing the number of districts in this country to 15,000 by 1990 (NCES 1992).

A study conducted by Mary Huba, (1983) looked at the relationships among high school size, other high school characteristics, and achievement in the freshman year of college. She found that freshmen from different size high schools attending a large midwestern Ph.D.-level public university did not differ from each other, on the average, in terms of freshman GPAs and persistence through the sophomore year. When other high school characteristics were examined, it was found that the number of college preparatory courses offered by a school could not predict student success in college.

In a report prepared by Eileen O’Brien and Mary Rollefson, (1996) they discuss the merits of extra-curricular participation as it relates to school success. Almost every high school in the U.S. offers some type of extra-curricular activity, such as music, academic clubs, and sports. These activities offer opportunities for students to learn the values of teamwork, individual and group responsibility, physical strength and endurance, competition, diversity, and a sense of culture and community. Extra-curricular activities provide a channel for reinforcing the lessons learned in the classroom, offering students the opportunity to apply academic skills in a real-world context, and are thus considered part of a well-rounded education. Recent research suggests that participation in extra-
curricular activities may increase students' sense of engagement or attachment to their school, and thereby decrease the likelihood of school failure and dropping out.

O'Brien and Rollefson also discussed the relationship between extra-curricular activities and school success. Indicators of successful participation in school include consistent attendance, academic achievement, and aspirations for continuing education beyond high school. Extra-curricular participation was positively associated with each of these success indicators among public high school seniors in 1992. During the first semester of their senior year, participants reported better attendance than their non-participating classmates—half of them had no unexcused absences from school and half had never skipped a class, compared with one-third and two-fifths of nonparticipants, respectively. Students who participated were three times as likely to perform in the top quartile on a composite math and reading assessment compared with nonparticipants. Participants were also more likely than nonparticipants to aspire to higher education: two-thirds of participants expected to complete at least a bachelor's degree while about half of nonparticipants expected to do so. It cannot be known whether participation leads to success, successful students are more inclined to participate, or both occur.

Although it cannot be known from these data whether the relationship between participation in extra-curricular activities and success in school is causal, and although degree or intensity of participation is not measured, it is clear that participation and success are strongly associated as evidenced by participants' better attendance, higher levels of achievement, and aspirations to higher levels of education. Furthermore, the data indicated that differences in participation were not related to differences in availability, as extra-curricular activities were available to virtually all high school seniors regardless of the affluence, size, location or minority status of the schools students attended. Despite wide availability of activities, low SES students participated less than did their high SES classmates. This participation gap is a cause for concern, especially if extra-curricular activities can
be a means of bringing at-risk students more fully into the school community, thereby increasing their chances of school success. In spite of the gap, however, low SES students participated at fairly high levels, and they persisted in their participation regardless of the relative affluence of the schools they attended. Neither the gap nor the persistence is explained by these data, but together they suggest the value of further study of the individual constraints of poverty and family background and the influence of school community on student engagement.

Since school consolidation continued to be an issue, numerous research efforts were conducted to determine if small schools varied from larger districts in curricular offerings. Studies by Monk, (1987, 1988, 1991), Haller, (1990), Monk and Haller, (1986, 1993) summarize their research findings on five points. First, the effect of school size on curricular offerings varies by subject matter. The academic areas of science, math, English, and history are less likely to be impacted by school size. State mandates are most likely the reason for this. However, in the area of foreign languages and or performing arts, school size appears to impact the availability of such classes. Small schools are less likely to offer a broad array of "fine arts or liberal arts" courses.

The second point of their research concluded that the strength of the relationship between school size and curricular offerings decreased as the schools became larger. Increased size of very small schools was linked to greater curricular gains than the curricular gains which resulted with the increased size of larger schools to even larger schools.

Monk and Haller pointed out that school size is related to the type of courses added within the subject areas. School size was positively related to the portion of the academic curriculum which was devoted to advanced and remedial courses. As schools become larger, a greater portion of the curriculum was devoted to advanced or remedial courses. They also pointed out that advanced curricular offerings increase at a rate greater than the rate for remedial course inclusion.
The fourth point of summary from their combined findings is that even after school size and rural location were controlled for, great curricular variations still existed among the high schools. They reported that school size only explained about half of the variation amongst curricular offerings.

The last point made by Monk and Haller was that the mere presence of any course in a school curriculum is not a guarantee for student participation in it. Only a small percentage of students take advantage of advanced level courses found in large school curriculum offering. Curriculum offerings of any sized school does not fully explain student course taking patterns nor the academic achievement of those students.

A study conducted by McCracken and Barcinas, (1991) agricultural education educators from Ohio State University, described the characteristics of rural and urban high schools and students across the state of Ohio. Their first objective was to describe the characteristics of a typical Ohio urban and rural school. They wanted to determine the number of curricular offerings, size of staff, extra-curricular offerings and per student expenditure by the school. The 1989 senior class size for the Ohio rural schools which were sampled averaged 74 students. The urban school senior class average size was 333 students. The four year enrollment figure for rural schools was an average of 309 students, while Ohio urban schools averaged 1368 students. In the area of teaching faculty, rural schools averaged 24 teachers and zero teacher aides, while the urban schools averaged 79 teachers and two teacher aids. The ratio of urban administrators to rural administrators was five to one.

Curricular offerings between the two types of schools varied greatly. Ohio urban schools offered 221 curricular choices while rural schools offered only 84. The extra-curricular offerings varied as much with 23 choices for rural students and 41 for the urban student. When comparing the educational price tag between the two types of schools, the rural school had a lower per pupil expenditure of $2657. The urban schools averaged a per pupil expenditure of $3527.
The student course taking pattern was different between the two groups. More urban than rural students were enrolled in an academic track. The rural students had a slightly higher grade point average of 2.64 compared to the urban student average of 2.54 on a 4.00 scale.

The researchers summarized that per pupil costs dropped as the district size increased to about 3000 pupils. In districts larger than 4000 students, the per pupil cost began to rise. The researchers pointed out that administrator efficiency did not go up as the district increased in size. They also pointed out that student participation in extra-curricular activities was the same for both rural and urban students, even though urban schools offered twice as many. The researchers also pointed out that the difference in curricular offerings could be due to the fact that vocational program choices are offered by urban schools while in the rural districts in the state of Ohio, vocational centers exist which were not counted as part of the rural high school course offerings. They also link this fact to the student enrollment in vocational programs. For rural students to enroll in vocational courses they must leave their school to go to one of the vocational centers. The researchers felt that this circumstance may tend to discourage rural students from leaving their own high school. As a result, rural students may select a general curriculum instead.

Student Factors Which May Affect Achievement

A government report entitled "A Profile of the American Eight Grader", (1990) highlighted a number of factors which could affect the academic achievement of students. The report discussed the “at risk” factors which were found in the eighth-grade students of the NELS:88 longitudinal study. Overall, 53 percent of the students had none of the risk factors, 27 percent had one, and 20 percent had two or more. The six “at risk” factors and the percentages of eighth-graders identified in each category are:

- single parent family—22 percent;
family income less than $15,000—21 percent;
home alone more than 3 hours per day—14 percent;
parents have no high school diploma—11 percent;
sibling dropped out—10 percent;
limited-English proficiency—2 percent.

Students with several risk factors tended to have more educational problems, including lower grades and higher absenteeism than students with none. Students with two or more risk factors were six times as likely as those with none to report that they did not expect to graduate from high school; they were twice as likely to score in the lowest 25 percent on achievement tests.

More than two-thirds of the eighth-graders reported positive feelings toward their school. In general, they felt safe in the school environment for only 9.9 percent of the white students reported that they did not feel safe when at school. Black and American Indian students did not feel as safe at school as whites for 18 percent of the black and American Indian students reported they did not feel safe.

It was also reported that the typical eighth-grader spent about 2 hours of leisure time reading per week. Doing homework accounted for 5.6 hours in the eighth-grader’s week and watching television accounted for 21.4 hours of their time.

In a report written by Timothy Madigan, (1997) he discussed some key points regarding student achievement and the number of science and math courses taken by students. He pointed out that some people are concerned that our nation’s students are being out-paced in scientific literacy by students from other advanced, industrial nations. Many education professionals and policymakers have outlined solutions to this problem. Increasing the number of science courses required for high school graduation, some have argued, will help students in the U.S. progress toward becoming first in the world in science achievement. Others have called for an integrated approach to science which continuously exposes all students to science material throughout high school. These recommendations
for more exposure to science are based in part on research that has documented a positive relationship between course taking and achievement. A positive relationship has been found between total number of science (and mathematics) credits a high school student took and his or her science proficiency level in 12th grade.

Madigan also pointed out that in the area of mathematics, it has been shown course taking is positively related to increases in a student's proficiency level between 8th and 10th grades. Among students who started at the same proficiency level in eighth grade, those who took higher level mathematics courses were more likely to increase to higher proficiency levels two years later than students who did not take higher level courses. These results suggest that course taking affects mathematics proficiency. More importantly, they show that taking more advanced mathematics courses seems to help both low and high achievers.

In a report prepared by Jim Houser, (1995) the types of school-to-work programs that are offered by schools is discussed. In addition to offering classroom-based courses, secondary schools and postsecondary institutions often provide opportunities for work-based learning, such as cooperative education, work experience, and school-based enterprises. Cooperative education and work experience programs allow students to earn school credit in conjunction with paid or unpaid employment. Cooperative education programs place students in jobs related to their vocational field of study, and typically involve employers in developing a formal training plan and evaluating students. On the other hand, traditional work experience programs sometimes place students in vocationally unrelated jobs, and may not involve employers as extensively as cooperative education programs. School-based enterprises are class-related activities that engage students in producing goods or services for sale or use to people other than the participating students themselves.

Houser also discussed how abundant school-to-work programs are in the schools of the United States. At the secondary level, about one-half of public high schools in 1991-92 offered cooperative
education programs. In contrast, fewer than one-third offered school-based enterprises and other work experience programs. Vocational schools were more likely than comprehensive high schools to offer each of these programs. Among vocational schools, area vocational schools were more likely than full-time vocational high schools to offer school-based enterprises and other work experience programs.

Houser also pointed out the number of work experience credits which are likely to be earned by students of different schools. On average, 1992 public high school graduates accumulated 0.15 credits in cooperative education and work experience courses—equivalent to about one in seven graduates completing a year-long course. College preparatory graduates and graduates without a college preparatory or vocational specialization averaged negligible numbers of such credits (0.04 and 0.09, respectively). However, vocational specialists averaged about 1 credit in cooperative education and work experience, equivalent to a full-year course. High school students concentrating in marketing and distribution and in health completed more cooperative education and work experience coursework as part of their occupational programs than did other vocational concentrators.

The educating of students is a multiple partnership with one of the partnerships being the school personnel and the parents of the student. A government report from the National Center for Educational Statistics, (1995) discussed the types of communication between schools and parents. Schools generally contacted parents for one of three reasons, to discuss the student’s academic performance, student’s behavioral difficulties, or to discuss the student’s future plans. A strong learning environment involves communication to the parents even when there are no problems with the student. The following were the discussion points of the report.

- Parents of 12th grade students reported that they were more likely to be contacted by school personnel regarding the academic performance of their child than about their child’s behavior.
- Parents of seniors in private schools were more likely than their public school counterparts to be called to request volunteer services or to discuss their child’s post-high school plans.
• Parents of white seniors were more likely than those of black, Hispanic, or Asian seniors to be asked to volunteer at school. Black parents were more likely than white or Hispanic parents to be contacted by the school personnel to inform them about helping their child with school work.

• Parents of seniors in schools with 41 percent or more of students receiving free or reduced-price lunch were more likely than parents of seniors in schools with less than 5 percent of students receiving free or reduced-price lunch to be contacted regarding their child's academic performance or academic program. Parents in rural schools were the least likely to be contacted about their child's attendance, and parents in urban schools were the least likely to be contacted by school personnel requesting parent volunteers.

• Parents who had a bachelor's degree or higher or whose child's achievement test scores were in the highest quartile were more likely to be called by school personnel regarding their child's post-high school plans and to be asked to volunteer at school than were other parents.

An article written by John Patrick, (1993) also emphasized the learning environment as being a key in the student's attempt to reach goal number three of the six national education goals. Goal three refers to the student's demonstrated competency in challenging subject matter. Patrick lists several answers to the question "what can schools do to improve student achievement?" The school should create a climate that is conducive to student achievement through the exercise of strong instructional leadership and maintenance of a safe, stable educational environment. Parents should be involved as monitors of homework assignments, encourages of academic achievement, and reinforcers of school rules. Instruction in the core subjects should emphasize active learning, thinking and doing in contrast to passive reception of knowledge transmitted via lectures and textbooks.

Patrick expanded his list of what parents should do to improve the academic achievement of their child. In addition to the parental involvement stated above, parents should guide their child in
productive use of their free time. This translated to less television viewing. Parents should also
provide learning resources for their child in their home. Books and magazines should be utilized in the
home by the child and encouraged by the parent. It is also suggested that the parent discusses with the
child school curriculum-related ideas. The influence of positive academic building concepts in the
home or family environment will increase the educational value the student receives from the school.

The body of literature reviewed supports the research questions and objectives of this study.
Student achievement and an equitable education for all students is a major concern for parents,
educators, and the country's policymakers. The NELS:88 data contains information which may direct
the efforts of educational reform as our society advances into the 21st century.
CHAPTER III
METHODOLOGY

Design

The data for this study came from the National Educational Longitudinal Study of 1988, (NELS:88). This public use data set was obtained from the National Center for Educational Statistics in Washington, D.C. As the name of the data set indicates this was a longitudinal study beginning with the base year of 1988, with subsequent follow-ups every two years through 1994. It is the base year and the first two follow-ups which are of the most interest to this study. The data set provides information about eighth-graders, sophomores, and seniors in high school.

The NELS:88 design allows the researcher to conduct statistical analyses on three principle levels: cross-wave, cross-sectional at a single point in time, and cross-cohort by comparing NELS:88 findings to those of previous longitudinal studies.

Base Year Study and Sample Design

The base year study design was made up of four components: descriptive surveys and achievement tests of students, and descriptive surveys of parents, school administrators, and teachers. In the NELS:88 base year, a two-stage stratified probability design was used to select a nationally representative sample of eighth-grade schools and students. Schools constituted the primary sampling unit; the target sample size for schools was 1,032. A pool of 1,032 schools was selected through stratified sampling with probability of selection proportional to eighth-grade size. A pool of replacement schools was selected by the same procedure. Of the 1,032 schools selected, 698 participated. An additional 359 schools from the replacement pool were selected and participated for a total school sample size of 1,057.
The second stage sampling unit was the student. The second stage student sampling produced a random selection of 26,432 eighth-graders from the participating schools. The number participating in the study was 24,599, which equals an average of 23 students participating per participating school.

