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ABSTRACT

Students in the eleventh grade in three Montgomery County, Maryland high schools were the subjects of a study to determine the effect of foreign language study on performance on the verbal section of the Scholastic Aptitude Test (SAT). The following results were reported: (1) when verbal ability is controlled, students who study foreign language for longer periods of time will do better on various SAT sub-tests and on the SAT-Verbal as a whole than students who have studied less foreign language; (2) having studied two foreign languages has no significant effect on SAT scores or on scores on the Test of Academic Progress (TAP); (3) language studied has no differential effect on SAT or TAP scores; and (4) there is some evidence that higher grades in foreign language study will increase the effect of this study on SAT scores (particularly the reading and vocabulary sub-scores). In conclusion, it appears that the effect of foreign language study makes itself felt more in the area of vocabulary development than it does in that of English structure use. (JB)

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Final Report

The Effect of Foreign Language Study in High School on Verbal Ability as Measured by the Scholastic Aptitude Test-Verbal

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Susan Gross (of the MCPS Department of Educational Accountability) provided valuable assistance in matters of design and analysis, and Leonard Shaefer, Language Processing Center, Georgetown University, was responsible for data entry and computer programming. Abby Shapiro and Janet Fairbank did the vast majority of data collection in the schools.

Nancy Rhodes oversaw the bulk of the coding, Cynthia McMillian typed most of the manuscript, Frederick Hobbs typed the bibliography, and Elizabeth Newman assumed the large responsibility of the tables and final preparation of the manuscript.

0.1 Introduction. In the final draft preparation of this report, we decided to omit Table 2 from our discussion. THERE IS NO TABLE 2 IN THIS REPORT.

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1.0 Literature review

1.1 Background to the question. Statements such as "I never really understood grammar until I studied a foreign language" are very often heard from students of both classical and modern languages. This "folk attitude" about the beneficial effect of second language study on native language performance is widely shared in the language teaching profession. In fact, one of the arguments used to justify a place for language instruction in the curriculum states that second language study has a positive effect on native language performance. Observations to this end appear frequently in the professional foreign language education literature in the United States, and in statements made to the American public to persuade them of the benefits of language study.

For example, the texts designed to introduce prospective language teachers to the profession include such statements as the following:

> "The American student can develop a clearer understanding of his native English by comparing it with a non-English communication system." (Grittner 1969:25)
>
> "Studying a second language provides a comprehension of the connotations of words and the building blocks of expression that is unimagined prior to the study of a second language." (Chastain 1976:6)

In the same vein is Vygotsky's observation that language study promotes the mastery of the "higher forms" of one's native language and enables him "to see his own language as one particular system among many, to view its phenomena under more general categories and this leads to awareness of his linguistic operations.. "(1962:110)

Language teaching professionals have used similar statements to justify the existence of the discipline to the American public. In the mid-1950's, the

Foreign Language Program of the Modern Language Association of America adopted the following as part of its statement "Values of Foreign Language Study": "The study of foreign language...provides...a new understanding of language, progressively revealing to the pupil the structure of the language and giving him a new perspective on English, as well as increased vocabulary and greater effectiveness in expression." (from Foreign Language Program Policy of the Modern Language Association of America in PMLA, pt. 2, September 1956, xiv; reprinted in W. M. Rivers Teaching Foreign Language Skills, Chicago: University of Chicago Press, 1970, p. 29)

When American educators were debating the issues of "liberal education" in the late 1950's, William Riley Parker asserted: "If, for example, liberal education means broadening and training the mind by pursuing knowledge for its own sake, it should not be forgotten that mind-training is largely verbal training--and most 'experts' in the liberal arts have signified their conviction that a single language just does not provide a sufficient range of verbal perceptiveness for a liberally educated person." (The Language Curtain, p. 126)

And more recently, when the "basic education" movement has in some locales adversely affected foreign language study by labelling it a "frill," Fred M. Hechinger of the New York Times has concluded an editorial on the subject of language study with the statement: "Knowledge of a foreign language, including and perhaps especially Latin, may not be essential to the mastery of English, but it helps."

While those individuals who have had successful foreign language learning experience tend to agree with statements such as those cited, the evidence for such statements is largely intuitive. The language teaching community in the United States has not collected an abundance of experimental data to support the claims. The goal of the present literature review is to examine what work has

been done relating to the influence of second language learning on performance in the native language. This examination will include research in three areas:

1. Elementary school language programs (FLES), including Latin and modern languages.
2. High school language programs.
3. Bilingual programs

1.2 Research evidence from elementary school language programs. Two kinds of studies have been carried out in the area of elementary school language programs in which modern languages are taught: studies which suggest a positive relationship between foreign language study and native language ability, and studies which show either no detrimental effect of foreign language study on native language ability or which seem to provide evidence undermining hypothesized positive effects.

1.2.1 Positive relationship between modern foreign language study and native language ability. Among the studies in the first group is one undertaken by Lonato (196) involving two classes of third grade students at a New York City (Bayside, Queens) and a Long Island, New York (Valley Stream) elementary school The study was conducted in the 1959-1960 academic year, with the population of 114 students being controlled for grade placement, age, IQ, and socioeconomic status. The experimental group received 15 minutes of oral French instruction per day. All sections of the Stanford Achievement Test, Elementary Battery, Form J, were administered to both groups at the beginning of the year, and an alternative form of the test, form K, was administered at the end of the school year.

At Bayside there was no significant difference between experimental and control scores on the Stanford test of reading, spelling, and language, although the experimental group had slightly higher mean gains on the reading and

language measures. The controls were slightly ahead in spelling mean gain. At Valley Stream, reading and language scores were not significantly different, although there were higher means for the language students. The experimental group registered a significantly higher mean gain on the spelling measure.

There are several aspects of this study which might lead one to question it as supportive of a positive impact of language study on English language arts skills. The first is underlined by the author herself: she points to the possible Hawthorne effect caused by the two experimental classes, since there was not a FLES program in place at either of the schools at the time. The second aspect involves what appears to be a significantly higher mean I.Q. in the experimental group at Valley Stream; it was this group that achieved a significantly higher mean gain on the spelling measure than did the controls.

In a 3-year study designed "to challenge superior students in the elementary grades by teaching them foreign language after school," 600 students in Salt Lake City, Utah were given 1 hour of Russian three times weekly for 3 years, starting in the 4th grade. The criterion for a "superior student" was a score of at least 115 on the Pintner-Durost General Ability Test. The control group consisted of "superior" students not involved in FLES. Gorden et al. (1963) report that the FLES group observed between the 4th and 6th grades performed better in science and social studies, while those observed between 5th and 7th grades performed better in arithmetic and spelling. All the "superior FLES students" reportedly behaved better in home room and were reportedly "more mature in socio-emotional components." These conclusions would appear to be impressionistic, however.

Finally, in a study of the effects of modern language study in English language skills conducted in Sidney, Australia, Boyd (1977) concluded that a combination of natural talent and some transfer from foreign language study accounted for the superior English scores of the students who had studied a second language.