First Follow-Up Core Study and Sample Design

The first follow-up of the NELS:88 consisted of the same components as the base year study. One exception to this was the exclusion of the parent survey because it was not conducted in 1990. Also, three new components were added in addition to the base year components. The three new components to the study were the dropout study, base year ineligible study, and the school effectiveness study. To provide a representative cross-sectional sample of sophomores, the student sample was freshened with 1,043 sophomores who were not in the base year study. These students were given an additional supplemental survey to gather basic demographic information which was asked for in the base year but not in the first follow-up. Those students retained from the base year study, (21,474) and the freshened sample provided a sample size of 22,517 students.

Second Follow-Up Core Study and Sample Design

The NELS:88 second follow-up, conducted in 1992, repeated all components of the first follow-up study. The parent survey was included in this follow-up once again and two other new components were added. Transcript and course offerings components were implemented into the second follow-up study. Students were asked to complete a questionnaire and to take achievement tests as they had in the base year and the first follow-up as well. Parents, teachers, and school administrators also completed a questionnaire concerning various aspects of the educational process and decision making.

Each student which responded in the first follow-up was also selected for the second follow-up. An additional 243 twelfth-graders were added to freshen the sample and to provide for an adequate cross-section of high school seniors. A student new to the study completed a supplement questionnaire which provided information which was asked for in the base year.
Instrumentation

The data collection instruments were developed by personnel of, and contractors for, the Office of the National Center for Educational Statistics. The development of the survey items was done with the NELS:88 study objectives in mind. Questionnaire items were designed to meet the longitudinal goals of the study. Survey items were selected based on their usefulness in predicting or explaining future outcomes which may be measured at a later point in time. The intent of the instrument development was to develop the items to provide continuity with earlier longitudinal studies from the 1970’s and the 1980’s. The question items also were derived to probe into new areas of educational policy concern and to reflect the directions educational theory might be taking. After the initial creation of the student, parent, teacher, and administrator instruments, a field test was conducted. The purpose of the field test was to provide the developers with pertinent information concerning the utilization of the surveys. The results of the field test highlighted problematic individual survey items and problematic questionnaire sections which had to be addressed through revamping of the instruments. The instrument developers calculated two types of error concerning the taking of, and the data interpretation from, the completed surveys. Type A error was defined as the "test taker" error, while type B error was defined as "clerical assistant" error, (data interpretation). Items from each of the surveys, which had a high error rate of either type A or B, were addressed individually to clarify the confusion on the part of the survey taker and the clerical assistant. After resolving the problems which had arisen from the field test of the instruments, the survey items and their respective formats were deemed qualified to collect the information from the respondents which would meet the goals of the NELS:88 research effort.

Instrument Content

The content for the seven basic instruments, which were completed during the second follow-up, will be highlighted in this section. To measure academic achievement a cognitive test consisting of four parts was given with a time limit of eighty-five minutes. The reading comprehension subtest consisted
of 21 questions to be completed in twenty-one minutes. The reading portion contained five short reading passages with three to five questions about the content of each. Students were to demonstrate understanding of the meanings of words, identify parts of speech, interpret the author’s perspective, and evaluate the passage as a whole.

The mathematics subtest included the following math abilities: graphs, word problems, equations, quantitative comparisons, and geometric figures. Some of the 40 questions could be answered by the application of basic skills or knowledge, while others were intended to allow the student to demonstrate higher-order thinking skills. The time allotment for the math subtest was thirty minutes.

Emphasis for the science portion of the cognitive exam was placed on understanding the underlying concepts of the science field rather than the regurgitation of specific scientific facts. The 25 questions to be completed in twenty minutes encompassed the areas of life science, earth science, and physical science/chemistry.

The last of the four subtests was the history/geography/citizenship portion that consisted of 30 questions to be completed in fourteen minutes. Important issues and events in the political and the economic history of the United State comprised the American history segment. Citizenship questions included the federal government and the rights and obligations of citizens of this country. Geography covered the settlement and food production shared by other societies as well as the United States.

At the time of the on site data collection, sample members were also asked to complete a student questionnaire in addition to the cognitive test. The student questionnaire consisted of 113 questions that took approximately one hour to complete. The student questionnaire asked the student about a broad range of topics concerning the student’s life, educational experiences to date, and future plans. The following areas were explored by the student questionnaire: student background, language use, home environment, perceptions of self, occupational or post-secondary educational plans, jobs,
household chores, school experiences and activities, work, and social activities. The questionnaire was available in two languages, Spanish and English.

The dropout questionnaire was designed to gain insight into why a student chose to drop out of school. The instrument covered topics such as last school attended, actions of school personnel, parents, and friends when the respondent quit going to school. Respondents also reported on how likely they were to return to school or earn a graduate equivalency diploma (GED). They were also asked to describe their current work activities and what their future plans were in the area of employment. The questionnaires were completed either by the respondent at an off campus site, in the presence of an interviewer, or through a telephone administration of the instrument. The dropouts were also asked to take the cognitive battery of tests. This could not take place through telephone administration of the test so the completion rate of the cognitive test by dropouts was low in comparison to the other instruments.

The parent questionnaire was a self-administered survey that took about forty-five minutes to complete. The instrument was developed to gather information from the parents concerning factors that influenced educational attainment and participation. The instrument also contained questions that were designed to focus on educational costs and financial aid decisions for continuation with post-secondary education plans. Those parents whose questionnaire was not returned were contacted for a phone interview to collect the same information as the paper instrument.

The administrator questionnaire focused on the students' preparation for post-secondary education and employment. The forty-five minute survey asked the school administrator about such topics as school governance, climate, student/school/teacher characteristics, school policies and practices, the school's grading and testing structure, and parent involvement in the school. The information gathered from the administrators was to be used to assist in the analysis of the student data and the educational climate of the particular school.
The teacher questionnaire was a four part instrument with a focus that switched from the student characteristics to information about the teacher's background. The first part of the instrument asked the teacher respondent to assess the student's school related behavior and academic performance. The teacher was also instructed to comment concerning the educational and career goals of the student. The second focus of the teacher survey was to gather information about the class the teacher respondent taught to the sample member, (student). Homework assignments, instructional methods, track assignments, and curricular content information was asked for. The third area of concentration of the teacher survey was information about the school climate and organizational culture. The last focal point of information gathered from the teacher was information concerning the teacher's background, academic training, subject area of instruction, and years of teaching experience. All of this information was gathered to obtain a teacher's perspective of the students in the sample and the educational operation of the school district.

The last form of data collection of the second follow-up was the student transcript component. A transcript copy was collected for each student in the sample, including dropouts, and early completers. The information received from the transcript contains the courses taken by the student, grades earned for each course completed, rank in class, cumulative grade point average, and standardized test scores for PSAT, SAT, ACT, and Advanced Placement tests.

With the large number of data collection instruments, it is very apparent of the study's attempt to gather as much information as possible concerning student achievement and educational experiences. Perspectives of the educational process were considered from students, parents, teachers, administrators, and dropouts of the education process. Each was considered to contribute valuable information to the understanding of the current status of our nation's educational system and progress.
Data Collection

The data collected for the NELS:88 study has been done in three waves, base year, first follow-up, and second follow-up. Each wave of data collection was preceded by pre-data collection activities. The pre-data collection activities included the obtainment and retention of school permission to come to the school, the establishment of a date for the on site data collection, and the tracking of sample members as they moved from school to school. For each school that was a participant in the study, a school coordinator was selected by the Principal and the school coordinator worked with the data collection team to establish the date for data collection and to arrange for facility requests that had to be made. The coordinator also examined the student sample list looking for students who had physical or learning disabilities that would preclude their participation in the study. The coordinator also classified the participating students by ethnic considerations to lessen the possibility of error when making analysis based on ethnic background.

On the day the on-site data collection took place, students who were participants in the study would go to a designated room. The student survey was completed first and, after a break, the timed tests of the cognitive battery would then be given. Student surveys and tests were examined for possible errors prior to the student's exit from the test room. Any missed, or improperly completed items were brought to the student's attention and an attempt was made to solicit the proper information. At the completion of the on-site data collection, arrangements were made to conduct a make up session for those students who had missed the survey session. The on-site data collection took place during the spring semester of each year of which the study was collecting data. The exception to this was during the third wave of collection. A supplement survey was given in October of 1991 for sample members who were going to graduate a semester early in comparison to the rest of the seniors who would graduate in May or June of 1992. The completion rates for each wave of data collection are listed in Table 1.
Every attempt was made to collect information from students, teachers, parents, dropouts, and administrators. Phone interviews were conducted with the sample members which did not respond during the on-site data collection or

Table 1. Percent completion rates of instruments during data collection.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Base Year</th>
<th>2nd Wave</th>
<th>3rd Wave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student questionnaire</td>
<td>93.05</td>
<td>94.1</td>
<td>92.5</td>
</tr>
<tr>
<td>Student tests</td>
<td>96.35</td>
<td>95.23</td>
<td>78.8</td>
</tr>
<tr>
<td>Dropout questionnaire</td>
<td>NA</td>
<td>89.84</td>
<td>87.6</td>
</tr>
<tr>
<td>Dropout tests</td>
<td>NA</td>
<td>50.05</td>
<td>40.3</td>
</tr>
<tr>
<td>School questionnaire</td>
<td>98.38</td>
<td>97.0</td>
<td>97.6</td>
</tr>
<tr>
<td>Parent questionnaire</td>
<td>92.08</td>
<td>NA</td>
<td>93.2</td>
</tr>
<tr>
<td>Teacher questionnaire</td>
<td>94.26</td>
<td>87.31</td>
<td>90.7</td>
</tr>
</tbody>
</table>

by a returned questionnaire. Off-campus test sites were established for study participants who did not take the tests at their school or their school would not participate and for dropouts that had been contacted for the second and third wave of data collection. Face to face interviews were also used to gather information from the participants.

Data Analysis

The information from the student survey and cognitive battery tests was scanned with an optical reader to convert the written responses from paper form to an electronic medium or computer file. During the scanning process, improper response to instrument items were flagged by the machine and those instruments were hand checked to determine the usefulness of the responses and, when ever possible, the correct marking of the instrument would be keyed. The data process for this study
adhered to the basic processes that had been used in the two previous longitudinal studies. Frequency distributions of responses were conducted both before and after the editing process. This allowed the staff to verify the accuracy of the recoding of response items that were coded incorrectly originally by the respondents. Once the responses had been scanned, edited, and accuracy verified, variable names were given to each of the response items that would allow the data to be analyzed by statistical packages such as SPSS-X or SAS. Due to the large amount of data from each wave of collection for this study, the data was transferred to a CD-ROM disk to allow for transport of the data to any interested party who wanted to analyze one or more parts of it. Provided with the data were Word Perfect text files which contained various user manuals to clarify the procedures of the NELS:88 study.

To analyze the data for this specific study, the statistical package SPSS-X for Windows was used. The data from the CD-ROM was copied onto the hard drive of an IBM 486 personal computer. With this system, the data can be read and the appropriate variables be selected and subjected to the appropriate statistical analyses to answer the objectives of this study.

Hypotheses

Statistical analyses were done to test this study's hypotheses to determine whether the researcher rejects or fails to reject the hypotheses. The hypotheses are the following:

1. There will be no difference in the frequency distribution for program track among the urban, suburban, and rural student groups.

2. There will be no difference in the frequency distribution for participation in team sports among the urban, suburban, and rural student groups.

3. There will be no difference in the frequency distribution for participation in cheerleading among the urban, suburban, and rural student groups.

4. There will be no difference in the frequency distribution for participation in vocational
clubs among the urban, suburban, and rural student groups.

5. There will be no difference in the frequency distribution for participation in academic clubs among the urban, suburban, and rural student groups.

6. There will be no difference in the frequency distribution for participation in music groups among the urban, suburban, and rural student groups.

7. There will be no difference for the mean number of Carnegie math units taken among the twelfth-grade urban, suburban, and rural student groups.

8. There will be no difference for the mean number of Carnegie science units taken among the twelfth-grade urban, suburban, and rural student groups.

9. There will be no difference for the mean number of Carnegie English units taken among the twelfth-grade urban, suburban, and rural student groups.

10. There will be no difference for the mean number of Carnegie social studies units taken among the twelfth-grade urban, suburban, and rural student groups.

11. There will be no difference for the mean number of Carnegie computer science units taken among the twelfth-grade urban, suburban, and rural student groups.

12. There will be no difference for the mean number of Carnegie foreign language units taken among the twelfth-grade urban, suburban, and rural student groups.

13. There will be no difference in the frequency distribution of math proficiency levels among the urban, suburban, and rural student groups.

14. There will be no difference in the frequency distribution of science proficiency levels among the urban, suburban, and rural student groups.

15. There will be no difference in the frequency distribution of reading proficiency levels among the urban, suburban, and rural student groups.
16. There will be no difference in the group mean math score among the twelfth-grade urban, suburban, and rural student groups.

17. There will be no difference in the group mean science score among the twelfth-grade urban, suburban, and rural student groups.

18. There will be no difference in the group mean reading comprehension score among the twelfth-grade urban, suburban, and rural student groups.

19. There will be no difference in the group mean history score among the twelfth-grade urban, suburban, and rural student groups.

20. There will be no linear relationship between selected student factors and student grade point average.

21. There will be no grade point average prediction equation of selected student factors.
CHAPTER IV.

FINDINGS

The purpose of this study has been divided into three objectives.

1. To describe and compare the academic courses taken and participation in school related activities by rural, urban, and suburban students.

2. To determine and compare the academic achievement as measured by cognitive tests, of rural, urban, and suburban students.

3. To determine the strength and type of relationship between selected student factors and academic achievement, as measured by grade point average, and to model an equation which can predict the student's academic achievement.

The research questions for the study parallel the study's objectives. The first question desired to be answered by this study was: Does a difference in course taking patterns and participation in school related activities exist between students educated in a rural school setting and those who are not (urban and suburban)? Secondly, was there a difference in academic achievement as measured by cognitive tests among rural, urban, and suburban students? Lastly, what was the strength of, and type of, relationship between student factors and academic achievement as measured by grade point average?

To determine if the research satisfied the research objectives, the information on the CD-ROM data disk was analyzed by the statistical package SPSS for Windows. Frequencies, means, standard deviations, t-tests, and analysis of variance were used to analyze the data and answer the research questions provided as objectives of the study.

Demographic Data

Demographic data were collected to describe the sample of students which were in the research study. The first demographic variable provided the distribution of the sample into the three urbanicity
categories. As noted in Table 2, 28.3 percent of the sample attended a school which was located in a rural area. Schools located in the suburban area constituted 36.1 percent of the sample and the remaining 26.9 percent of the sample were enrolled in schools located in urban areas.