1.2.2 No detrimental effect on native language ability due to modern foreign language study. Among the studies showing no detrimental effect of foreign language study on native language ability is a one-year study conducted in the Champaign, Illinois public schools. Ninety fourth grade FLES students studied Spanish for 100 minutes per week during time that had been subtracted from instructional periods in social studies, arithmetic, and language arts. Ninety control students attended school for the same number of minutes per day and had full instructional periods of social studies, arithmetic, and language arts. Pre-administration of Iowa subtests on reading vocabulary, reading comprehension, and language skills led the experimenters to believe that the two groups were comparable. In the post-test of the same Iowa subtests, experimental pupils showed slightly higher mean gains on the measures of reading vocabulary and reading comprehension, but lower mean gains on the language skills measures. Reported t-values indicate that all three diferences were non-significant. The authors state in their conclusions, however, that "the experimental group showed greater achievement in reading vocabulary and reading comprehension and that in language skills...the two groups varied little..." (Johnson, Ellison, and Flores 1963:11). In a critique of this study, Eddy (1978) points out that it seems "prudent not to consider this study as solid evidence for a positive significant effect of foreign language study on English language arts performance because the confidence levels discussed in the report are not interpretable and do not appear to justify the conclusions." (1978:12)

Leino and Haak (1963) conducted a large-scale study in the schools of St. Paul, Minnesota from 1960-1963. FLES students studied Spanish for 15 minutes a day, which was time subtracted from the study of social studies, language arts, or arithmetic. No significant difference was found between the achievement test scores of fourth, fifth, and sixth grade students on the Iowa Test of Basic Skills and the Stanford Social Studies Test.

In a one-year study carried out in a New York state laboratory school with primary school children, Potts (1967) found no significant difference between the scores of the experimental (French FLES) students and those of control students on the California Achievement Test and the California Reading Test.

Similarly, in a three-year study of a FLES program in Dade County, Florida in which the second language was either Spanish or English, Gaarder and Richardson (1968) found no significant differences between the FLES and non-FLES students in the areas of paragraph meaning, word meaning, spelling, arithmetic reasoning, or arithmetic computation, as measured by the Stanford Achievement Test.

Several studies have investigated foreign language instruction at the elementary school level in Europe. Hilgendorf et al. (1970) examined the effect of English instruction on German and math by comparing children who had studied English from the third grade with children who studied English only in the fifth and sixth grades. The children were tested at the end of the sixth grade in spelling, reading, and arithmetic, and it was concluded that English instruction had not affected attainment in other subjects.

In a controversial study of the so-called British Pilot Scheme whereby oral French as a second language was introduced into 125 British schools to students at age eight and continued for five years, Burstall et al. (1974) investigated, among other things, whether the early introduction of French had a significant effect on achievement in other areas of the primary school curriculum. Three groups of students were followed: 5,700 eight-year-olds starting French in 1964; 5,300 eight-year-olds starting French in 1965; 6,000 eight-year-olds starting French in 1968. Groups one and three were followed for five years (three in primary, two in secondary), and group two was followed for eight years (three in primary, five in secondary). There were two control groups: (1)

children who were the same age as the experimental group but who started French at age eleven; and (2) children older than experimental group, but with equivalent years of exposure to French. It was found that the introduction of French did not lead to any decline in other school subjects, including reading and English language skills. The study was controversial because it called into question the traditional argument that younger children are better language learners. The subjects taught from the age of eight did not subsequently reveal any substantial gains in achievement when compared with the children who started three years later. Furthermore, Burstall argues that the issue is not age of beginning language study, but time spent in language study, and that given the same amount of time studying language, the older pupils appeared to be more efficient learners than the younger ones. It is concluded that the results of the study "may tip the scales against a possible expansion of the teaching of French in primary schools." (Burstall et. al. 1974:246) In another European study, Natorp (1976) examined 386 five- and six-year-olds in Munich, Germany. Two hundred twenty-five received daily French (as a foreign language) instruction for eight months, while 161 received no instruction. Natorp's rather impressionistic conclusions were that the experimental children increased their vocabulary, made fewer grammatical errors, and used complete verbs to a greater extent.

Doye and Luttge (1977) compared fifth grade children who had had English instruction from the third grade with children who had received English instruction for one year only. The comparison was made at the end of the fifth grade, with special focus on the effects of English instruction on German and math. No significant differences were found between the groups.

Finally, Holmstrand (1979) examines the effect of early English instruction on attainment in Swedish and math in the Swedish EPAL (English in the Elementary

School/Primary Level) project. The project, which has been in progress since 1969, starts English instruction in the first grade, with "loan" time from Swedish. Using aptitude tests as a means of comparison, Holmstrand found no major differences between the experimental and control groups regarding achievement in Swedish and math in the lower and intermediate schools. The general impression to be gained from both American and European studies is that instruction in a foreign language at the elementary level is not detrimental to native language skills, and may even enhance performance in different areas of the curriculum, including native language study.

1.2.3 Studies of elementary school Latin programs. A variety of Latin programs have been implemented in American elementary schools, most having the explicit purpose of enhancing English language skills. Documentation of these programs is provided in two reviews of research by Masciantonio (1977) and Mavrogenes (1977). It should be noted that the two reviews cover for the most part the same literature and arrive at the same conclusions. For instance, a study by Offenberg (1971) describes a program whose objectives were: (1) to introduce children orally to basic Latin structure and vocabulary; (2) to extend the children's English vocabulary, especially through the study of Latin roots and affixes; (3) to acquaint the children with classical culture and its influence on the present; and (4) to stimulate interest in the study of Latin, foreign languages, and humanities. Starting in 1970, over 4,000 fourth, fifth, and sixth graders in 85 elementary schools in Philadelphia received 15 to 20 minutes of Latin instruction daily from itinerant Latin teachers. By 1976, the program had expanded to include 14,000 pupils in 125 elementary schools. It was found in 1970-71 that fifth grade children who were taking the Latin course scored one full year higher than the control group (who were not taking Latin) on the vocabulary subtest of the Iowa Tests of Basic Skills. Furthermore, it was

noted that Latin students were performing at about grade level, whereas control students were one year below grade level.

Three hypotheses were tested in a study conducted in the District of Columbia public elementary schools in 1970-71: (1) There are no significant differences in the English reading achievement scores of a sample of sixth grade students receiving Latin instruction as compared with those receiving no foreign language instruction; (2) There are no significant differences between the English reading achievement scores of sixth grade students receiving French or Spanish instruction as compared to those receiving no foreign language instruction; and (3) The English reading achievement scores of students taking any kind of foreign language do not differ significantly from each other. Based on the scores in vocabulary, comprehension, and "total reading," students with one year of Latin instruction were found to be "five months ahead" of students receiving no foreign language instruction, while students with four years of instruction in either French or Spanish were found to be "four months ahead" of those students with no foreign language instruction. Several facts lead us to accept these results with caution, however. First, the report's authors are careful to point out that they have been unable to ascertain group comparability between experimental and control groups, though they do state that classes in the District of Columbia were heterogeneously grouped at the time of the study. The language classes had been "randomly chosen" by the principals of the elementary schools involved; there is no way to tell to what extent personal bias may have crept into these decisions. Secondly, the FLES students had been taking French and Spanish for three years prior to the pre-test so it is difficult to make inferences about what impact the treatment had on the measured outcomes. Were the measured gains of the FLES students attributable to the one year's experience they had between October 1970 and May 1971, or did these gains depend in some way on the prior training they had received in French or Spanish?

A Latin pilot study was implemented in 1972-73 in the Alexandria, Virginia public schools in the fifth and sixth grade levels, its purpose being to increase the English reading skills of the pupils. (Payne 1973) The experimental and control groups were pre- and post-tested with the SRA (Science Research Associates) Assessment Survey; the Gates-MacGinitie Vocabulary, Comprehension, Speed, and Accuracy Tests; and the Slosson Oral Reading Test. While the experimental group did better on the Slosson Oral Reading Test, no other statistically significant differences were observed between the control and experimental groups.

In the 1973-74 school year, the Indianapolis Public Schools initiated an experimental program which used teacher-made or adapted materials designed to stress the importance of Latin root words. (Sheridan 1976) The experimental group of sixth grade students received one half hour of instruction in Latin per day with a Latin specialist teacher; the program was coordinated with instruction in other subjects. In each of the two years (years II and III) for which tables are given in the report, the experimental group numbered about 400 for the October administration of the pre-test (Form H of the Metropolitan Achievement Test) and had been reduced to approximately 300 by the time of the March administration of the post-test (Form F of the same test). The control group numbered approximately 100 in years II and III. In addition to establishing group comparability through pre-testing, "the groups were selected on the basis of their similarity of economic, social and academic profiles." (Sheridan, 1976: 4)

Masciantonio (p. 377) reports that in the first year of the project, the experimental group showed a gain over the control group (emphasis ours) of: eight months in word knowledge, one year in reading, one year one month in language, and four months in spelling. This statement is not quite accurate; Sheridan states (p. 3) that these gains are simply the net improvement in the

experimental group's scores. There are no tables comparing experimental with control group for the first year of the project in Sheridan's report. The report does contain comparative data on years II and III, however.

Pre-test scores show there to be non-significant differences favoring the control group in the sub-tests on word knowledge, reading, or language. The experimental group was significantly better in spelling ($p<.01$). The post-tests showed that this advantage of the experimentals had disappeared (i.e. there was no significant difference between the groups on the spelling measure); the experimentals scored significantly higher than the controls in word knowledge ($p<.05$). Reading and language scores showed non-significant differences in favor of the experimental group. The results of year II's testing justify cautious optimism concerning the effect of FLES Latin on English language arts skills, but no more. First, who were those 100 students in the experimental group whose scores were not recorded in spring? They might have been the poorest (or the best) readers of the group. It would lend confidence to the results of this study to eliminate these students from the pre-test group. Second, in three of the four sub-tests, the gains of the experimental group are greater than those of the controls, but we cannot have confidence in these results since the differences in mean gain were not analysed statistically

Insert table 1 about here

The results of year III give cause for more optimism, however. The pre-tests found the experimental and control groups not differing significantly in the areas of word knowledge, reading, and language. The controls held a signficant ($p<.01$) advantage in spelling. On the post-test, however, the experimental group performed significantly better on word knowledge ($p<.05$),

HIGH-SCHOOL FOREIGN LANGUAGE STUDY AND FRESHMAN PERFORMANCE

TABLE 1

DIFFERENCES IN AVERAGE SCORES BY INTELLIGENCE LEVEL

"Q" Decile	10	9	8	7	6	5	4	3	2	1
Mechanics										
FL	80.0	75.4	75.0	63.6	63.9	59.4	54.1	54.9	50.1	38.3
Non-FL	66.5	55.1	60.5	49.3	46.8	42.9	40.5	39.5	36.6	25.3
Diff.	14.3	20.3	14.5	14.3	17.1	16.5	13.6	15.4	13.5	13.0
Effectiveness										
FL	76.3	77.5	77.2	65.5	62.9	57.7	55.5	48.8	45.4	29.6
Non-FL	69.1	63.2	61.2	57.1	48.1	40.6	45.4	39.0	30.7	24.2
Diff.	7.2	14.3	16.0	8.4	14.8	17.1	10.1	9.8	14.7	5.4
Reading Comprehension										
FL	82.2	79.1	77.6	66.1	68.5	59.4	55.4	50.0	50.4	37.4
Non-FL	70.0	62.0	68.5	55.6	48.7	43.6	43.9	40.8	34.2	28.3
Diff.	12.2	17.1	9.1	10.5	19.8	15.8	11.5	9.2	16.2	9.1
Linguistic Ability										
FL	85.9	78.7	78.1	67.8	66.9	60.2	56.4	51.4	51.9	39.6
Non-FL	73.1	61.1	65.4	57.8	53.1	44.6	43.0	40.8	32.9	25.0
Diff.	12.8	17.6	12.7	10.0	13.8	14.6	13.4	10.6	19.0	14.6
History										
FL	71.3	68.4	74.4	65.5	58.3	55.3	52.3	46.9	41.3	40.9
Non-FL	67.5	57.8	67.0	57.6	52.0	48.9	49.8	42.6	40.5	37.0
Diff.	3.8	10.6	7.4	7.9	6.3	6.4	2.5	4.3	0.8	3.9
Mathematics										
FL	80.7	78.0	67.5	64.4	55.8	53.5	50.7	44.2	40.0	33.5
Non-FL	78.4	64.8	69.5	57.4	54.3	45.9	40.8	41.3	34.1	27.7
Diff.	2.3	13.2	-2.0*	7.0	1.5	7.6	9.9	2.9	5.9	5.8

Non-FL exceed FL. This is the only instance in the whole study, and, in view of the excessive difference at Q9, is obviously due to an unusual distribution.

reading ($p<.10$), and language ($p<.01$). There was no significant difference in spelling scores, although the experimental group gained ground on the controls.

It would seem then that the evidence from the Indianapolis project provides some support for the arguement that FLES Latin can positively affect English language arts skills of elementary students. The overall results of the project were positive enough though that Latin instruction is continuing in Indianapolis schools.

In a program begun in 1975 in two Los Angeles schools, fifth and sixth graders were given twenty minutes of Latin instruction daily as part of the language arts program. The program, known as the Language Transfer Project, was expanded to 30 schools. Based on pre- and post-tests using the Comprehensive Test of Basic Skills, the evaluators of the program claimed a mean gain of eight months in the vocabulary of the fifth grade experimental students, as opposed to a six-month mean gain for the control group, and in the sixth grade nine months, as opposed to six months for the controls. The conclusion of the study was that the project was successful in improving the reading, vocabulary, and comprehension scores of the experimental group "by more than one month for each month of instruction." (Masciantonio 1977:380)

A fifth and sixth grade Latin program initiated by the University of Massachusetts and the local public school district of Easthampton, Massachusetts had as its goals: (1) to stimulate and strengthen the students' reading skills in English, and (2) to provide cultural enrichment. Two hundred fifty children in nine classes received 20 minutes of daily instruction in Latin. Using the pre- and post-tests of the vocabulary section of the Stanford Achivement Test, the Latin students showed a marked improvement over the previous sixth grade students.

Seventh grade children in Worcester, Massachusetts were instructed in Latin five times a week. Reporting on the study, Masciantonio states that

"children with reading scores at the 4.5 to 5.5 grade level in September 1975 increased their vocabulary scores by fourteen months and their reading comprehension by nineteen months in one school year... Pilot-group pupils outstripped their counterparts in the control group by eight months in vocabulary scores and by thirteen months in reading comprehension scores." (Masciantonio 1977:381) The general conclusion to be drawn from these studies is that the study of Latin certainly did not interfere with achievement in other areas of the curriculum, and clearly enhanced English language skills in some cases.