To describe the type of educational programs the respondents have undertaken in their respective high schools, a variable for program track was selected. The variable representing the school program the student was in was configured from the courses listed on the student's transcript. There were six possible responses which could have resulted from the information on the student's transcript. First was rigorous academic track. Secondly, was academic track followed by the third possibility which was vocational track. The fourth possibility was vocational/rigorous academic. Possibility number five was academic/vocational and the sixth possible response was none of the above.

A crosstabs frequency analysis was conducted to the program track variable and urbanicity variable to determine the number and percentages of the respondents across the possible combinations of high school program and locality of the high school. A Chi square statistic was also calculated to determine if the resulting frequency distribution was equally distributed across the categories. Author Marija Norris, (1988) stated in the SPSS-X Introductory Statistics Guide that two variables are by definition independent if the probability that a case falls into a given cell is simply the product of the marginal probabilities of the two categories defining the cell. An adjusted residual was calculated for each cell and any cell which had an adjusted residual value of two or more is considered a contributor to the significant Chi square statistic.

Table 2. Frequency distribution for urbanicity of school location

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-urban</td>
<td>5699</td>
<td>26.9</td>
<td>26.9</td>
<td>26.9</td>
</tr>
<tr>
<td>2-suburban</td>
<td>7642</td>
<td>36.1</td>
<td>36.1</td>
<td>63.0</td>
</tr>
<tr>
<td>3-rural</td>
<td>5993</td>
<td>28.3</td>
<td>28.3</td>
<td>91.2</td>
</tr>
<tr>
<td>8-missing</td>
<td>1854</td>
<td>8.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The results of the crosstabs analysis are shown in Table 3. The null hypothesis that there would be no difference in the frequency distribution for program track among urban, suburban, and rural student groups is rejected. Of the students enrolled in urban schools, 19.4 percent showed a rigorous academic program track, while 50.2 percent were enrolled in an academic track. Only 3.7 percent of the urban students were in a vocational track and .8 and 4.4 percent were in the vocational/rigorous track and academic/vocational track respectively.

Of the students enrolled in suburban schools, 19.3 percent showed a rigorous academic program track, while 47.7 percent were enrolled in an academic track. Only 5.5 percent of the suburban students were in a vocational track and .6 and 6.1 percent were in the vocational/rigorous track and academic/vocational track respectively.

Of the students enrolled in rural schools, 15.7 percent showed a rigorous academic program track, while 44.3 percent were enrolled in an academic track. Only 7.8 percent of the rural students were in a vocational track and .8 and 8.5 percent were in the vocational/rigorous track and academic/vocational track respectively.

Table 3. Distribution of program tracks by urbanicity

<table>
<thead>
<tr>
<th>Program Track</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1</td>
<td>19.4</td>
<td>50.2</td>
<td>3.7</td>
<td>.8</td>
<td>4.4</td>
</tr>
<tr>
<td>Suburban</td>
<td>2</td>
<td>19.3</td>
<td>47.7</td>
<td>5.5</td>
<td>.6</td>
<td>6.1</td>
</tr>
<tr>
<td>Rural</td>
<td>3</td>
<td>15.7</td>
<td>44.3</td>
<td>7.8</td>
<td>.8</td>
<td>8.5</td>
</tr>
<tr>
<td>missing</td>
<td>8</td>
<td>.7</td>
<td>10.1</td>
<td>4.2</td>
<td>.7</td>
<td>84.3</td>
</tr>
</tbody>
</table>

1=rigorous academic, 2=academic, 3=vocational, 4=rigorous academic/vocational, 5=academic/vocational, 6=none of the above
* bolded values indicate cells which contributed to the significant Chi square statistic
Student Participation in Extra and Intra-Curricular Activities

To describe the participation of the sample members in extra- and intra-curricular school related activities, eight variables were selected. The eight variables represented the student’s participation in team sports, cheerleading, vocational clubs, academic clubs, and music groups.

The possible responses for the variable team sport were the following:

- school does not have
- did not participate
- participated on a junior varsity team
- participated on a varsity team
- participated as a captain or co-captain on any team.

The results of the crosstabs and Chi square procedures between team sport and urbanicity are shown in Table 4. The null hypothesis that there would be no difference in the frequency distribution for participation in team sports among urban, suburban, and rural student groups was rejected. Of the students enrolled in urban schools, 1.7 percent responded that their school did not have team sports, while 63.2 percent responded that they did not participate. Only 2.5 percent of the urban students had participated on a junior varsity team, while 14.8 percent responded that they participated on a varsity team sport. Nine percent responded that they had served as a co-captain or captain of any team.

Of the students enrolled in suburban schools, 1.7 percent responded that their school does not have team sports, while 60.2 percent responded that they did not participate. Only 2.5 percent of the suburban students had participated on a junior varsity team, while 16.5 percent responded that they participated on a varsity team sport. A total of 10.3 percent responded that they had served as a co-captain or captain of any team.

Of the students enrolled in rural schools, 1.1 percent responded that their school did not have team sports, while 62.3 percent responded that they did not participate. Only 2.1 percent of the rural
students had participated on a junior varsity team, while 16.6 percent responded that they participated on a varsity team sport. In addition, 11.5 percent responded that they had served as a co-captain or captain of any team.

Urbanicity was divided into urban, suburban, and rural schools. The other possible value for urbanicity variable was missing. The category represented respondents who were out of the country, or enrollment status was unknown. This fraction of respondents equaled only 2.5 percent of the respondents for the variable team sport. An unknown enrollment status was not of importance to the research questions of this study and is not reported in the findings or discussion sections of this study.

The next variable for student participation that was selected was cheerleader. The results of the crosstabs analysis and Chi square between the variables cheerleader and urbanicity are shown in Table 5. The null hypothesis that there would be no difference in the frequency distribution for participation in cheerleading among urban, suburban, and rural student groups was rejected. Of the students enrolled in urban schools, 7.6 percent responded that their school did not have a cheerleading program, while 75.6 percent responded that they did not participate. Only .6 percent of the urban students had participated on a junior varsity squad, while 3.4 percent responded that they participated on a varsity team squad. A total of 2.3 percent responded that they had served as a co-captain or captain of the cheerleader squad.

Table 4. Student participation in team sports by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Team Sport</th>
<th>Does not have</th>
<th>No participation</th>
<th>Junior Varsity</th>
<th>Varsity</th>
<th>Team Leader</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1.7</td>
<td>63.2</td>
<td>2.5</td>
<td>14.8</td>
<td>9.0</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>Suburban</td>
<td>1.7</td>
<td><strong>60.2</strong></td>
<td>2.5</td>
<td>16.5</td>
<td>10.3</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>1.1</td>
<td>62.3</td>
<td><strong>2.1</strong></td>
<td><strong>16.6</strong></td>
<td><strong>11.5</strong></td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic
Table 5. Student participation in cheerleading by urbanicity.

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Does not have</th>
<th>No participation</th>
<th>Junior Varsity</th>
<th>Varsity</th>
<th>Team Leader</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>7.6</td>
<td>75.6</td>
<td>.6</td>
<td>3.4</td>
<td>2.3</td>
<td>10.5</td>
</tr>
<tr>
<td>Suburban</td>
<td>4.8</td>
<td>77.8</td>
<td>.4</td>
<td>3.4</td>
<td>2.6</td>
<td>10.9</td>
</tr>
<tr>
<td>Rural</td>
<td>2.1</td>
<td>82.1</td>
<td>.5</td>
<td>4.4</td>
<td>3.0</td>
<td>7.9</td>
</tr>
</tbody>
</table>

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

Of the students enrolled in suburban schools, 4.8 percent responded that their school did not have cheerleading, while 77.8 percent responded that they did not participate. Only .4 percent of the suburban students had participated on a junior varsity squad, while 3.4 percent responded that they participated on a varsity team squad. In addition, 2.6 percent responded that they had served as a co-captain or captain of any cheerleading squad.

Of the students enrolled in rural schools, 2.1 percent responded that their school does not have cheerleading, while 82.1 percent responded that they did not participate. Only .5 percent of the rural students had participated on a junior varsity squad, while 4.4 percent responded that they participated on a varsity team squad. Three percent responded that they had served as a co-captain or captain of any squad.

A variable was selected which measured the respondents participation in program related student vocational clubs. Examples of the student clubs were FFA, Future Teachers of America, Future Homemakers of America and other vocational education clubs. The possible responses to the question of student participation in these clubs were similar to those for participation in a team sport. The student could respond that he/she participated as an officer of the club rather than as a captain or co-captain. The results of the crosstabs and Chi square procedures for the variables school clubs and urbanicity are shown in Table 6. The null hypothesis that there would be no difference in the frequency
Table 6. Student participation in vocational clubs by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Does not have</th>
<th>No participation</th>
<th>Participated</th>
<th>Club Leader</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>15.8</td>
<td>65.4</td>
<td>8.0</td>
<td>2.4</td>
<td>8.3</td>
</tr>
<tr>
<td>Suburban</td>
<td>11.1</td>
<td>68.1</td>
<td>8.9</td>
<td>3.4</td>
<td>8.5</td>
</tr>
<tr>
<td>Rural</td>
<td>5.8</td>
<td>62.4</td>
<td>18.4</td>
<td>7.4</td>
<td>5.9</td>
</tr>
</tbody>
</table>

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

distribution for participation in vocational clubs among urban, suburban, and rural student groups was rejected.

Of the students enrolled in urban schools, 15.8 percent responded that their school did not have vocational clubs such as those listed as the examples, while 65.4 percent responded that they did not participate. Only 8 percent of the urban students participated in a vocational club, while 2.4 percent responded that they had participated as a leader or officer of the club.

Of the students enrolled in suburban schools, 11.1 percent responded that their school did not have vocational clubs such as those listed as the examples, while 68.1 percent responded that they did not participate. Only 8.9 percent of the suburban students participated in a vocational club, while 3.4 percent responded that they had participated as a leader or officer of the club.

Of the students enrolled in rural schools, 5.8 percent responded that their school did not have vocational clubs such as those listed as the examples, while 62.4 percent responded that they did not participate. Only 18.4 percent of the rural students participated in a vocational club, while 7.4 percent responded that they had participated as a leader or officer of the club.

Participation by students in academic clubs was also selected to be analyzed. Academic clubs consists of those clubs that stress academic achievement and competition. Examples are computer, engineering, debate, math, science, and other academic subject areas as well. The results of the crosstabs and Chi square procedures for the variables academic club and urbanicity are shown in Table.
7. The null hypothesis that there would be no difference in the frequency distribution for participation in academic clubs among urban, suburban, and rural student groups was rejected.

Of the students enrolled in urban schools, 3.6 percent responded that their school did not have academic clubs such as those listed as the examples, while 63.7 percent responded that they did not participate. A total of 19.5 percent of the urban students participated in an academic club, and 4.9 percent responded that they had participated as a leader or officer of the club.

Table 7. Student participation in academic clubs by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Does not have</th>
<th>No participation</th>
<th>Particpated</th>
<th>Club Leader</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>3.6</td>
<td>63.7</td>
<td>19.5</td>
<td>4.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Suburban</td>
<td>4.0</td>
<td>64.1</td>
<td>19.4</td>
<td>3.9</td>
<td>8.5</td>
</tr>
<tr>
<td>Rural</td>
<td>6.3</td>
<td>63.5</td>
<td>20.4</td>
<td>4.0</td>
<td>5.9</td>
</tr>
</tbody>
</table>

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

Of the students enrolled in suburban schools, 4 percent responded that their school did not have academic clubs such as those listed as the examples, while 64.1 percent responded that they did not participate. Only 19.4 percent of the suburban students participated in an academic club, while 3.9 percent responded that they had participated as a leader or officer of the club.

Of the students enrolled in rural schools, 6.3 percent responded that their school did not have academic clubs such as those listed as the examples, while 63.5 percent responded that they did not participate. A total of 20.4 percent of the rural students participated in an academic club, while 4 percent responded that they had participated as a leader or officer of the club.

Opportunities for and participation in fine arts type activities was also selected for analysis. Student participation in music groups such as band, orchestra, chorus, and other music groups was determined by selecting the variable music. The crosstabs and Chi square procedures were conducted
between the variables music and urbanicity. The results shown in Table 8 allow the researcher to reject the null hypothesis that there would be no difference in the frequency distribution for participation in music groups among urban, suburban, and rural student groups was rejected.

Of the students enrolled in urban schools, 2.1 percent responded that their school did not have music groups such as those listed as the examples, while 72.6 percent responded that they did not participate. Only 12.9 percent of the urban students participated in a music group, while 4.3 percent responded that they had participated as a leader or officer of the group.

Of the students enrolled in suburban schools, 1.5 percent responded that their school did not have music groups such as those listed as the examples, while 72.2 percent responded that they did not participate. Only 11.5 percent of the suburban students participated in a music group, while 6.4 percent responded that they had participated as a leader or officer of the group.

Of the students enrolled in rural schools, 1.9 percent responded that their school did not have music groups such as those listed as the examples, while 70.6 percent responded that they did not participate. Only 15.1 percent of the rural students participated in a music group, while 6.7 percent responded that they had participated as a leader or officer of the group.

Table 8. Student participation in music groups by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Does not have</th>
<th>No participation</th>
<th>Participated</th>
<th>Club Leader</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>2.1</td>
<td>72.6</td>
<td>12.9</td>
<td>4.3</td>
<td>8.1</td>
</tr>
<tr>
<td>Suburban</td>
<td>1.5</td>
<td>72.2</td>
<td>11.5</td>
<td>6.4</td>
<td>8.3</td>
</tr>
<tr>
<td>Rural</td>
<td>1.9</td>
<td>70.6</td>
<td>15.1</td>
<td>6.7</td>
<td>5.7</td>
</tr>
</tbody>
</table>

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

Comparison of Courses Taken

A second aspect of the first research objective was to determine the number of courses taken by the sample of students of the research study. Comparisons between the urbanicity of the schools where
the students were enrolled were made of the number of courses taken by the students. The mean number of Carnegie units taken by the student of the different courses was the variable utilized for this analysis. A one-way analysis of variance was performed to determine if one group's mean number of units was different from the mean of another group. The groups were urban, suburban, and rural. If the group means were found to be different, then a Scheffe' test was performed to determine between what groups the difference existed. The summary of the one-way analysis of variance procedure is shown in Table 9.

The mean number of Carnegie math units taken by grade 12 students of urban schools was 3.04. The second highest mean for number of Carnegie math units was the suburban students with a mean number of units of 3.00. The rural students had a group mean of 2.84 math units. The one-way analysis of variance found the means of the three groups to be significantly different. The Scheffe' test indicated the difference between the mean number of Carnegie math units to be between the rural and the suburban and also between the rural and the urban students. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups' mean number of Carnegie math units taken was rejected.

The highest group mean for number of science Carnegie units was the suburban group which had a mean number of science units of 2.79. The urban students' mean of 2.74 science units was the next highest. The rural students' mean number of science units was 2.64. The one-way analysis of variance indicated a difference did exist between the group means. The difference found by the Scheffe' test was between the rural and the urban students and also between the rural and the suburban students. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups' mean number of Carnegie science units taken was rejected.
Table 9. Analysis of variance results for mean Carnegie units taken by urbanicity of respondent

<table>
<thead>
<tr>
<th>Course</th>
<th>Urban mean</th>
<th>Suburban mean</th>
<th>Rural mean</th>
<th>F Ratio</th>
<th>F Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>3.04</td>
<td>2.89</td>
<td>2.84</td>
<td>39.86</td>
<td>.00</td>
</tr>
<tr>
<td>Science</td>
<td>2.74</td>
<td>2.79</td>
<td>2.64</td>
<td>23.35</td>
<td>.00</td>
</tr>
<tr>
<td>English</td>
<td>3.74</td>
<td>3.73</td>
<td>3.70</td>
<td>1.34</td>
<td>.26</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.14</td>
<td>3.24</td>
<td>3.08</td>
<td>29.05</td>
<td>.00</td>
</tr>
<tr>
<td>Computer Science</td>
<td>0.39</td>
<td>0.35</td>
<td>0.42</td>
<td>24.53</td>
<td>.00</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>1.97</td>
<td>1.80</td>
<td>1.23</td>
<td>367.34</td>
<td>.00</td>
</tr>
</tbody>
</table>

There was no difference among the three different groups urban, suburban, and rural for the mean number of English Carnegie units taken. The mean number of units for the urban group was 3.7364, suburban’s group mean was 3.7255, and the mean number of English units for the rural group was 3.6970. The one-way analysis of variance indicated no significant difference among the three group means. Therefore, the null hypothesis was not rejected.

The highest group mean for number of social studies Carnegie units was the suburban group which had a mean number of social studies units of 3.24. The urban students’ mean of 3.14 social studies units was the next highest. The rural students’ mean number of social studies units was 3.08. The one-way analysis of variance indicated a difference did exist among the group means. The difference found by the Scheffe’ test was between the rural and the urban students and also between the rural and the suburban students. The Scheffe’ test also found a difference between the urban students and the suburban students. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups’ mean number of Carnegie social studies units taken was rejected.

The highest group mean for number of computer science Carnegie units was the rural group which had a mean number of computer science units of .42. The urban students’ mean of .39 computer science units was the next highest. The suburban students’ mean number of computer science units
was .35. The one-way analysis of variance indicated a difference did exist among the group means.
The difference found by the Scheffe's test was between the rural and the urban students, between the
rural and the suburban students and also between the urban and suburban group means for the number
of Carnegie computer science units taken. The one-way analysis of variance statistical procedure
indicated a significant difference at the .05 level among the three groups. Therefore, the null
hypothesis that there is no difference among the urban, suburban, and rural student groups' mean
number of Carnegie computer science units taken was rejected.

The highest group mean for number of foreign language Carnegie units was the urban group
which had a mean number of foreign language units of 1.97. The suburban students' mean of 1.80
foreign language units was the next highest. The rural students' mean number of foreign language
units was 1.23. The one-way analysis of variance indicated a difference did exist among the group
means. The difference found by the Scheffe's test was between the rural and the urban students,
between the rural and the suburban students and also between the urban and suburban group means for
number of foreign language Carnegie units taken. The one-way analysis of variance statistical
procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null
hypothesis that there is no difference among the urban, suburban, and rural student groups' mean
number of Carnegie foreign language units taken was rejected.

Comparison of Academic Achievement by Proficiency Level

The second research objective of this study was to determine if there was a difference in
academic achievement among rural, urban, and suburban students. To determine if a difference in
academic achievement existed the researcher selected variables from the sample data which
corresponded to academic achievement scores on cognitive tests. The scores on the cognitive tests were
also used to determine the proficiency level of the respondent in the areas of math, reading, and science.

A description of the proficiency levels follows:

| Reading Level 1 | Simple reading comprehension including reproduction of detail and/or the author’s main thought. |
| Reading Level 2 | Ability to make relatively simple inferences beyond the author’s main thought and/or understand and evaluate relatively abstract concepts. |
| Reading Level 3 | Ability to make complex inferences or evaluative judgments that require piecing together multiple sources of information from the passage. |
| Math Level 1   | Simple arithmetical operations on whole numbers: essentially single step operations which rely on rote memory. |
| Math Level 2   | Simple operations with decimals, fractions, powers, and roots. |
| Math Level 3   | Simple problem solving, requiring the understanding of low level mathematical concepts. |
| Math Level 4   | Understanding of intermediate level mathematical concepts and/or having the ability to formulate multi-step solutions to word problems. |
| Math Level 5   | Proficiency in solving complex multi-step word problems and/or the ability to demonstrate the knowledge of mathematics material found in advanced mathematics courses. |
| Science Level 1 | Understanding of everyday science concepts; “common knowledge” that can be acquired in everyday life. |
| Science Level 2 | Understanding of fundamental science concepts upon which more complex science knowledge can be built. |
| Science Level 3 | Understanding of relatively complex scientific concepts; typically requiring an additional problem solving step. |

The crosstabs statistical procedure with a calculated Chi square statistic was conducted to determine the distribution of the sample across the three reading, science, and five math proficiency levels. The respondents were divided into three groups based on the urbanicity of their school in which they were enrolled. The three groups are the same as they have been for the previous statistical analysis, urban, suburban, and rural.

The possible responses for math proficiency are the following:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>“below level 1”</td>
</tr>
<tr>
<td>1</td>
<td>“level 1”</td>
</tr>
<tr>
<td>2</td>
<td>“level 2”</td>
</tr>
</tbody>
</table>
The results of the crosstabs and Chi square procedures for the variables math proficiency and urbanicity are shown in Table 10. The null hypothesis that there will be no difference in the frequency distribution of math proficiency levels among the urban, suburban, and rural student groups was rejected.

The urban students had 4.1 percent which were at a proficiency level of zero and 12.8 percent had a math proficiency of level 1. A total of 7.3 percent of the urban students had a proficiency level of 2 and 14.4 percent had a level 3 proficiency. Twenty percent of the students had a math proficiency level of 4 which is the second highest and 4.6 percent functioned at the highest math proficiency level 5.

The suburban students had 4.1 percent which was at a proficiency level of zero and 11.3 percent had a math proficiency of level one. A total of 8.2 percent of the suburban students had a proficiency level of 2 and 15.2 percent had a level 3 proficiency. A total of 20.1 percent of the students had a math proficiency level of 4 which is the second highest level and 3.9 percent functioned at the highest math proficiency level 5.

A total of 4.8 percent of the rural students were at a proficiency level of zero and 17.2 percent had a math proficiency of level one. A total of 10.2 percent of the rural students had a proficiency level of 2 and 17.0 percent had a level 3 proficiency. A total of 16.9 percent of the students had a math proficiency level of 4 which is the second highest level and 1.8 percent functioned at the highest math proficiency level 5.
Table 10. Distribution of math proficiency by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1</td>
<td>4.1</td>
<td>12.8</td>
<td>7.3</td>
<td>14.4</td>
<td>20.0</td>
<td>4.6</td>
<td>7.2</td>
</tr>
<tr>
<td>Suburban</td>
<td>2</td>
<td>4.1</td>
<td>11.3</td>
<td>8.2</td>
<td>15.2</td>
<td>20.1</td>
<td>3.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Rural</td>
<td>3</td>
<td>4.8</td>
<td>17.2</td>
<td>10.2</td>
<td>17.0</td>
<td>16.9</td>
<td>1.8</td>
<td>9.0</td>
</tr>
<tr>
<td>missing</td>
<td>8</td>
<td>2.3</td>
<td>5.2</td>
<td>1.7</td>
<td>1.5</td>
<td>.5</td>
<td>.1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

\(0=\)below level, \(1=\)level 1, \(2=\)level 2, \(3=\)level 3, \(4=\)level 4, \(5=\)level 5, \(8=\)missing, \(9=\)test not complete

* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

The science area had only three levels of proficiency and the possible responses are the same as they were for the math proficiency level with the exclusion of number four and five response. The results of the crosstabs procedure for the variables science proficiency and urbanicity are shown in Table 11. The null hypothesis that there will be no difference in the frequency distribution of science proficiency levels among the urban, suburban, and rural student groups was rejected.

The urban students consisted of 11.0 percent which were at a proficiency level of 0 and 17.6 percent had a science proficiency of level 1. A total of 18.1 percent of the urban students had a proficiency level of 2 and 15.8 percent had a science proficiency level of 3.

The suburban students consisted of 9.8 percent which were at a proficiency level of 0 and 18.3 percent had a science proficiency of level 1. A total of 18.9 percent of the suburban students had a proficiency level of 2 and 16.0 percent had a science proficiency level of 3.

The rural students consisted of 12.7 percent which were at a proficiency level of 0 and 22.9 percent had a science proficiency of level 1. A total of 20.6 percent of the rural students had a proficiency level of 2 and 13.4 percent had a science proficiency level of 3.
Table 11. Distribution of science proficiency by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1</td>
<td>11.0</td>
<td>17.6</td>
<td>18.1</td>
<td>15.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Suburban</td>
<td>2</td>
<td>9.8</td>
<td>18.3</td>
<td>18.9</td>
<td>16.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Rural</td>
<td>3</td>
<td>12.7</td>
<td>22.9</td>
<td>20.6</td>
<td>13.4</td>
<td>7.5</td>
</tr>
<tr>
<td>missing</td>
<td>8</td>
<td>4.0</td>
<td>4.0</td>
<td>2.3</td>
<td>.7</td>
<td>2.2</td>
</tr>
</tbody>
</table>

0=below level, 1=level 1, 2=level 2, 3=level 3, 8=missing, 9=test not complete
* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic

The reading area consisted of only three levels of proficiency and the possible responses are the same as they were for the science proficiency level. The results of the crosstabs procedure for the variables reading proficiency and urbanicity are shown in Table 12. The null hypothesis that there will be no difference in the frequency distribution of the reading proficiency levels among the urban, suburban, and rural student groups was rejected.

The urban students consisted of 5.4 percent at a proficiency level of 0 and 20.2 percent at a reading proficiency of level 1. A total of 23.6 percent of the urban students were at a proficiency level of 2 and 18.4 percent were at a reading proficiency level of 3.

Table 12. Distribution of reading proficiency by urbanicity

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1</td>
<td>5.4</td>
<td>20.2</td>
<td>23.6</td>
<td>18.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Suburban</td>
<td>2</td>
<td>5.4</td>
<td>19.5</td>
<td>26.5</td>
<td>16.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Rural</td>
<td>3</td>
<td>6.4</td>
<td>25.7</td>
<td>28.0</td>
<td>13.4</td>
<td>3.5</td>
</tr>
<tr>
<td>missing</td>
<td>8</td>
<td>2.0</td>
<td>5.5</td>
<td>3.2</td>
<td>1.5</td>
<td>9</td>
</tr>
</tbody>
</table>

0=below level, 1=level 1, 2=level 2, 3=level 3, 8=missing, 9=test not complete
* table values are reported as percents
* bolded values indicate cells which contributed to the significant Chi square statistic
The suburban students consisted of 5.4 percent at a proficiency level of 0 and 19.5 percent at a reading proficiency of level 1. A total of 26.5 percent of the suburban students functioned at a proficiency level of 2 and 16.0 percent at a reading proficiency level of 3.

The rural students consisted of 6.4 percent which functioned at a proficiency level of 0 and 25.7 percent at a reading proficiency of level 1. A total of 28 percent of the rural students functioned at a proficiency level of 2 and 13.4 percent at a reading proficiency level of 3.

Comparison of Academic Achievement by Cognitive Test Scores

The results of the frequency distributions for the different proficiency levels of math, science, and reading, indicated the wide range of cognitive ability existed among the students in the schools studied. To accurately and adequately measure the achievement of the students and to compare the achievement of the students in groups against one another, a standardized test score was utilized. The student's raw score on the cognitive ability test was converted to a standardized score with a mean of 50 and the standard deviation of 10. The cognitive testing which took place during the second follow-up used tests which were of a different level of difficulty. The test the respondent received was based on their cognitive test performance during the base year when the student was in eighth-grade.

The variable selected to be used as the measurement of cognitive ability and to be compared across groups of students was the standard score for mathematics, science, reading comprehension, and history/citizenship/geography tests. The grouping variable was the variable urbanicity which divided the study's sample into urban, suburban, and rural subsets. The results of the one-way analysis of variance procedure for the cognitive test achievement comparisons are shown in Table 13.

The mean standard math score for the urban students was 66.32 compared to the mean standardized math score of the suburban students which was 66.48. The rural students' mean standardized math score was 61.42. The one-way analysis of variance indicated that a difference in the mean scores of the three groups was significant at the .05 level. The Scheffe' post-hoc test found the
difference to be between the group means of the rural group and the means of both the urban and suburban groups. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups' mean math score was rejected.

Table 13. Analysis of variance results for standardized student achievement scores by urbanicity of respondent.

<table>
<thead>
<tr>
<th>Test</th>
<th>Urban mean</th>
<th>Suburban mean</th>
<th>Rural mean</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>66.32</td>
<td>66.48</td>
<td>61.42</td>
<td>94.57</td>
<td>.00</td>
</tr>
<tr>
<td>Science</td>
<td>65.93</td>
<td>66.47</td>
<td>61.94</td>
<td>69.34</td>
<td>.00</td>
</tr>
<tr>
<td>Reading comprehension</td>
<td>66.19</td>
<td>65.99</td>
<td>61.30</td>
<td>85.61</td>
<td>.00</td>
</tr>
<tr>
<td>History/citizenship/</td>
<td>66.75</td>
<td>66.59</td>
<td>61.73</td>
<td>90.51</td>
<td>.00</td>
</tr>
<tr>
<td>geography</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The mean standard science score for the urban students was 65.93 compared to the mean standardized science score of the suburban students which was 66.47. The rural students' mean standardized science score was 61.94. The one-way analysis of variance indicated that a difference in the mean scores of the three groups was significant at the .05 level. The Scheffe' post-hoc test indicated the difference between the group means to be between the rural group mean and the mean of both the urban and suburban groups. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups' mean science score was rejected.

The mean standard reading comprehension score for the urban students was 66.19 compared to the mean standardized reading comprehension score of the suburban students which was 65.99. The rural students' mean standardized reading comprehension score was 61.30. The one-way analysis of
variance indicated that a difference in the mean scores of the three groups was significant at the .05 level. The Scheffe’ post-hoc test determined the difference among the group means to be between the rural group mean and the mean of both the urban and suburban groups. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups’ mean reading comprehension score was rejected.