1.3 Research evidence from high school language programs. A few studies have been undertaken to examine the effect of foreign language study on the native language ability of high school or college students. For example, Skelton (1958) compared 1,947 college freshmen at the Alabama Polytechnic Institute, 953 of whom had had no foreign language instruction, and 546 of whom had had one semester or more of a foreign language. Students within each group were further divided by intelligence level, as measured by a psychological examination, to meet "the objectives of the critics, who have insisted that the apparent superiority is due only to the fact that the students who elected foreign language were more intelligent to begin with." (Skelton 1958:8) All students were given a battery of 6 tests, including mechanics of expression (grammar, punctuation, capitalization, spelling), effectiveness of expression (sentence structure and style, diction and organization of thought), reading comprehension, American history, mathematics, and the afore-mentioned psychological test. Based on a comparison of scores, (see Table 2) Skelton's somewhat puzzling conclusion was that "the study of foreign language does improve one's command of his own language, thereby enhancing one's control of subject matter in fields in which language is the vehicle of instruction." (Skelton 1958:10)

In a much more recent study, Bastian (1979) examined the performance of students in Boise, Idaho to determine: (1) the effect of two or more years of high school foreign language instruction on achievement in English, and (2) if there were any male/female differences in English achievement between students with two years of foreign language instruction and those without. Bastian collected data from the permanent record cards of 238 randomly selected college-bound seniors, the data including foreign language status, percentile score on the English usage section of the American College Testing Program (ACT), percentile score on the English usage section of the Metropolitan Achievement Test, percentile score on the Otis-Lennon Mental Ability Test (IQ), and the cumulative GPA. The ACT score was considered the dependent variable, while the MAT score provided a measure of subjects' achievement in English before foreign language study. Bastian's conclusions were that (1) two or more years of high school foreign language study has a significant positive effect on the subject's achievement in English. The foreign language group performed at a significantly higher level than did the non-foreign language group when initial differences in pre-treatment English achievement and scholastic aptitude were controlled; (2) girls perform at a higher level than boys on the English achievement test; and (3) there was no significant interaction between foreign language study and gender.

In a similar study, Timpe (1979) set out to determine the effect of high school foreign language study on college entrance examination scores (ACT). In an attempt to distinguish between the effect of superior native intelligence and that of foreign language study, "bright" students were selected on the basis of class standing, GPA, and program of studies. Timpe states that there is some basis for the assumption that the more gifted students are more likely to study foreign language, and tentatively concludes that (1) although foreign language study helped both subgroups, the lower group received the most benefit; (2) the

presumed effect of foreign language study is roughly proportional to the number of years of study; and (3) the study of a foreign language has the greatest effect on the ACT scores in English (as opposed to scores on other portions of the test).

Three studies have been done to examine the effect of Latin study on the English language skills of high school students. Riley (1969) conducted a study in Erie County, Pennsylvania in which 352 students matched in types of I.Q. and grade level were compared on CEEB (college entrance) scores, grades in the two most recent semesters of English, and scores on a nationwide English vocabulary examination. Students with a Latin background showed higher scores in all areas, these results being attributed to Latin study.

In a study conducted by Bowker (n.d.), a vocabulary test was given to two groups of juniors at a private secondary school in Boston. The first group had had two years of Latin and a modern language while the second group had had a modern language but no Latin. Scores on the vocabulary test were higher for the first group than for the second.

Scanlan (1976) evaluated a course at the University of Illinois designed to enlarge students' English vocabulary through the study of Latin and Greek roots and derivatives. The course included the use of computer-assisted instruction with the Plato IV system. Scores on a standarized vocabulary pre- and post-test showed improvements in all students, with an increase in 40 percentile ranks for some.

Finally, Masciantonio reports on a study conducted by the Human Engineering Laboratory in Washington, DC: the foreign language study background of 220 adult native English speakers was tabulated and compared with their scores on an English vocabulary test. Those having no foriegn language background had an average English vocabulary percentile of 28, while those with Latin and another language averaged 58. (Masciantonio 1977:381)

Once again, the study of foreign languages cannot be said to interfere with native language skills and in some cases, there is evidence that such study enhances the students' competence in their native language.

1.4 Research evidence from bilingual programs. In the FLES and Latin programs described thus far, the language learning situations by and large consist of brief daily periods of exposure to the target language within the larger and dominant context of the speaker's native language. The target language is generally not expected to be used outside of the language classroom given the general lack of a real or pragmatic need to use the language in question. The study of a foreign language in these situations does not differ significantly from the study of other academic subjects.

However, the effect of foreign language learning on native language ability has also been examined in language learning situations that are very different from the FLES or Latin ones: situations in which the learners have an immediate need to apply their language skills to the accomplishment of other academic or real world tasks; that is to say, situations in which the goal is not simply exposure to the target language in an academic context, but rather the development of an ability to use the language in everyday communication. While most of the studies in this area concern children and adolescents in a formal school setting, the subjects range from children who are encountering a second language for the first time in the school setting to children who already control two or more languages before they come to school. Studies in this area clearly reveal both the varied nature of bilingualism and the intricate nature of the relationship between bilingualism and the socioeconomic context in which it occurs.

The earliest studies seemed to provide evidence of the negative effect of second language study on first language skills. Macnamara (1966), for example, reported that Irish primary school children whose home language was English but

who were instructed in Irish, were eleven months behind in problem arithmetic relative to other Irish children taught in English. No differences were noticed between the groups with problems expressed in arithmetic symbols. Macnamara suggested that his findings provided evidence for the so-called "balance effect" in language learning, i.e. that the bilingual pays for second language skills by a decrease in first language skills. Furthermore, Macnamara attributes English language achievement differences between all groups of Irish children and British norms to the fact that British schools spend twice as much time on English instruction as do Irish schools.

However, in a critique of the study, Cummins (1978a) points out that these discrepancies do not necessarily constitute the balance effect in that "the balance effect metaphor suggests an intrinsic relationship between the learning of Irish and a decline in English skills, whereas, in fact, the most likely cause of the decline in English skills, i.e., the time factor, is extrinsic to the language learning situation. In other words, less time in English instruction will lead to lower levels of English achievement no matter what the extra time is spent at." (Cummins 1978a:866)

Fourth and fifth grade Japanese-English bilinguals performed at a significantly lower level than bilingual control groups on measures of verbal and academic skills in a study undertaken by Tsushima and Hogan (1975). The two groups were matched on non-verbal ability, and the bilinguals were children whose mothers were born and raised in the United States. In describing the study, Cummins (1978a) comments that no details are provided regarding the bilinguals' relative competence in both languages, i.e. their degree of bilingualism.

Although its findings did not specifically relate to native language competence, Peal and Lambert's study of French-English bilinguals in Montreal (1962) is recognized as providing the first evidence that bilingualism causes

gains in language ability for one or both languages. The study was controversial in that it included only bilinguals who had reached a relatively similar degree of competence in both languages, i.e. "balanced bilinguals." Four measures were used to estimate the degree of bilingualism, and the researchers found that ten-year-old "balanced bilinguals" did better on measures of non-verbal intelligence than did the monolingual controls, and they also performed better on measures of verbal intelligence.

Swain (1974) provides a thorough review of the nature and effects of the various types of foreign language immersion programs that have evolved in Canada. Swain closely examines the effect of immersion programs on English language skills, and does so by exploring five questions:

1. What is the effect of using French in kindergarten? Here Swain focuses on a study done by Barik, McTavish and Swain (1974) which examined children's readiness for reading and arithmetic in English grade one classes in Toronto and Ottawa, as measured by the Metropolitan Readiness Test (MRT). French immersion children and English kindergarten children were compared, and it was found that they performed similarly.

2. What happens to the English language skills of children who have attended a total French immersion kindergarten if they continue in a total French immersion grade one? In this instance, Swain reports on the results from the St. Lambert experiment in Montreal, in which it was found that listening and speaking skills do not fall behind, while the ability to read English does, relative to children in an English-medium grade one. However, the immersion children were found to catch up quickly, following the introduction of one daily hour of English language arts in grade two.

3. What is the effect on English language skills if English language arts are not introduced until Grade three or four? Swain reports on a study by

Edwards and Casserly (1973) of students in the Ottawa Roman Catholic Separate School Board. As measured by the Metropolitan Achievement Test, grade two immersion children were found to be behind in both reading and spelling relative to children who had been instructed in English all but 75 minutes daily. The immersion children had caught up by grade three in reading but not in English language rules. Similar results were found for immersion students in the Protestant School Board of Greater Montreal.

4. What are the advantages of early partial immersion as opposed to early total French immersion, specifically regarding English language skills? Here the progress of first, second, and third grade partial immersion students was compared to that of students in the regular English program and in the total immersion programs in St. Thomas, Ontario. (Swain, Barik and Nwanunosi 1973) Swain remarks that in general, partial immersion does not result in native language skills which are superior either to those students in the regular English program or to those in total immersion who do not receive English language arts until grade two or three. In pondering why this might be, Swain points out that in partial immersion programs, English reading is introduced in grade one and French reading is introduced in grade two. This sequence is reversed in total immersion programs. She suggests that it may be easier to learn to read in French as French has a more systematic sound-symbol correspondence than English, and that once the basics of reading have been learned, it may be easier to transfer them to one's native language than to a second language, as the sound patterns, vocabulary and language structures are already well-established.

5. What of the English language skills of late immersion students? The results in this instance are from the grade seven immersion programs of the

Protestant School Board of Greater Montreal and the grade eight program of Peel County. Grade seven immersion students were compared to regular English program students on paragraph meaning and language usage; grade eight students were compared on vocabulary knowledge, English reading comprehension speed, and accuracy. The results of both comparisons suggest that participation in immersion programs in grades seven and eight has not resulted in any negative effects on the measured language skills of the immersion students.

The overall impression resulting from Swain's overview is that English (or native) language skills are not adversely affected in immersion programs. Several other studies solidify this impression. For example, Tremaine (1975) tested the hypothesis that the attainment of "concrete operations" would be accompanied by major progress in the comprehension of both English and French in bilingual students. He also wanted to describe the development and interrelation of the syntax of two languages when one of the two is "weaker" than the other, and to test Lambert and Tucker's (1972) suggestion that "learning through a second, linguistically related language may have a favorable influence on children's performance in their native language." (Lambert and Tucker 1972:82) Tremaine compared total immersion students in grades one, two, and three (Ottawa Roman Catholic School Board) to students receiving 75 minutes of French daily, and found predictably large differences in French syntactical knowledge in favor of the immersion group. However, he also found differences in English syntactical development in favor of the immersion group, and concluded that "intensive exposure to French facilitated the comprehension of certain English syntactic structures." (Cummins 1978:867)

Genesee (1978) compared third and fifth graders in a trilingual English-Hebrew-French program with children in a bilingual English-Hebrew

program, and found that the trilingual students performed at the same level in English as the bilinguals, and significantly better in Hebrew.

With regard to the relationship between first and second language skills, Cummins (1978a) outlines two hypotheses: the developmental interdependence hypothesis, and the threshhold hypothesis. In the former he suggests that the development of second language skills is a function of the level of the child's first language skills at the time when second language exposure begins. He states that when the first language is adequately developed and reinforced, "as in the case of most middle-class anglophone children in North American immersion programs," intensive exposure to a second language is likely to result in high levels of competence in the second language, at no cost to the first language. "However, when L1 is poorly developed, as in the case of many lower-class or 'disadvantaged' minority language children, intensive exposure to L2 can impede the continued development of L1 skills." (Cummins 1978a:856) Cummins goes on to clarify what he means by the 'inadequate development' of L1 skills, by describing situations in which parents may continue to speak L1 with each other but attempt to use L2 with their children, thus exposing them to a low level of L1 stimulation and to perhaps faulty L2 models. He goes on to say that this pattern is exceptional, as the majority of working-class minority language children who fail in school have perfectly fluent L1 speaking skills when they start school, "however, as with low socioeconomic status children in general, their L1 experience may not have emphasized success." While it is debatable as to whether working-class children should be singled out on the issue of educational language functions, Cummins' clarification is essential because without it, the developmental interdependence hypothesis is sadly reminiscent of the

"deficit" or cultural deprivation theory advanced in the 1960's by researchers attempting to account for the failure of minority children in American schools. In its most extreme form, this theory held that minority children failed because they essentially had no language skills whatsoever at the point of entering school. Studies that offer support for this hypothesis include work by Toukomaa and Skutnabb-Kangas (1976 on Finnish migrant children in Sweden, Dube and Hebert (1975) on French-English bilinguals in Maine, Hebert (1976) on French-English bilinguals in Manitoba, Ben-Zeev's work (1972;1977) on Hebrew-English and Spanish-English bilinguals, and Modiano's work (1968) with Mexican Indian children.

The threshhold hypothesis suggests that the cognitive and academic effects of bilingualism are mediated by the relative levels of competence which a bilingual child reaches in L1 and L2. That is, there may exist "threshhold" levels of linguistic competence which a bilingual child must reach in both languages to avoid cognitive disadvantages and to permit "the potentially beneficial aspects of becoming bilingual to influence cognitive growth." (Cummins 1978a:858) Studies that investigate this hypothesis include Cummins' (1978b) work on Irish and Ukranian-English programs, and Gowan and Torrances' (1965) study of Chinese, Malayan, and Tamilese children.

These studies will not be reviewed in detail, as they are not of direct relevance to the present work. The two hypotheses are important, however, because they dramatize the complexity of any language learning situation, and the variety of social, economic, and psychological factors that play a role in an individual's competence in a given language. Clearly, the relationship between a speaker's first and second language skills is an intricate one that cannot be adequately accounted for along a single dimension.

1.5 Conclusion. It is the intricacy of this relationship, in fact, that emerges as the dominant theme of this literature review and provides a synthesis for the wide variety of studies that have been discussed. Based upon these studies, it would appear that the learner's competence in a second language and the effect of studying that language on her/his native language skills can be understood in terms of the interaction between two major areas: (1) the language learning situation itself, i.e. the actual degree of exposure to the second language and the functions of the second language in the learning situation (i.e. is the language being learned as an academic subject separate unto itself, or is it the medium through which other subjects are being learned?), and (2) sociolinguistic factors in and surrounding the language learning situation, such as the relative prestige of the languages in question, the different functions filled by the languages, and so forth. Not much evidence for a negative effect of second language study on native language ability is provided in the studies discussed here. However, the studies do evidence a wide range of results, from neutral to positive. This wide range can be understood precisely as a function of the interaction of the two major areas: while no two language learning situations can be alike, they can be compared and understood as the same factors come into play.

The study that is described below was originally prompted by the final report of the "Wirtz Commission" (Willard Wirtz, et al. On Further Examination, Report of the Advisory Panel on the Scholastic Aptitude Test Score Decline. New York: College Entrance Examination Board, 1977.) The Commission noted a "...clear parallel...between students' SAT-Verbal scores and the number of foreign language courses they have taken in high school." The report was careful to state that there was no way to tell, from the data at the Commission's disposal, whether languages were studied by students who were more verbally

gifted in the first place, or whether language study really did have some affect on SAT-Verbal score, since the Commission did not have access to measures of verbal intelligence prior to the beginning of language instruction. Our interest in pursuing this study was to perform a post hoc pilot study that would gather not only prior measures of verbal ability, but also academic record in high school, so as to be able to account for potentially "contaminating" experience that some students might get (in drama, extra courses in English, reading courses, for example) that would have an effect on their SAT-Verbal score. In addition, we wanted to take into account the students' language-related activities outside school (language of the home, experience in non-English speaking environment, experience abroad, language instruction outside school, etc.) Although recent studies (particularly Bastian) have shown more careful attempts to control for these confounding variables, we felt that even more credible results could be obtained by accounting for an increased number of them.