The mean standard history/citizenship/geography score for the urban students was 66.75 compared to the mean standardized history/citizenship/geography score of the suburban students which was 66.59. The rural students’ mean standardized history/citizenship/geography score was 61.73. The one-way analysis of variance indicated that a difference in the mean scores of the three groups was significant at the .05 level. The Scheffe’ post-hoc test determined the difference among the group means to be between the rural group mean and the mean of both the urban and suburban groups. The one-way analysis of variance statistical procedure indicated a significant difference at the .05 level among the three groups. Therefore, the null hypothesis that there is no difference among the urban, suburban, and rural student groups’ mean history score was rejected.

The final research objective of this study was to determine the type and strength of relationship between the student’s academic achievement as measured by grade point average and selected student factors and to build an equation which would predict the student’s achievement based on these selected student factors. The variable selected to represent academic achievement was the student’s cumulative grade point average(GPA). The student’s GPA was selected, rather than one of the cognitive tests, because GPA represents a measurement which has been developed over an expanse of time rather than the results of one forty-minute examination. The selected student factors were chosen by the researcher on the basis of how well the factors “theoretically” fit with the previous variables selected
for the first and second research objective. The variables selected to represent the selected student factors were the following:

- hours spent on homework per week (hmwrkhrs);
- hours spent at work per week (jobhrs);
- how important a good education is to the student (impeduc);
- number of Carnegie math units taken (math);
- hours spent riding around per week (riding);
- number of Carnegie science units taken (science);
- student's self-concept (selfcon);
- social economic status (ses);
- what education level the student feels they will go to (st2far);
- number of hours per week spent on extra- and intra-curricular activities (xcurrhrs).

The variables for social economic status and student self-concept are composite variables which have been built by the respondent's answer to several other variables. The explanation of how they were derived may be found in Appendix B.

The results of the correlational test are shown in Table 14. Each of the selected student factors had a positive relationship with academic achievement, GPA and each of the student factors coefficient of relationship was significant at the .05 level. Therefore, the null hypothesis that there would be no linear relationship was rejected. The size of the relationships between GPA and the student factors was not large. The largest coefficient was .17 for the student factor of hours spent doing extra- and intra-curricular activities per week. The next largest coefficient was .17 for the number of hours spent doing homework per week. The smallest coefficient was .02 for the factor number of Carnegie math units taken by the student.
Table 14. Correlations between student factors and academic achievement as measured by GPA

<table>
<thead>
<tr>
<th>Student Factor</th>
<th>Coefficient</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMWRKHRS</td>
<td>.17</td>
<td>.000</td>
</tr>
<tr>
<td>JOBHRS</td>
<td>.03</td>
<td>.000</td>
</tr>
<tr>
<td>IMPEDUC</td>
<td>.05</td>
<td>.000</td>
</tr>
<tr>
<td>MATH</td>
<td>.02</td>
<td>.004</td>
</tr>
<tr>
<td>RIDING</td>
<td>.10</td>
<td>.000</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>.04</td>
<td>.000</td>
</tr>
<tr>
<td>SELFCON</td>
<td>.10</td>
<td>.000</td>
</tr>
<tr>
<td>SES</td>
<td>.11</td>
<td>.000</td>
</tr>
<tr>
<td>ST2FAR</td>
<td>.05</td>
<td>.000</td>
</tr>
<tr>
<td>XCURRHRS</td>
<td>.17</td>
<td>.000</td>
</tr>
</tbody>
</table>

To predict the students' academic achievement, the stepwise multiple regression procedure was conducted. The predictor or influence variables were the same variables that represented student factors for the correlational analysis as well. The results of the stepwise multiple regression are shown in Table 15. Thus, the null hypothesis was rejected by the researcher. The variables are listed in the table as they were entered into the regression equation. The number of extra-curricular hours correlated the highest with academic achievement and was selected first. The multiple correlation (R value) is the magnitude of relationship between the criterion variable and a predictor or combination of predictor variables. The R value squared is known as the coefficient of determination which expresses the amount of variance in the criterion variable which can be predicted from the predictor or combination of predictor variables. The R squared increment represents the additional variance in the criterion variable which can be explained by adding a new predictor variable to the regression equation. The R squared increment from step to step had to be significant at the .005 level for the SPSS statistical package to add another predictor variable to the regression equation. The variables in Table 15 are ordered in the sequence of greatest amount of academic achievement variance explained to the least amount of academic achievement variance explained.
Table 15. Stepwise multiple regression of influence variables on students' academic achievement

<table>
<thead>
<tr>
<th>Influence Variable</th>
<th>Beta</th>
<th>Multiple R</th>
<th>R2</th>
<th>R2 Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>XCURRHRS</td>
<td>.8083</td>
<td>.1667</td>
<td>.0278</td>
<td></td>
</tr>
<tr>
<td>HMWRKHRS</td>
<td>1.0597</td>
<td>.1738</td>
<td>.0302</td>
<td>.0042</td>
</tr>
<tr>
<td>IMPEDUC</td>
<td>9.2413</td>
<td>.1804</td>
<td>.0325</td>
<td>.0023</td>
</tr>
<tr>
<td>ST2FAR</td>
<td>1.0114</td>
<td>.1843</td>
<td>.0340</td>
<td>.0015</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>12.1834</td>
<td>.1880</td>
<td>.0354</td>
<td>.0014</td>
</tr>
<tr>
<td>SELFCON</td>
<td>.4133</td>
<td>.1905</td>
<td>.0363</td>
<td>.0009</td>
</tr>
</tbody>
</table>
CHAPTER V.
SUMMARY

Objectives

The objectives of this study are the following:

1. To describe and compare the academic courses taken and participation in school related activities by rural, urban, and suburban students;

2. To determine and compare the academic achievement, as measured by cognitive tests, of rural, urban, and suburban students;

3. To determine the strength and type of relationship between selected student factors and academic achievement, as measured by grade point average, and to model an equation which would predict the student’s academic achievement.

Population and Sample

The initial sample of the NELS:88 study were eighth-graders which represented the population of students in eighth-grade enrolled in schools across the United States. The sample was a two-stage stratified sample. The first stage of sampling represented the school unit and the second stage represented students. The target sample size for schools was 1,032. A pool of 1,032 schools was selected through stratified sampling with probability of selection proportional to the eighth-grade size. A random sampling process selected 26,432 eighth-graders from the pool of participating schools. The actual number of eighth-grade students which participated in the study was 24,599. The data set used by researcher was the public use version. To maintain the confidentiality of the participants and their identity, no identifying data were included with the public use data set.

Instruments

The data collection instruments were developed by personnel of, and contractors for, the Office of the National Center of Educational Statistics. Survey items were selected based on their usefulness in
predicting or explaining future outcomes that may be measured at a later point in time. The question items also were used to probe into new areas of educational policy concern and to reflect the directions educational theory might be taking. After the initial creation of the student, parent, teacher, and administrator instruments, a field test was conducted. The results of the field test highlighted problematic individual survey items and problematic questionnaire sections which had to be addressed through revamping of the instruments. The instrument developers calculated two types of error concerning the taking of, and the data interpretation from, the completed surveys. Type A error was defined as the "test taker" error, while type B error was defined as "clerical assistant" error, (data interpretation). After resolving the concerns which had arisen from the field test of the instruments, the survey items and their formats were deemed qualified to collect the information from the respondents which would meet the goals of the NELS:88 research effort.

Instrument Content

The content for the seven basic instruments which were completed during the second follow-up will be summarized here. To measure academic achievement, a cognitive test which consisted of four parts was given. The reading subtest contained five short reading passages with three to five questions about the content of each. Students were to demonstrate understanding of the meanings of words, identify parts of speech, interpret the author's perspective, and evaluate the passage as a whole.

The mathematics subtest included the following math abilities: graphs, word problems, equations, quantitative comparisons, and geometric figures. Some of the forty questions could be answered by the application of basic skills or knowledge, while others were intended to allow the student to demonstrate higher-order thinking skills.

Emphasis for the science subtest of the cognitive exam was placed on understanding the underlying concepts of the science field rather than the regurgitation of specific facts. The topics which were in the science subtest were life science, earth science, and physical science/chemistry.
The last subtest of the cognitive instrument was history/geography/citizenship. Important issues and events in the political and the economic history of the United States constituted the American history segment. Citizenship questions included the federal government and the rights and obligations of citizens of this country. Geography covered the settlement and food production shared by other societies as well as the United States.

Sample members also completed a student questionnaire in addition to the cognitive test. The student questionnaire consisted of 113 questions about a broad range of topics concerning the following: student background; language use; home environment; perceptions of self; occupational or post secondary educational plans; jobs; household chores; school experiences and activities; work; and social activities. The questionnaire was available in two languages, Spanish and English.

Data Analyses

The information from the student survey and cognitive battery tests was scanned with an optical reader to convert the written responses from paper form to an electronic medium or computer file. During the scanning process, improper responses to instrument items were flagged by the machine and those instruments were hand checked to determine the usefulness of the responses. Frequency distributions of responses were conducted both before and after the editing process. This allowed the staff to verify the accuracy of the recoding of response items that were coded incorrectly originally by the respondents. Once the responses had been scanned, edited, and accuracy verified, variable names were given to each of the response items to allow the data to be analyzed by statistical packages such as SPSS-X or SAS. Due to the large amount of data from each wave of collection for this study, the data was transferred to a CD-ROM disk to transport the data. Provided with the data were WordPerfect text files which contained various user manuals to clarify the procedures of the NELS:88 study.
To analyze the data for this specific study, the statistical package SPSS-X for Windows was used. The data from the CD-ROM was read by the electronic codebook which was copied to the hard drive of a personal computer. The data could then be read and the appropriate variables selected for the appropriate statistical analyses to answer the research objectives.

Demographic Data

The first statistical analysis was to determine the composition of the sample by urbanicity. Figure 1 shows the breakdown of the sample into the three groups based upon their urbanicity.

![Figure 1. Urbanicity of the sample](image)

It was of interest to the researcher to determine the type of educational program the respondents had undertaken in their respective high schools. There were five meaningful responses which resulted from the information on the student’s transcript. The results of the crosstabs and Chi square procedures are shown in Figure 2. The program track values were the following:

1- rigorous academic
2- general academic
3- vocational
4- vocational/academic
5- vocational/rigorous academic
The null hypothesis that there would be no difference in the distribution of program track among the urban, suburban, and rural student groups was rejected.

Student Participation in Extra and Intra-Curricular Activities

A summary of the crosstabs and Chi square procedures are shown in Figure 3. The null hypothesis that there would be no difference in participation in team sports among the three student groups was rejected.

Figure 2. Distribution of students across the five program tracks.

Figure 3. Participation in team sports by urbanicity
The next variable for student participation that was selected was cheerleader. Figure 4 below depicts the results of the crosstabs and Chi square analyses in a bar chart fashion. The null hypothesis that there would be no difference in participation in cheerleading among the three student groups was rejected.

Examples of the student vocational clubs were FFA, Future Teachers of America, Future Homemakers of America and other vocational education clubs. The bar chart in Figure 5 shows the results of the crosstabs and Chi square procedures. The null hypothesis that there would be no difference in the participation in student vocational clubs among the three student groups of urban, suburban, and rural was rejected.

Figure 4. Participation in cheerleading by urbanicity
Student participation in academic clubs was also part of this study. Academic clubs were those such as math, debate, and other clubs in which participation fosters academic learning. The results of the crosstabs and Chi square statistical analyses are shown in Figure 6. The results support the rejection of the null hypothesis which said there would be no difference in academic club participation among the urban, suburban, and rural student groups.
Opportunities for and participation in fine arts type activities was also analyzed. Student participation in music groups such as band, orchestra, chorus, and other music groups was determined. The bar chart if Figure 7 depicts the results of the crosstabs and Chi square analyses. The null hypothesis which was that there would be no difference in participation in music groups among the three student groups was rejected.

![Bar chart showing student participation in music groups by urbanicity](image)

**Figure 7.** Student participation in music groups by urbanicity

**Comparison of Courses Taken**

Comparisons between the urbanicity of the schools where the students were enrolled and the number of courses taken by the students was done by the utilization of one-way analysis of variance. If the group means for the mean number of Carnegie units for a specific subject were found to be different, then a Scheffe' test was performed to determine between what groups the significant difference existed.

The mean number of Carnegie math units taken by grade 12 students of urban schools was 3.04, suburban students 3.00 and rural students had a group mean of 2.84 math units. The means of the three groups were found to be significantly different. The Scheffe' test determined the differences to be
between the rural (2.84) and suburban (3.00) and also between the rural and the urban (3.04) students mean number of Carnegie math units taken. The null hypotheses, which stated there would be no difference among the three groups, was rejected.

The highest group mean for number of science Carnegie units was the suburban group which had a mean number of science units of 2.79, urban students 2.74 science units and rural students 2.64. A difference existed among the three group means and the significant difference was found to be between the rural and the urban students and also between the rural and the suburban students. The null hypotheses, which stated there would not be a difference among the three groups, was rejected.

Between the three different groups urban, suburban, and rural, there was no significant difference for the mean number of English Carnegie units taken. The mean number of units for the urban group was 3.74, suburban was 3.73, and the mean number of English units for the rural group was 3.70. Since no difference was indicated by the one-way analysis of variance procedure, the researcher failed to reject the null hypotheses.

The highest group mean for number of social studies Carnegie units was the suburban group which was 3.24. The urban students' mean was 3.14 and the rural students' mean was 3.08. The one-way analysis of variance indicated a significant difference existed among the group means. The significant difference was between the rural and the urban students and also between the rural and the suburban students. The Scheffe' test also found a significant difference between the urban and suburban students. The null hypotheses, which stated there would not be a difference among the three groups, was rejected.

The highest group mean for number of computer science Carnegie units was the rural group which had a mean .42 units followed by the urban students' mean of .39 and the suburban students' mean number of computer science units of .35. It was determined a difference did exist among the group means and the significant difference was between the rural and the urban students, between the
rural and the suburban students and also between the urban and suburban group means for the number of Carnegie computer science units taken. The null hypotheses, which stated there would not be a difference among the three groups, was rejected.

The highest group mean for number of foreign language Carnegie units was the urban group with 1.97 Carnegie units. The suburban students' mean was 1.80 and the rural students' mean number of foreign language units was 1.23. The one-way analysis of variance indicated a significant difference did exist among the group means. The significant difference was between the groups rural and urban and between the rural and suburban. A significant difference also existed between the urban and suburban group means for number of foreign language Carnegie units taken. The null hypotheses, which stated there would not be a difference among the three groups, was rejected.

Comparison of Academic Achievement by Proficiency Level

The second research objective of this study is to determine if there was a difference in academic achievement among rural, urban, and suburban students. The researcher selected variables from the sample data that corresponded to achievement scores on cognitive tests. The scores on the cognitive tests were used to determine the proficiency level of the respondent in the areas of math, science, and reading. A description of the proficiency levels were detailed in Chapter IV.

The results of the crosstabs and Chi square analyses for the distribution of the sample across the math proficiency levels is depicted by a bar chart in Figure 8. The null hypothesis that there would be no difference in the frequency distribution of math proficiency levels among the urban, suburban, and rural student groups was rejected. A greater percentage of the rural students functioned at the lower end of the proficiency scale and thus the inverse would be that fewer rural students functioned at the high end of the proficiency scale.
The results of the crosstabs and Chi square analyses for the distribution of the sample across the science proficiency levels is depicted by a bar chart in Figure 9. The null hypothesis that there would be no difference in the frequency distribution of science proficiency levels among the urban, suburban, and rural student groups was rejected. The pattern established by the math proficiency levels was reinforced by the results of the science proficiency levels. Fewer rural students function at the highest science level and more rural student function at the lowest science proficiency levels.

The results of the crosstabs and Chi square analyses for the distribution of the sample across the reading proficiency levels is depicted by a bar chart in Figure 10. The null hypothesis that there would be no difference in the frequency distribution of reading proficiency levels among the urban, suburban, and rural student groups was rejected. The previous pattern established by the math and science proficiency levels was supported by the results of the reading proficiency levels as well.
Comparison of Academic Achievement by Cognitive Test Scores

The student’s raw score on the cognitive ability test was converted to a standardized score. The cognitive testing took place during the second follow-up and used tests of different difficulty levels. The test the respondent received was based on their cognitive test performance during the base year when the student was in eighth-grade.

The results of the one way analysis of variance indicated a significant difference existed between two groups’ mean test score. The bar chart shown in Figure 11 illustrates the mean score differences between the urban, suburban, and rural student groups. The rural student group’s mean score was significantly lower than both the urban and suburban student groups for all four tests. Subject 1 was the math test. Subject 2 was the science test. Subject 3 was the reading comprehension test and test number 4 was the history/citizenship/geography test. The null hypotheses, which stated there would not be a difference among the three groups’ mean score, was rejected for all four subject areas.

Figure 10. Reading proficiency level distribution by urbanicity
The third research objective was to determine the type of, and strength of, relationships between selected student factors and their respective academic achievement as measured by their cumulative grade point average (GPA). Ten student factors were selected to be correlated to the student's GPA. They were the following: hours spent on homework per week (hmwrkhrs); hours spent at work per week (jobhrs); how important a good education is to the student (impeduc); number of carnegie math units taken (math); hours spent riding around per week (riding); number of carnegie science units taken (science); student's self-concept (selfcon); social economic status (ses); what education level the student feels they will go to (st2far); number of hours per week spent on extra and intra-curricular activities (xcurrhrs).

The coefficient of correlation ranged from a high of .17 to a low of .02. All ten variables and their coefficients were significant at the .05 level. Thus, the null hypothesis was rejected.

The third research objective also sought to build a model equation which would predict the students' GPA. The same ten variables were used in a stepwise multiple regression model. The regression procedure selected six of the ten variables to be included in the equation that would predict the students' GPA. Those variables were entered into the equation in the following order: number of hours per week spent on extra and intra-curricular activities (xcurrhrs); hours spent on homework per
week (hmwrkhrs); how important a good education is to the student (impeduc); what education level the
student feels they will go to (st2far); number of carnegie science units taken (science); student's self-
concept (selfcon);

The amount of variance in the students' GPA that could be explained by the predictor variables of the regression equation was .04. The null hypothesis was rejected.
CHAPTER VI.
DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

The first statistical procedures used to analyze the data described the sample of the study. Specifically, the breakdown of the sample’s urbanicity of the participating respondents, and the type of secondary educational track the participants were completing was described. The likelihood that a school was selected for inclusion in the study was proportional to the number of similar schools that existed. As a result, the sample contained more suburban schools and students classified as “suburban”. The largest number of school districts in the United States would be suburban with the number of rural and urban schools being nearly equal.

The results of the type of secondary educational track that the students were completing exhibited similar percentages of students in each of the five possible tracks. The frequency distribution showed that fewer rural students were in a rigorous academic track and academic track. The rural student group had the highest percentage of students embarking on a vocational track and the academic/vocational track.

The first research objective was to describe and compare the academic courses taken, and participation in, school related activities by urban, suburban, and rural students. The non-participation rate of the students for team sports was nearly equal across all three urbanicity groups. When student participation was compared for cheerleading, two concerns were indicated by the frequency distribution. First, urban students responded more frequently that their school did not have cheerleading. Thus, if the opportunity did not exist, the student could not choose to participate. The rural students responded with the lowest frequency, that their school did not have cheerleading. They also had the highest non-participation response for this activity. The high rate of non-participation,
when compared to the other two groups could be the result of the students, with their limited time, are already involved in other extra- or intra-curricular activities.

Student participation in vocational clubs exhibited the greatest difference in participation among the three groups of urban, suburban, and rural students. There was a 10 percent difference between urban and rural students, urban having the higher percent of did not have responses. The non-participation response were nearly equal across the three groups although rural was again the lowest. The participation rate was larger for the rural students in comparison to the other two groups. More than twice as many rural students responded that they participated in a group or as a group leader. The participation response could be related to the larger number of rural students who are in the process of completing a vocational program track. It is apparent that rural students have the opportunity to participate in such vocational clubs and the data show that they do to higher degree than urban or suburban students. The specific advantages of vocational club participation was not a research objective of this study, but as the regression model indicated, participation in extra-curricular activities is a positive, contributing factor for academic achievement as measured by grade point average.

On the other end of the club participation spectrum was academic clubs such as math, debate, and others. Rural students had less opportunity to participate because fewer of their schools had academic clubs. However, the participation rate in academic club activities was the highest among rural students. The researcher concludes that rural students take advantage of club participation opportunities and that this is an asset to the rural school’s educational environment.

The last extra- or intra-curricular activity which was evaluated for student participation was fine arts (music). Again, the rural students participated at a slightly higher rate than that of the urban and suburban students. This finding supports the research conducted by Monk and Haller in which they state that rural schools foster participation because students feel like they are a greater part of the school.
To determine if course selection among the three groups of students was different, the researcher made comparisons between the number of Carnegie units. One Carnegie unit represents a class that meets for one hour per day for the entire school year. Of the subject areas and comparisons made, English units were the only ones that were the same across all three groups. Regardless of program track and urbanicity, English units completed were the same.

Because of the large size of the sample, a small difference between group means was determined to be significant. An approximate two-tenths of a point difference in the number of Carnegie math units taken between the rural group’s mean and the urban and suburban group means is not large but significant. The researcher concludes that the small difference could be attributed to the lower number of rural students who were completing a rigorous academic program track. Also, more rural students were in a vocational track where higher level math courses were less likely to be taken, thus an overall lesser group mean for the number of Carnegie math units taken by rural students. The same conclusion could be made for the number of Carnegie science units taken by students. Again, the rural group’s mean number of science units is slightly less than the other two groups. The argument for the aforementioned conclusion can be supported by a correlational test in which it would be found that the number of math and science units taken by a student correlates highly to one another. The researcher also concludes that smaller rural schools offer less number of science and math courses than larger schools. The article, “School Size and Program Comprehensiveness”, by Emil Haller showed evidence which supports this conclusion. Approximately 25 percent of small rural schools offer the basic science courses plus two additional elective science courses. However, nearly 75 percent of the larger schools offer the basic science courses plus two additional science electives. The same course offerings disparity exists with math courses as well.

An interesting outcome of this data analysis was the comparison of computer science units taken by the students of the three different groups. One might think that the suburban school districts with
their larger size and support would have the highest number of Carnegie computer science units. However, it was the rural group of students who had a group mean number of units significantly higher than both the urban and suburban group means. The suburban students took less computer science classes than either rural or urban students. One may conclude that the rural and urban schools put more emphasis on computer science and that type of technology, thus more students take a computer science class or classes. Computer science classes are generally linked closely to math courses, so one may generalize that students taking more math courses would also have more computer science classes. The results of this study do not support that generalization.

A significant difference among the groups also existed for the number of foreign language units taken. The urban group had the highest group mean of almost 2 units per student compared to the 1.8 and 1.2 units for the suburban and rural students respectively. It may be expected that urban students would take more foreign language units because of their schools diverse student body or larger number of course offerings. The urban school can be diverse in the number of cultures and languages which may be spoken by the students at school and at home. The rural students tend to be more homogeneous in their cultural mix and typically rural schools offer only one foreign language to study. In Haller's study, approximately 25 percent of the smaller schools offered more than one foreign language. In the larger sized schools of Haller's study, approximately 95 percent of the larger schools offered more than one foreign language.

The second research objective was to determine if there was a difference in academic achievement among the three groups. This determination was carried out in two ways. First, frequency distributions described the proficiency level of the three groups for reading, math, and science. Secondly, analysis of variance was conducted for the groups' mean score on a cognitive test.

The rural student group had the greatest number of students which functioned at the lower end of the proficiency scale for all three academic areas, math, science, and reading. Nearly fifty percent of
the rural students functioned at the lowest 3 math levels which was twelve percent greater than either urban or suburban students. This finding supports the previous conclusion made by the researcher that rural students take less math units and the vocational track does not allow or offer to them the opportunity to take and achieve higher math proficiency.

The same pattern is established by the results of the science proficiency level frequency distribution. A higher percentage of rural students functioned at the lowest two levels of science proficiency when compared to the urban and suburban students. It is a logical conclusion to draw that since rural students take fewer units of science than urban or suburban students, then it should be expected that a larger number of rural students would be proficient at the lower science levels. If the vocational subject areas integrated science principles into their daily curriculum, then one might expect the science proficiency level that rural students operate at increase.

The results of the reading proficiency level distribution was similar to those of the science and math. A greater number of rural students were proficient at lower reading levels than urban or suburban students. This could be the result of the lack of “head start” type programs in the rural areas. Urban areas have been a target of “Head Start” type programs for numerous years. In President Clinton’s address concerning the education goals for the year 2000 (1997), he specifically states his support of Head Start type programs. His support was shown by his promise to expand Head Start to one million children. Urban students had the greatest percentage of their group reading at the highest proficiency level. This could be the result of the programs that have been available to promote reading and learning with preschool age children.

The comparison of the groups’ mean standard score for the four different subject areas on the cognitive test supports the prevailing pattern which has been repeating itself after each statistical analysis. The pattern is that rural students are less academically oriented and the urban and suburban students are very similar to one another in each statistical analysis. The four subject areas in which a
cognitive test was given were math, science, reading comprehension, and history/citizenship/geography. The rural students group test mean was approximately five points less than the group means of the urban and suburban students. That difference was significant whereas a significant difference never existed between the urban and suburban group means.

It may be noted that the results of the cognitive test achievement do not parallel the studies cited in the review of literature. The studies cited generally had suburban students achieving at the highest level, rural students were the next highest and urban students were the lowest achievers. The cognitive tests used in this study were not of the same type as the achievement measures used in previous studies. The cognitive tests for this study were designed to measure the proficiency level of the respondent for the different subject areas. Other achievement studies were simply measuring the amount of facts learned. This study also included a broader sample of the population in that test completers included students who were in twelfth-grade in school, school dropouts, and students who had fallen behind their grade level.

The selected student factors which correlated positively to academic achievement were listed in Table 14. It cannot be denied that the correlation coefficients were small. This does not necessarily mean that even though the coefficients are small, that they are useless in describing the relationship between the student factors and academic achievement. Walter R. Borg and Merideth D. Gall authors of the textbook Educational Research An Introduction state the following with regard to the interpretation of correlation coefficients:

“Another point to consider in interpreting correlation coefficients obtained in relationship research is that many factors influence most of the behavior patterns and personal characteristics of interest to educators. Therefore, the influence of any one factor is not likely to be large.”
Academic achievement would be considered a personal characteristic.

The factors which were selected were chosen to describe the student and their personalities with respect to their academic achievement. The researcher will briefly discuss what the student factors were to represent. Socio-economic status indicated the status of the student with regard to their family’s living standard and parental education levels. The researcher was surprised that its correlation coefficient was so low and that it was part of the achievement prediction equation. Self-concept of the student indicates the degree of comfort the student has with him or herself and his/her abilities. The researcher believed that confidence in the student’s abilities would lend itself to greater achievement. How far the student predicts he/she will go on the education ladder indicated the aspirations they may have for him/herself.

The amount of time the student spends on extra and intra-curricular activities indicated how involved the student is within their school and or community. Involvement would indicate a positive school environment in which the student would feel comfortable and achieve more. The amount of time spent doing homework indicated the effort the student puts in to achieve higher grades. The number of science and math units taken by a student can indicate the educational program track which they may be on. It has been established previously that higher level math and science classes will have a larger proportion of high achieving students in them. How important a good education was as perceived by the respondent indicated the respondent’s desire to attain a quality education.

The time spent working on a job instead of doing school related activities was also selected to determine if time spent working was a deterrent for academic success. The time spent riding around was selected to see if the time spent riding around in a vehicle was a detriment to academic achievement.

Since all ten of the variables correlated positively with GPA, the two factors expected to be a deterrent to academic achievement were not, hours working at a job and riding around. Since more
schools are implementing work-based learning, the additional time required for working should not necessarily mean a decrease in their academic achievement.

The amount of time the student spends engaging in extra- and intra-curricular activities indicates that higher achieving students are those who participate in school or community functions. This is supported by studies carried out by Monk and Haller. They stated that rural schools have an advantage because of their smaller size. The rural schools have a school environment which fosters student participation in activities because the students are a more close knit group and more likely to participate. One must be careful not to overstate this relationship between participation in extra- and intra-curricular activities and academic achievement because students from rural schools overall achievement, as measured by cognitive tests, is lower than urban and suburban students.

The amount of time spent on homework also indicated a positive relationship with GPA. The relationship does not require much explanation as logic would indicate that the more time a student spends learning the material, the better they would perform on various assessments. What is more important is what encourages the student to spend time doing their homework. How many teachers effectively use homework assignments to aid the learning process? What constitutes good homework? These were not research questions of this study, but the answers could have provided additional insight towards furthering academic achievement.

The stepwise multiple regression procedure yielded an equation which predicts student GPA by using six of the ten selected student factors. The order they are listed in Table 15 is the order in which the statistical package SPSS selected them. The beta weights for the predictor variables are not of importance for explaining the variance in the criterion variable. The multiple correlation value for $R$ explains how well the six variables as a group correlate to academic achievement or GPA. The $R$ value for the group (last step) was .19. This value is small, but the variable academic achievement is very complex and many variables would be needed to show a greater group correlation. If the numbers
are removed from the regression equation and we simply use the prediction variables as words, the logical equation would be the following:

GPA = extra-curricular activities + homework completed + importance of good education + amount of education expected to get + number of science units taken + student self-concept. If instead of beta weights descriptors such as high, moderate, and low were used for each predictor variable, then the GPA or academic achievement would be the summation of what those words represent in total student effort. The equation, now simplified, would still not explain much of the variance in the students' GPA. Academic achievement is too complex to be measured by six variables.