2.0 Building the Corpus: Procedures for data collection, coding, keying, and emendation

2.1 Data Collection Procedures

2.1.1 Gaining access to permanent records in the Montgomery County Public Schools. In order to be able to conduct research using data from the Montgomery County Public Schools, it is necessary to obtain approval of a formal proposal which outlines in some detail the research topic to be explored, the types of data collection to be undertaken, and the methods of analysis. Such a proposal was written and was submitted to the Department of Educational Accountability for analysis by this office and for recommendation for approval by the Deputy Superintendent of the Montgomery County Public Schools. Approval was obtained from the Deputy Superintendent on 2 June 1980. Once this approval was obtained, we were able with relative ease to proceed first to the adminstrative offices of Region 3, where the three high schools we desired to obtain records from are located, and then to the principals of the high schools themselves, and finally to the registrars of the high schools, who are in charge of the record cards from which we were planning to copy information. At each level, a meeting was held between the principal investigator and individuals concerned in order to explain the overall plan of our research and to make a formal request for cooperation. At all levels, we have been extremely impressed by and grateful for the cooperation provided by MCPS personnel.

2.1.2 Privacy Act Procedures. In order to obtain the data for our investigations, we needed to gain access to the permanent record cards of students near graduation from the Montgomery County Public Schools, which contain the grade records and the test records of individual students. The Privacy Act obligates school districts to require that "informed consent" be received from the rele-

vant individual (either the parent or the student himself) when information is obtained from permanent record cards for any other reason than management or research studies undertaken by the school district itself. Our initial ideal was to collect permanent record information of the graduating class of June 1980. The Privacy Act stipulates that permission must be received from the student himself (rather than from the parent) if the student has attained majority by the time the request is made. Since a substantial proportion of the students in our population had reached their eighteenth birthday by the time we were prepared to request permission, we decided to deal instead with the permanent record cards of the class of 1981, virtually all of whose records could be collected upon obtaining the permission of their parents. We reasoned that students who had already graduated from high school would not be highly motivated to respond to a request to gain access to their permanent record cards. Once we had been formally introduced to the principals of the three high schools by regional office personnel, we met with each one of them in order to obtain their permission and support for the mailing which we desired to make to the parents of the class of 1981. In order to obtain the "informed consent" required by the Privacy Act, it was necessary to write a letter, addressed to the parents of the children whose records were sought, in which the general outline of the project was given and in which the parents' permission was requested. Guarantees were given that the anonymity of all students' grade and test information would be maintained. In addition, in order to provide parents with some assurance that the present effort was a serious one and had been examined and approved by appropriate individuals in the MCPS hierarchy, we obtained from each principal a personal letter addressed to the parents of the students in the high school encouraging them to cooperate in the venture. Attached to the principal's cover letter and the letter of explanation by the principal investigator was a consent

form to be signed and a stamped return envelope. A copy of each of the three documents is included in Appendix A.

In order to facilitate the initial mailing of approximately 1,200 letters to parents and a subsequent follow-up mailing to non-respondents, we requested from computer services at MCPS six sets of address labels for the entire graduating class of 1981 for all three high schools. One of these sets of labels was used to establish a master list upon which we recorded mailing and responses, plus any other relevant information. The second and third labels for each individual were used to address the initial envelope and to identify the corresponding consent form so that there would be no ambiguity about the consent forms that were returned. The fourth and fifth mailing labels were used similarly for the follow-up to those parents who did not respond to our initial mailing. The sixth label was reserved for any communication with parents that was needed during the course of the project. Our initial mailing was done at the end of August 1980, with returns tabulated during the first two weeks of September. The follow-up mailing was accomplished during the third week of September, and by the end of the first week in October, we had virtually all of the consent forms that we were to receive; a 40.3 percent response overall from the initial list of 1,235 students in the three high schools. See Table 3 for the complete picture of our consent form mailing. Note in Table 3 that the number of cases actually used in our computer analysis is smaller than the number of responses received. This is due to three factors: first, through a data input error, about 45 cases from School 3 were not included in the data set analyzed; second, we rejected a number of cases because of insufficient data; and third; some responses requested that we not use a particular student's data.

Insert Table 3 about here

Table 3: Responses to Request for Consent

High school	Initial mailing	No. of responses	Followup	No. of responses	Total responses*	Cases in analysis
1	358	87	209	58	145	139
2	428	104	157	34	138	133
3	449	147	221	74	221	168
Totals	1,235	338	587	166	504	440

*Includes some responses where we were explicitly not given permission to gain access to records.

NOTE: There is no Table 2 in this report.

2.1.3 Data collection instrument. The form onto which we transfered information from the students' permanent record cards underwent several modifications. The first draft of the data collection instrument was designed before we had seen any of the permanent record cards themselves in any of the three high schools. Based upon the blank samples of the standarized record cards used by the MCPS, the principal investigator decided what information would be most useful in the analysis that was projected. The selection of these different variables was discussed with two researchers from Educational Testing Services (ETS) during a meeting held on the ETS campus in August 1980. This initial draft was used by the principal investigator and by the primary consultant for the project to gather approximately ten cases of data during early September. Based upon this experience, the instrument was substantially modified in two major ways.

First, virtually all of the information which we had thought to be available concerning the students' extra-curricular activities, summer work experience, and vocational preferences were, in fact, not available to us on the permanent record cards. This information was dropped from our final data collection instrument draft. A second major change in the instrument involved the organizing of its format to more closely approximate the physical alignment of the grades, course names, Carnegie units, and test scores on the various permanent record cards involved. A copy of the final draft of the data collection instrument is included as Appendix B.

2.1.4 Data collection procedures. Once the final draft of the data collection instrument was available in multiple copies, two data collectors with extensive experience in collecting data from the schools in MCPS were hired to do the major portion of data collection. This procedure was recommended to us by the

primary consultant, an employee of MCPS, and turned out to be an extremely effective one. During the four-week period when data were being collected, the principal investigator only needed to remain in telephone contact with the two data collectors in order to answer their questions, and to visit the high schools each week to deliver fresh supplies of forms and to pick up those forms which had been filled with data.

For the collection of data for each case, a signed consent form was presented to the school registrar or her assistant, at which time the permanent record was handed to the data collector. Once the data collection was completed, the permanent record file was returned to the registrar, and the consent form was returned to the data collector and attached to the data collection instrument containing the information relating to the student involved.

2.2 Coding procedures. The only data needing coding before keypunching were the students' academic records from grades 7 through 11: course names, grades, and Carnegie units. The coding process was facilitated by having coding spaces already assigned on the data collection instrument. The coding chart is attached as Appendix C. Once the coding chart had been worked out, coding was accomplished smoothly and quickly. The principal investigator coded the first twelve cases for each high school and was able to anticipate most problems and to adjust the coding procedures based upon this experience. After this, three free-lance coders were hired to perform the bulk of the coding. Any question which they had concerning individual cases were settled when the principal investigator reviewed the coding of each case before it was sent to be keyed.

2.3 Keying and data emendation procedures. Once the data collection instruments had been coded and had been reviewed by the principal investigator, they were sent in batches of fifty to the Language Processing Center at Georgetown

University, with whom we had contracted to perform the keypunching of our data and data emendation. Each case required 15 IBM cards, so the 440 cases in our study involved keypunching 6,600 IBM cards.

Once all cases had been keyed, a frequency printout was delivered to the principal investigator. On this printout, he indicated those values which to him appeared to be anomalous. This information was conveyed to the LPC staff, who went back to the data set to determine whether these anomalous values represented keying errors or some other type of error, most likely coding. Once keying errors had been corrected in this process, the other errors, with case numbers attached, were furnished to the principal investigator for him to consult the original data collection instrument to determine the source of the anomalous value. The results of this process were conveyed to MCPS staff once again and corrections were made in the data set. Because of this procedure, we have very high confidence in the quality of our data set.