Conclusions

The following conclusions are made by the researcher based upon the findings of this study.

- Suburban schools are the most abundant type of school in the United States.

- A greater percentage of rural students take vocational courses than either urban or suburban students.

- Student participation rates in extra- and intra-curricular activities is nearly equal between the rural, urban, and suburban students. However, rural students do participate at a slightly higher rate.

- Course taking among the three groups is not equal with the exception of the number of English units taken. Rural students take less number of science, math, and foreign language units. Rural students take more units of computer science than either the urban or suburban students.

- A higher percent of the rural students function at the lower end of the proficiency scales for math, science, and reading comprehension.

- Rural students are academically lower than urban and suburban students in the areas of math, science, reading, and history/citizenship/geography based on this study. These findings
contradict other achievement comparison studies. When comparisons are made between studies extreme caution must be exercised to be certain the definitions of rural, urban, and suburban are the same. The samples must be equivalent with one not being more inclusive or exclusive than the other. The type of cognitive or achievement test must be compared to one another for similarities and differences.

- Students who complete their homework and are involved in school activities have two factors that correlated the highest to academic achievement.

- Academic achievement is a complex characteristic. The six variables selected for the academic achievement prediction equation could only explain a small portion of the variance that exists within academic achievement as measured by the grade point average variable.

The conclusions have been drawn from this study but are also supported by the studies conducted by Haller, Monk, Borg and Gall.

Recommendations

Based on the findings of this study and the experience of the researcher, the following recommendations are offered to the parents, teachers, administrators, and education policymakers. These groups of people represent those who should have equal concern over the quality of the educational experience that students receive. Even though it is not possible to isolate every single factor that would explain academic achievement, some variables have been isolated in this study that we (we being the groups of people listed above) can influence or control in order to encourage a student to achieve as high as possible.

1. Alternative methods need to be utilized to educate students in the subjects of math and science. One example would be to integrate science and math principles into vocational programs to be learned by students in an “applied” learning situation. Integration of academics into vocational programs has a positive affect on student learning. Students
remember only so much that they see and hear, but retain even more when they apply what is being taught. It also gives the vocational track student an opportunity to learn the science and math principles which would allow them to function at a higher proficiency level. As the vocational world becomes even more technology oriented, the gap between vocational and academics begins to decrease.

2. Increase the number of students exposed to computer technology. Our world has become highly technology driven both in education and in industry. Our society can no longer afford to produce students that cannot use technology.

3. Development of a homework guide for teachers, students, and parents which outline the benefits of learning by completion of purposeful homework. President Clinton also stated in his education goals 2000 address that parents need to get involved with helping their children learn. Homework can be an extension of the school building classroom, but only if the homework assignments are planned out and have a desired purpose.

4. Development of a plan of action to increase the student participation rate in extra- and intra-curricular activities. This recommendation is closely related to the last recommendation. Educators must find out why student choose not to participate and then develop a plan to combat nonparticipation. The results of the data analysis indicated a positive correlation between grade point average and participation in school activities.

5. Increase the exposure of all students and specifically urban and suburban students to vocational programs and career exploration opportunities. A higher percentage of the jobs in the future will not require a college degree. Students need to be exposed to possible careers through exploration at an early age. Career counseling should become a major focus of the school counselors so students will have some idea of what they plan to do upon graduation from high school. A college education is getting too expensive to be used as a
career exploration mechanism. Vocational programs and participation in vocational student clubs offer students the opportunities to explore careers and build personal leadership skills which will benefit them in the school or workplace.

6. Develop competency based instruction for learning the academic subjects specifically for science and math to allow for student mastery before advancing to a higher level of inquiry. It should be apparent that the educational system can no longer pass students through without them reaching a suitable level of competency in the subject areas. Competency based education could greatly change education and schooling as we know it now. Classes may be held year round with an extended hour school day. Students progress through the curriculum at their speed or rate of learning rather than the average rate of learning for the entire class.

7. Continued emphasis on reading and reading programs as the fundamental requirement that all academic achievers need for any aspect of learning. Reading is the thread which bonds all learning activities together. Reading must be a priority at the earliest developmental stages. The frustration of trying to learn under the handicap of not being able to read must be phenomenal and done away with.

8. Further study to explore why students choose not to participate in extra- and intra-curricular activities. Lack of student participation should be a concern of educators and parents. Students should be involved in positive activities whether it be sports, club activities, or school related work experience. These activities can help to build positive student character that will benefit society and the student when they become an adult.

The title of this study was "Educational experiences and academic achievement of rural students as compared to suburban and urban students in the United States." The findings, conclusions, and recommendations exhibit what the results of the study were. The educational experiences of rural
students were not the same for urban and suburban students. There were differences in courses taken and slight differences in participation rates for extra- and intra-curricular activities.

The academic achievement of rural students is lower than the academic achievement of urban and suburban students. The reason or reasons for lower achievement were not found by this study. Academic achievement can be influenced by several variables. This study determined that doing the assigned homework and participating in school activities should predict higher achievement.

The quality judgment of which educational experience was the best was not determined by this study. This study only provided information which parents, teachers, administrators, and education policymakers could use to make informed decisions about the quality of the educational experience they want to take responsibility for.
APPENDIX A
VARIABLES
G12URBN3  Trichotomizes the urbanicity of the area in which the sample member's second follow-up school is located. This metropolitan status is defined by QED for public school districts, for Catholic dioceses, or in some cases for the county in which the school is located. QED bases the classifications on the Federal Information Processing Standards as used by the U.S. Census.

1 = Urban—central city
2 = Suburban—area surrounding a central city within a county constituting the MSA
3 = Rural—outside MSA
4 = Not enrolled in any school or not enrolled in a traditional diploma-granting school (dropouts and alternative completers)
8 = Missing (includes out-of-country, deceased, and enrollment status unknown cases)

Question 25F2 Tapc Pos. 194-195  Format: I2

F2S25F2 TOTAL TIME SPENT ON HMWRK OUT SCHL
out of school each week
**F2S30AA  PARTICIPATED ON A TEAM SPORT AT SCHOOL**

A team sport (baseball, basketball, football, soccer, hockey, etc.)

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Question 30AC  Tape Pos. 215-215
Format: II

F2S30AC  PARTICIPATED IN CHEERLEADING/POMPON

Cheerleading, pompon, drill team

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TOTALS: 21188 100.0%
Please mark one for each activity in which you have participated THIS SCHOOL YEAR. Mark the highest number that applies on each line. CLUBS, SCHOOL GROUPS, INTRAMURAL SPORTS

Question 30B

Question 30BA  Tape Pos. 216-216
Format: II

F2S30BA  PARTICIPATED IN SCHOOL MUSIC GROUP
Band, orchestra, chorus, or other music group

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Question 30BG Tape Pos. 222-222

Format: I1

F2S30BG PARTICIPATED IN SCHOOL ACADEMIC CLUBS

Academic clubs (Art, Computer, Engineering,
Debate/Forensics, Foreign languages, Sciences, Math,
Psychology, Philosophy Club, etc.)

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>CODES</th>
<th>FREQ</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHOOL DOES NOT HAVE..................</td>
<td>1</td>
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<tr>
<td>DID NOT PARTICIPATE....................</td>
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<td>10932</td>
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<td>3</td>
<td>3355</td>
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<tr>
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MISSING............................ | 6     | 5     | 0.0%    |

TOTALS:                                | 21188 | 100.0%|
Question 30BI  
Tape Pos. 224-224  
Format: II

**F2S30BI**  PARTICIPATED IN SCHOOL FTA, FHA, FFA

Future Teachers of America, Future Homemakers of America, 
Future Farmers of America, or other vocational education or 
professional clubs

<table>
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<tr>
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<th>PER-CENT</th>
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**RESERVED CODES:**

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<th>FREQ</th>
<th>PER-CENT</th>
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</thead>
<tbody>
<tr>
<td>NONRESPONDENTS &amp; DROPOUTS..</td>
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<td>6.5%</td>
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**TOTALS:**  
21188  100.0%
F2S31  TIME SPENT ON EXTRACURRICULAR ACTIVITIES

In a typical week, how much total time do you spend on all SCHOOL SPONSORED extracurricular activities (sports, clubs, or other activities)?

F2S33F  HOW OFTEN DOES R DRIVE OR RIDE AROUND

Driving or riding around (alone or with friends)
Question 400

Getting a good education

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>CODES</th>
<th>FREQ</th>
<th>PERCENT</th>
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<tbody>
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<tr>
<td>SOMEWHAT IMPORTANT</td>
<td>2</td>
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<td>VERY IMPORTANT</td>
<td>3</td>
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<tr>
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</table>

TOTALS:                       |       | 21188| 100.0%  |
**F2S43 HOW FAR IN SCHOOL R THINKS S/HE WILL GET**

As things stand now, how far in school do you think you will get?

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>CODES</th>
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<th>PERCENT</th>
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<tr>
<td>LESS THAN TWO YEARS OF VOCATIONAL, TRADE OR BUSINESS</td>
<td>03</td>
<td>287</td>
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<tr>
<td>TWO YEARS OR MORE OF VOCATIONAL, TRADE OR BUSINESS</td>
<td>04</td>
<td>513</td>
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<tr>
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<td>TWO OR MORE YEARS OF COLLEGE</td>
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<td>18.9%</td>
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<tr>
<td>MULTIPLE RESPONSE</td>
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<td>610</td>
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**TOTALS:** 21188 100.0%
F2S88  CURRENT JOB, # HRS WORKED DURING SCHL YR

How many hours do/did you usually work each week on your current or most recent job during this school year?
APPENDIX B
COMPOSITE VARIABLES
This composite employs all of the self-concept items in student question 66 (and dropout question 57). They are F2S66A (F2D57A), F2S66D (F2D57D), F2S66E (F2D57E), F2S66H (F2D57H), F2S66I (F2D57I), F2S66J (F2D57J), and F2S66L (F2D57L). As with F2LOCUS1, each of the above seven items was standardized separately to a mean of zero and a standard deviation of 1. All nonmissing components were averaged. Any student missing all seven components were assigned a missing value (8).

Four of these items—F2S66A (F2D57A), F2S66D (F2D57D), F2S66E (F2D57E), and F2S66H (F2D57H)—are reverse scoring items; therefore, the values were reversed before the composite was created.

F2S66A/F2D57A: "I feel good about myself." ("I take a positive attitude toward myself.")

F2S66D/F2D57D: "I feel I am a person of worth, the equal of other people." ("I feel I am a person of worth, on an equal plane with others.")

F2S66E/F2D57E: "I am able to do things as well as most other people." [text identical]

F2S66H/F2D57H: "On the whole, I am satisfied with myself." [text identical]
**F2RTRPRG** Indicates the sample member's high school program, as determined from transcript course-taking data. This composite variable is constructed from the NAEP-equivalent subject area summary composite variables.

01 = Rigorous academic track
   F2RENG_C GE 04.00 and F2RSOC_C GE 03.00 and F2RSCI_C GE 03.00 and F2RMAT_C GE 03.00 and F2RC0M_C GE 00.50 and F2RFOR_C GE 02.00

02 = Academic track
    (F2RENG_C + F2RSOC_C + F2RSCI_C + F2RMAT_C) GE 12.00

03 = Vocational track
    F2RVAG_C GE 03.00 or F2RVBU_C GE 03.00 or F2RVGN_C GE 03.00 or F2RVHE_C GE 03.00 or F2RVHO_C GE 03.00 or F2RVMA_C GE 03.00 or F2RVTE_C GE 03.00 or F2RVTR_C GE 03.00

04 = Rigorous academic and vocational
    Criteria for values 01 and 03 met.

05 = Academic and vocational
    Criteria for values 02 and 03, but not 01, met.

06 = None of the above
Socioeconomic Status. The second follow-up files contain three versions of a continuous variable, "F2SES-", which indicates the sample member's socioeconomic status. F2SES1 was derived from the base year parent questionnaire data, the base year student questionnaire data, or the first or second follow-up new student supplement data. Both F2SES2 and F2SES3 are constructed with second follow-up parent questionnaire data. F2SES3 incorporates the 1989 revision\(^1\) of Duncan's Socioeconomic Index (SEI), whereas F2SES1 and F2SES2 utilize the original (1961)\(^2\) version that was used in NLS-72, HS&B, and the NELS:88 base year and first follow-up.\(^3\) F2SES1 has been constructed for all sample members and appears on the student file, but F2SES2 and F2SES3 appear only on the parent component data file and, therefore, have only been constructed for the subset of student and dropout sample members for whom parent data were collected.

**F2SES1** Continuous variable indicating sample member's socioeconomic status. F2SES1 was constructed using base year parent questionnaire data, when available. The following parent data were used: father's education level, mother's education level, father's occupation, mother's occupation, and family income (data coming from BYP30, BYP31, BYP34B, BYP37B and BYP80). Education-level data were recoded according to the definition of BYPARED (with the exception of category "7", which was recoded as missing for F2SES1 calculations). Occupational data were recoded using the Duncan SEI, as used in NLS-72, HS&B, and earlier NELS:88 socioeconomic status variables as indicated below. Parent data were used to construct F2SES1 if at least one component was not missing.

If all parent data components were missing, the following base year student questionnaire items were used to calculate F2SES1 for base year respondents: father's educational level (BYS34A), mother's educational level (BYS34B), father's occupation (BYS7B), mother's occupation (BYS4B) and presence of household items (BYS35A-P). For base year nonrespondents and first or second follow-up refreshed students, the equivalent new student supplement items were used (F1N20A or F2N8A, F1N20B or F2N8B, F1N7B or F2N7, F1N5B or F2N5 and F1N21A-P or F2N12A-P respectively). The first four components from the base year student/NSS data are the same as the components from the base year parent data (i.e., educational-level data, BYS34A/F1N20A/F2N8A and BYS34B/F1N20B/F2N8B, similarly recoded; occupational data, BYS4B/F1N7B/F2N7 and BYS7B/F1N5B/F2N5 of student data, also recoded). The fifth component for F2SES1 from the


\(^3\) Note that one value in the occupational prestige scale was transposed in earlier releases of the socioeconomic status composite variable and has been corrected in the present version of F2SES1.
student data was derived by summing the non-missing household items listed in BYS35A-P or in F1N21A-P/F2N12A-P (after recoding "Not Have Item" from "2" to "0"), calculating a simple mean of these items, and then standardizing this mean. If eight or more BYS35A-P or F1N21A-P/F2N12A-P were nonmissing, this component was computed; otherwise it was set to missing.

Each nonmissing component (after any necessary recoding) was standardized to a mean of 0 and a standard deviation of 1. Nonmissing standardized components were averaged yielding the F2SES1 composite.