3.0 Population characteristics.

3.1 Selection of high schools. In order to select an unbiased sample of subjects who would be as free as possible of language-related contaminating effects, our original plan was to take data from the permanent records of a particular year's graduating class at three high schools in the MCPS. The original criteria for the selection of school sites were:

A. The socioeconomic level of the school population should be minimally skewed toward the high end

B. The non-English speaking ethnic population should not be high

C. The number of students likely to have had residence abroad (e.g., U.S. military or U.S. State Department dependents) should be as low as possible

D. The number of students not having studied a foreign language and having taken the SAT during that year should be as high as possible.

The principal investigator met with the foreign language coordinator of the MCPS early in the project in order to select schools that would meet these criteria. Once we became aware of the constraints to be imposed on us by Privacy Act compliance, it became obvious that the original schools selected could not be included, since they were situated in four different administrative regions. Dealing with four different regional offices would have been too time-consuming for our rather tight time schedule, and it was decided to proceed with one of the regions, Region Three, and to select three high schools within this region that would come as close as possible to satisfying the four criteria just mentioned. As will be seen below, we were able to gather enough information concerning criteria B and C above to satisfy our requirements here. In our final regression analysis, we excluded those students who were non-English speaking and those who had other language experience (e.g. residence abroad or schooling in a language environment other than English) that made their status

as a "pure" anglophone suspect. We do not have complete descriptions of the socioeconomic environment for each of the three high schools from which we drew our cases. In global terms, one of the high schools draws students from a predominantly upper-middle class population; the other two high schools tend to include students from a wider variety of middle- and upper-middle class backgrounds, and include a fair proportion of both blue- and white-collar families.

3.2 Population age, sex, and ethnicity. The vast majority (87 percent, 381 cases) were born in 1963, with approximately 11 percent (48 cases) born in 1962. Only one individual was born in 1961, and seven were born in 1964. Thus, less than two percent of our cases were either older or younger than one would normally expect for 11th graders: 16-17 years old.

Our population was split exactly evenly sex-wise: 220 males and 220 females.

Tables 4 and 5 show the ethnic composition of our sample and the ethnic composition of the high schools in question according to MCPS data, respectively. In comparing the two tables one sees that, in the main, our sample is fairly representative of the student populations in the three high schools. The only case in which the white population in our sample appears to differ substantially from that reported by MCPS is in the case of School 2, where the proportion of white students in our sample is approximately nine percent greater than it is in the school as a whole. In general, ethnic minorities are somewhat under-represented in our sample. The composition of our sample was of course determined by the return (or non-return) of our consent form. It is a well-documented fact that minority individuals tend to respond to such survey procedures at a lower rate than do majority individuals.

Insert Tables 4 and 5 here

Table 4: Ethnic Composition of Sample by High School

	#1, N=139		#2, N=133		#3, N=168		TOTAL, N=440	
	N	%	N	%	N	%	N	%
White	117	84.2	128	96.2	153	91.1	398	90.5
Black	10	7.2	3	2.2	3	1.8	16	3.6
Asian	7	5.0	1	0.8	3	1.8	11	2.5
Hispanic	1	0.7	0	0.0	8	4.8	9	2.0
Other	4	2.9	0	0.0	0	0.0	4	0.9
Missing	0	0.0	1	0.8	1	0.5	2	0.5

Table 5: Ethnic Composition of High Schools, School Year 1979-80*

	1 N=1,505	2 N=1,463	3 N=1,917
White	81.0%	87.4%	89.0%
Black	10.4%	8.7%	3.4%
Asian	5.5%	2.1%	3.8%
Hispanic	2.5%	1.7%	3.8%
American Indian	0.3%	0.1%	0.1%

*Source: Department of Educational Accountability Statistical Profiles, Montgomery County Public Schools, Rockville, MD, January 1980.

3.3 Language background. In order to identify those students whose language experience had been other than only English, we collected three pieces of data from the permanent record card: (1) evidence of participation in classes in English as a second language; (2) evidence that some other language than English was the primary language of the pupil; (3) and evidence that there was some language other than English which was spoken regularly in the home.

The vast majority (97.3%) of our subjects had never participated in a class in English as a second language (ESL). We found evidence that only nine had participated previously in ESL classes; none were doing so currently, and the data concerning ESL were missing for three students. For 97.0% of our subjects, English was the primary language at the time we were gathering our data. Only three students were currently using Spanish as their primary language, six were using an Asian language, and four were using some other language or the data were missing. For 93.6% (412) of our cases, English was the only language used in the home. Spanish was used in the homes of thirteen students, French in one, an Asian language in seven, and in seven, some other language or the data were missing.

3.4 Non-English schooling and residence abroad. Recognizing that school experience in a language environment other than English could have a contaminating effect on the results of this study, we sought to identify those students who had spent time, either in the United States or abroad, in a school environment where classes were conducted in another language. This school experience could be, for instance, in an elementary school "immersion" program, in a private international school (where the curriculum typically is conducted in two or more languages), or in a school located abroad where instruction was given in a language besides English. In our sample, 420 (95.5%) subjects

appeared to have had no experience in a non-English school environment. Of the total 440 subjects in our sample, 33 had spent one year or more abroad.

3.5 Test profiles of sample population compared with school and county-wide statistics.

3.5.1 Sample scores compared with county-wide data. Table 6 compares our sample with MCPS-wide data for the seventh grade administration of the Iowa Test of Basic Skills (ITBS), Composite score. Our sample is ten points higher than the MCPS for first and third quartile scores; for the second quartile, it is eleven points higher than the MCPS-wide population. Of course, this comparison can only be indicative of the higher ability level of our sample, since the county-wide results are from the 1980 administration of ITBS and the results for the vast majority of our subjects are from the 1976 administration.

Insert Table 6 about here

Table 7 compares the quartile scores of our sample with the MCPS-wide quartile scores on the Test of Academic Progress (TAP), administered in grade eleven. At both the first quartile and the second quartile levels, our sample scored eleven points higher than did the MCPS-wide population. At the third quartile level our sample scored only four percentage points higher. As with the ITBS scores discussed above, we are comparing the county-wide quartiles of the 1980 administration of TAP with the sample means from the 1976 administration. However, these test data provide additional evidence indicating that our sample is substantially higher in academic achievement than is the population of the Montgomery County Public Schools in its entirety.

3.5.2 Comparison of sample means with high school means on standarized tests. In Table 8, on selected subtests of the ITBS, by high school, we compare the mean percentile scores for our sample with those published by MCPS. These test

Table 6: Iowa Tests of Basic Skills--Composite Score Quartiles: Grade 7

	MCPS-wide percentile*	Sample percentile
First quartile	42	52
Second quartile	66	77
Third quartile	84	94

*Source: MCPS Annual Test Report, 1979-80, Department of Educational Accountability, MCPS, November, 1980.

Table 7: Test of Academic Progress--Composite Score Quartiles: Grade 11

	MCPS-wide percentile*	Sample percentile
First quartile	36	47
Second quartile	63	74
Third quartile	87	91

*Source: MCPS Annual Test Report, 1979-80, Department of Educational Accountability, MCPS, November 1980.

Table 8: Comparison of Mean Percentile Scores for Selected Iowa Tests of Basic Skills Subtests and Composite: School-wide Mean and Sample Mean, Grade 9 by School

	#1		#2		#3	
	School mean*	Sample mean	School mean*	Sample mean	School mean*	Sample mean
ITBS-Vocabulary	49%ile	64%ile	45%ile	71%ile	69%ile	71%ile
-Reading Comp.	47	61	44	68	62	67
-Spelling	44	60	43	64	58	65
-Capitalization	44	69	46	67	62	71
-Punctuation	46	67	46	68	62	71
-Language Usage	47	61	45	66	62	69
-Composite	52	63	47	72	68	69

*Source: MCPS Annual Test Report, 1979-80, Department of Educational Accountability, MCPS, November, 1980

scores provide further evidence that our sample is substantially more gifted than the average for the three high schools in question. This is particularly true in schools RM and RH, where the differences in means between total school population and our sample range between 15 and 20 percentage points. It must be kept in mind, however, that we are comparing the scores here of our sample population (who took this ninth grade test several years ago) with the total school population of students who took the tests in spring 1980.