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<th>Duncan's SEI Label</th>
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<td>18</td>
<td></td>
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<tr>
<td>19</td>
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Finally, minor errors in the construction of this variable and released on first follow-up files as "F1SES" have been corrected in this release.
Cognitive Test Results

The following section contains information about cognitive test variables. The cognitive test battery consisted of multiple choice tests in four subject areas: reading comprehension, mathematics, science, and history/citizenship/geography.

Multiple Test Forms. In the base year, all students received the same set of tests. Analysis of eighth-grade test results showed a wide range of student achievement. This diversity was expected to increase as students progressed through high school with some taking advanced courses and making substantial gains in achievement, while others remained at a relatively low level. A single test form administered to all students in the follow-up surveys would have had the potential for serious "ceiling" and "floor" effects, that is, many students getting all items correct because the test was too easy for them, while others could only guess at most of the questions because they lacked sufficient background. When this situation occurs, it is impossible to accurately assess the level of achievement for the highest and lowest scoring students.

The reading and mathematics tests were selected for development of multiple forms targeted to students' ability levels in the first follow-up. The same pattern was repeated for the second follow-up. While the other subject areas might have profited from this "tailored testing" approach as well, the complexity of administering multiple forms dictated that their use be as limited as possible.

The reading test was chosen because the time burden of reading the passages before questions about them could be answered meant that relatively few test items could be administered in the time allotted for the test. With the smallest number of items of any subject area, the reading test could least afford any "wasted" questions: those that were much too hard or much too easy for a particular test taker. Two forms of the reading test were developed; the easy form was administered to students who had scored below the sample mean in the first follow-up, while those scoring above the mean received a set of passages and items that was, on average, more difficult. Students who were new to the NELS:88 sample in the second follow-up received the easier form.

In the case of the mathematics test, the need for multiple forms was based on the diversity of exposure to course work that could be expected by senior year. Academic track students would have, by this time, taken courses in algebra, geometry, and higher-level mathematics. Those in general or vocational programs might have only taken general or business math, essentially arithmetic, or none at all. Unlike science and history, where many topics might have been introduced at a lower level of sophistication in earlier grades, much of the material covered in advanced mathematics courses would be completely unfamiliar to students who had not taken these courses. Three mathematics test forms were administered in the second follow-up. The easiest and hardest forms were given to the students who had scored in the low and high quartile, respectively, in the first follow-up; students in the middle half of the distribution received the middle-difficulty test, as did those who were not tested in the earlier year.

Item Response Theory (IRT) Scoring. Raw scores achieved on tests which vary in average difficulty are not comparable to each other. For example, a student who took the middle difficulty mathematics form in the second follow-up would probably have gotten more questions correct if he or she had taken the easiest form, and fewer if the hardest form had been administered. Item Response
Theory (IRT) was employed to calculate scores that could be compared regardless of which test form a student took. A core of items shared among the different test forms made it possible to establish a common scale. IRT uses the pattern of right, wrong, and omitted responses to the items actually administered in a test form, and the difficulty, discriminating ability, and "guess-ability" of each item, to place each student on a continuous ability scale. It is then possible to estimate the score the student would have achieved for any arbitrary subset of test items calibrated on this scale.

Thus, IRT scoring makes possible measurement of gains in achievement over the four year time span of the survey even though the tests used were not identical at the three points in time. As was the case with the multiple forms of the second follow-up tests described above, the tests shared common items that were present in more than one test administration. These overlapping items made it possible to use IRT scoring to develop scores that are on the same scale and thus can be compared to measure gains over time.

IRT has several other advantages over raw number-right scoring. By using the overall pattern of right and wrong responses to estimate ability, it can compensate for the possibility of a low-ability student guessing several hard items correctly. If answers on several easy items are wrong, a correct difficult item is, in effect, assumed to have been guessed. Omitted items are also less likely to cause distortion of scores, as long as enough items have been answered right and wrong to establish a clear pattern. Raw scoring necessarily treats omitted items as if they had been answered incorrectly. While this may be a reasonable assumption in a motivated test, where it is in students' interest to try their best on all items, this may not always be the case in the NELS:88 situation.

In each of the four subject areas, the IRT scale was calibrated using PARSCALE software. The test responses of the longitudinal sample members, that is, those that had completed a test in that subject in all three years of the survey, were used for the calibration. Item parameters were computed for all test items that had appeared in any of the test forms at any time: a total of 54 in reading, 81 in mathematics, 38 in science, and 47 in history. Holding these parameters fixed, Bayesian estimates of placement on the continuous ability scale were obtained for all test takers at all three points in time. The procedure used takes into account group membership (year and test form) in order to minimize floor and ceiling effects. These ability estimates were used in conjunction with the item parameters to compute the IRT scores in the database.
Description of Scores

**IRT-Estimated Number Right: raw score metric, total item pool.** This score is an estimate of how many correct responses a test taker would have given if he or she had answered all of the items in the total item pool for the subject area (all items administered at all times). The IRT-based estimate is the probability of a correct answer, given a person's demonstrated ability and the parameters of the item, summed over all of the test items. This sum of probabilities is not an integer, but can be interpreted as an estimated count of correct answers. The highest possible score would be the total number of test items for the subject area. The lowest score is not zero, but is an estimate of how many test items a person of extremely low ability might have guessed correctly. This score may be used for either cross-sectional or longitudinal analyses. However, it is essential that for longitudinal analyses, the base year and first follow-up scores have been re-scaled to the second follow-up metric be used to measure gains. It would be incorrect to compare second follow-up scores with earlier releases of the first two waves that were based on a different metric. Refer to the section "Measuring Gains over Time" below for additional information.

**IRT-Estimated Number Right: t-score.** This is a transformation of the IRT-estimated Number Right, converted to a standardized (t-score) metric. For NELS:88 core sample cases at one point in time, weighted by the within-year questionnaire weight, this score has a mean of 50 and standard deviation of 10. This norm-referenced score is primarily useful for making cross-sectional comparisons.

**IRT Theta: t-score.** Like the t-score based on IRT-estimated Number Right described above, this score is standardized to a mean of 50 and standard deviation of 10. However, it is different in three ways. First, it is a transformation of the IRT-estimated ability scale (theta) rather than of a count of estimated correct answers on test items. Second, the standardization is done across years, rather than within year. Each test taker in the panel sample had three thetas: the measurements of ability at the base year, first follow-up, and second follow-up. The scores are standardized so that the mean score within each subject area is 50, and the standard deviation is equal to 10 when scores are aggregated over all students and all three observations for each student. The parameters for standardizing were computed for the panel sample, and then applied to all test scores. Thus, the mean of these scores for the base year test takers alone would be less than 50, for the first follow-up around 50, and for the second follow-up, more than 50. By contrast, the t-score for IRT number right was computed within year. Hence, these scores have a mean of 50 and a standard deviation of 10 when aggregated within each single wave of data. The third difference is a consequence of the second difference. Since all three waves are used in standardizing, the resulting scores are normally distributed across years, and the distributions within year, particularly for the earliest and the latest observations, would be somewhat skewed. Thus, this score is most useful for analysis of longitudinal gains rather than cross-sectional comparisons. Gains in this metric can be computed by subtracting earlier scores from later ones.
Proficiency Scores. The proficiency scores provide a means of distinguishing total scores and score gains, as measured by overall IRT-Estimated Number Right scores and the norm-referenced t-scores, from criterion-referenced measurements of specific skills. At several points along the score scale of the reading, mathematics, and science tests, four-item clusters of test questions having similar content and difficulty were identified. A student was assumed to have mastered a particular level of proficiency if at least three of the four items in the cluster were answered correctly, and to have failed at this level if two or more items were wrong. Clusters of items provide a more reliable test of proficiency than do single items because of the possibility of guessing in a multiple choice test: it is very unlikely that a student who has not mastered a particular skill would be able to guess enough answers correctly in a four item cluster. (For some of the students who had not answered critical items, an IRT-based procedure was undertaken to resolve proficiency score assignments.) The proficiency levels were assumed to follow a Guttman model, that is, a student passing a particular skill level was expected to have mastered all lower levels; a failure should have indicated non-mastery at higher levels. A small percentage of students (3.5 percent on the reading test, 9.7 percent in mathematics, and 8.8 percent in science) had response patterns that did not follow the Guttman model. They were not assigned proficiency scores since evidence based only on the items in the clusters was contradictory. However, the proficiency probability scores described below, which are based on the test as a whole, can still be used for anyone with a valid test score.

Three levels of proficiency were marked in the reading test, five in the mathematics test, and three in the science test, defined as follows:

**Reading Level 1:** Simple reading comprehension including reproduction of detail and/or the author's main thought.

**Reading Level 2:** Ability to make relatively simple inferences beyond the author's main thought and/or understand and evaluate relatively abstract concepts.

**Reading Level 3:** Ability to make complex inferences or evaluative judgments that require piecing together multiple sources of information from the passage.

**Math Level 1:** Simple arithmetical operations on whole numbers: essentially single step operations which rely on rote memory.

**Math Level 2:** Simple operations with decimals, fractions, powers and roots.

**Math Level 3:** Simple problem solving, requiring the understanding of low level mathematical concepts.

**Math Level 4:** Understanding of intermediate level mathematical concepts and/or having the ability to formulate multi-step solutions to word problems.

**Math Level 5:** Proficiency in solving complex multi-step word problems and/or the ability to demonstrate knowledge of mathematics material found in advanced mathematics courses.

**Science Level 1:** Understanding of everyday science concepts; "common knowledge" that can be acquired in everyday life.

**Science Level 2:** Understanding of fundamental science concepts upon which more complex science knowledge can be built.

**Science Level 3:** Understanding of relatively complex scientific concepts; typically requiring an additional problem solving step.
Probability of Proficiency. In addition to the scores indicating students' actual responses to the item clusters, probabilities of proficiency are reported for each level in each subject area. These estimates were obtained using IRT methods to estimate students' probabilities of mastery at each level, treating clusters of items as single items for the purpose of IRT calibration. Since the proficiency probability scores are estimates based on each student's overall performance in the subject area (theta), they are computed for everyone who had a scorable test, not only for those with complete and consistent data on the item clusters. For example, if a test taker had omitted several test items in the "level 2" cluster, it might be impossible to assign the item-based proficiency level score. However, the probability of proficiency on that cluster could still be estimated based on the level of performance demonstrated by responses to the other test questions. These measures of probability of mastery at each proficiency level are particularly useful in analyzing achievement gains over time. They provide a way of relating students' background and experiences to improvements in skills that are more specific than the overall scores in reading, mathematics and science.

Test Composites

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<th>Description</th>
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<tr>
<td>F22XRSTD</td>
<td>Reading Standardized Score</td>
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<tr>
<td>F22XMIIRR</td>
<td>Math IRT-Estimated Number Right</td>
</tr>
<tr>
<td>F22XMSTD</td>
<td>Math Standardized Score</td>
</tr>
<tr>
<td>F22XSIIRR</td>
<td>Science IRT-Estimated Number Right</td>
</tr>
<tr>
<td>F22XSSTD</td>
<td>Science Standardized Score</td>
</tr>
<tr>
<td>F22XHIRR</td>
<td>Hist/Cit/Geog IRT-Estimated # Right</td>
</tr>
<tr>
<td>F22XHSTD</td>
<td>Hist/Cit/Geog Standardized Score</td>
</tr>
<tr>
<td>F22XRTH</td>
<td>Reading Theta T Score</td>
</tr>
<tr>
<td>F22XMTH</td>
<td>Math Theta T Score</td>
</tr>
<tr>
<td>F22XSTH</td>
<td>Science Theta T Score</td>
</tr>
<tr>
<td>F22XHTH</td>
<td>History/Citizenship/Geography Theta T Score</td>
</tr>
<tr>
<td>F22XRPRO</td>
<td>Overall Reading Proficiency</td>
</tr>
<tr>
<td>F22XMPRO</td>
<td>Overall Math Proficiency</td>
</tr>
<tr>
<td>F22XSPRO</td>
<td>Overall Science Proficiency</td>
</tr>
</tbody>
</table>

Subject Area Summary Composite Variables. Three groups of composite variables aggregating Carnegie units by sample member and subject area have been constructed from course data and have been included on the transcript component student file. Lists of the CSSC course codes aggregated to create each summary composite variable appear in Appendix H of the Transcript Component Data File User's Manual. The first group of variables are comparable to composite variables constructed for analyses conducted for the National Center for Education Statistics using data from the 1982 High School and Beyond Transcript Study. HS&B-equivalent variables were constructed only for the New Basics subject areas.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2RHEN_C</td>
<td>Total Carnegie units in ENGLISH</td>
</tr>
<tr>
<td>F2RHMA_C</td>
<td>Total Carnegie units in MATHEMATICS</td>
</tr>
<tr>
<td>F2RHSC_C</td>
<td>Total Carnegie units in SCIENCE</td>
</tr>
<tr>
<td>F2RHSO_C</td>
<td>Total Carnegie units in SOCIAL STUDIES</td>
</tr>
</tbody>
</table>
F2RHCO_C  Total Carnegie units in COMPUTER SCIENCE/PROGRAMMING/DATA PROCESSING
F2RHFO_C  Total Carnegie units in FOREIGN LANGUAGES
Chapter S
Psychometric Properties of the NELS:88 Scores

In the final analysis, the reliability and validity of the NELS:88 cognitive scores depend on the:

1) appropriateness of the test content specifications,
2) psychometric quality of the test items themselves,
3) appropriateness of the difficulty of the tests for the students being measured,
4) lack of speededness,
5) success of the IRT procedures used for linking across grades and forms, and
6) scoring procedures.

Previous sections discussed content specifications, psychometric qualities or the items, appropriateness of item difficulties, speededness and linking procedures used. This chapter provides both traditional indices of reliability as well as IRT centered estimates. In addition, evidence for the construct and predictive validity of the NELS:88 scores are presented.

Reliability of the IRT Scores

An approximate index of the reliability of the IRT theta estimates is presented in Table 5.1 by grade and content area. While the plot of the Information function is the most comprehensive measure of the reliability of the IRT scores, it is sometimes helpful to present an estimate of the more familiar single index type. These indices are computed as 1 minus the ratio of the average measurement error variance to the total variance (see for example, Samejima, 1994).

Table 5.1
Reliability of Theta

<table>
<thead>
<tr>
<th></th>
<th>Base Year Follow-up</th>
<th>First Year Follow-up</th>
<th>Second Year Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>.80</td>
<td>.86</td>
<td>.85</td>
</tr>
<tr>
<td>Math</td>
<td>.89</td>
<td>.93</td>
<td>.94</td>
</tr>
<tr>
<td>Science</td>
<td>.73</td>
<td>.81</td>
<td>.82</td>
</tr>
<tr>
<td>History/Citizenship/Geography</td>
<td>.84</td>
<td>.85</td>
<td>.85</td>
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</tbody>
</table>

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