Table 9 and 10 portray the same kinds of comparison between school mean score and our sample mean score for the 11th grade TAP Mechanics of English Reading and Composite scores, and for the 1980-administered SAT-Verbal and Math. Unlike the ITBS scores discussed above, however, both the whole school population mean scores and our sample scores come from 1980 administration of these tests. Table 9 supports our previous conclusion based upon seventh and ninth grade data that our sample from Schools 1 and 2 are roughly ten percentile points higher than the school mean. For School 3, however, TAP mean scores are very close, with the sample group scores somewhat <u>below</u> the school mean in composite TAP. Table 10, showing mean SAT Verbal and Math scores, provides further evidence that our sample groups from all three high schools are significantly more gifted than the average for the schools.

3.5.3 Conclusion: representativeness of the sample. The test data discussed above show conclusively that our sample, while not grossly unrepresentative of MCPS or the three high schools where data were collected, does include more students from the higher end of the academic achievement/aptitude scale. While ethnic minorities are not present in the sample in quite the proportion of the county population as a whole, these populations are not grossly under-represented. In sum, while we cannot claim that the results discussed

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Table 9: Comparison of Mean Percentile Scores for Selected Test of Academic Progress Subtests and Composite: School-wide mean and Sample Mean, Grade 11, by School

	#1		#2		#3	
	School mean*	Sample mean	School mean*	Sample mean	School mean*	Sample mean
Mechanics of English	55%ile	65%ile	58%ile	69%ile	71%ile	72%ile
Reading	50	62	60	69	67	67
Composite	55	64	63	70	74	68

*Source: MCPS Annual Test Report, 1979-80, Department of Educational Accountability, MCPS, November, 1980.

Table 10: Comparison of Mean SAT Verbal and SAT Mathematics Scores, 1980 Administration Only, School-wide Mean and Sample Mean, by School

	#1 (N=182)*		#2 (N=145)*		#3 (N=364)*	
	School mean**	Sample mean	School mean**	Sample mean	School mean**	Sample mean
Verbal	437	487	454	481	464	503
Math	487	541	511	556	517	549

efers to the number of students who took SAT tests in 1980.
rce: MCPS Annual Test Report, 1979-80, Department of Educational Accountability, MCPS, November, 1980.

below are truly representative of the total populations of the three high schools or of MCPS, we can say that they are indicative of what county-wide results might be.

4.0 Variables included in analysis. The discussion below will cover first the independent, then the dependent variables which are considered in the development of our final model for the step-wise regression analysis used in this study. Our discussion of the independent variables will be divided into two parts: those which come directly from our data collection instrument (which we refer to as "first-level" variables), and those which we have constructed based upon data from the form (which we call "second-level" variables).

4.1 Independent variables.

4.1.1 First-level variables: personal and academic. Most of the variables relating to the personal background of our subjects have been discussed in Section 3. We will only list them here, and mention whether they were included in the final regression analysis. Subjects were identified by the high school they attended; this proved to be non-significant in our intermediate analyses, and this variable was eliminated in the final computer run. Birthdate of each subject was recorded, and was used to create a variable, OLDER, which was subsequently eliminated because preliminary regression analyses showed it to be non-significant. Both sex and ethnicity appear in the final regression analysis. The number of years enrolled in MCPS was recorded for each subject; early regression runs found this to be non-significant, and it was dropped from the final analysis.

Language-backround-related information was collected on the data collection instrument, and was used to create a variable, LANGBACK, which will be dicussed below. Finally, experience in elementary school foreign language study, if any, was recorded; out the 440 cases in our computer corpus, 23 had had some experience in elementary school foreign language study.

While individual course names, grades and Carnegie unit information was

collected for all students, this information was only included in our analysis as second-level variables, since it was necessary to calculate grade point average for the various subjects as well as overall grade point average. It was also necessary to arrive at measures of length of exposure to various subject matters relevant to our analysis: for instance, number of years of study of foreign language and number of years of study of English.

4.1.2 Iowa Tests of Basic Skills and Cognitive Abilities Test, general background. The Montgomery County Public Schools administer the Iowa Tests of Basic Skills (ITBS) and the Cognitive Abilities Test (CAT) in grades seven and nine. These test results were collected for all students, with the seventh grade results intended to be a "pre-measure" of verbal ability in our experimental design. For the ITBS the national stanine score and the national percentile score were gathered for all subtests, as well as the composite for each of the students in our sample. In our preliminary anslyses, however, we used only the ITBS vocabulary, reading comprehension, spelling, capitalization, punctuation, language usage, and composite scores. Spelling, capitalization, punctuation, and language usage proved to be non-significant in these analyses, and were eliminated from the final regression run. For the seventh grade CAT, national stanine, standard score, and national percentile were collected for the three sub-parts of the test: verbal, quantitative, and non-verbal. In our anaylsis, we used only the national percentile score for the verbal subtest, which, like its ITBS counterparts, was considered to be a "pre-measure" of verbal ability.

While ITBS and CAT test data were collected for the ninth grade test administration, this information was not included in our regression analysis. This ninth grade data did prove very useful to us, however, in comparing our sample with the school populations they were drawn from. This information is discussed in Part 3, above.

4.1.3 Iowa Tests of Basic Skills: descriptions of sub-tests. (These descriptions are paraphrased from the Manual Administrators, Supervisors, and Counselors, Iowa Test of Basic Skills, Boston: Houghton Mifflin Co. 1964.)

ITBS Vocabulary. This test is composed of forty items each of which is a word taken from the Thorndike and Rinsland wordlist. The student chooses the correct definition of the word from a list of four possibilities. Nouns, verbs, and adjectives are given approximately equal representations; a few adverbs are included as well. (Manual, page 27.)

ITBS Reading. The reading comprehension passages of this test vary from a few sentences to a full page. They represent a selection of a variety of material encountered in everyday reading. Skills tested are: (1) recognizing and understanding stated or implied factual details and relationships; (2) discerning the purpose or main ideas of a test passage; (3) organizing ideas by recognizing common elements or place in time sequence; and (4) evaluating materials that have been read, and recognizing a view point, mood or tone, and quality of style or structure. (Manual, pages 27-8.)

ITBS Spelling. The items in this test consist of a list of four words, one of which maybe misspelled. A fifth response is always possible: "no mistakes." (Manual, page 31.)

ITBS Capitalizing and Punctuation. Items for these two tests are very close in format; each one includes one or two sentences extending over three lines of approximately equal length. The students choose which line has the error, or selects the option, "no mistakes."

ITBS Language Usage. Items of this test consist of three sentence groups, one of which may contain an error of spoken or written English. The students select the sentence containing the error, or "no mistakes." Categories of usage covered in the test are: pronoun usage, verb usage, use of adjectives and

adverbs, avoidance of the double-negative, redundancy, commonly confused homonyms, and miscellaneous individual word forms. (Manual, pages 33-4.)

ITBS Composite. This summary score involves adding the scores of the following subtests: vocabulary, reading comprehension, language skills (including tests on spelling, capitalization and punctuation, and language usage), work study skills (which includes subtests on map reading, reading graphs and tables, and using reference materials), and arithmetic skills (including subtests on arithmetic and problem solving).

4.1.4 Cognitive Abilities Test: descriptions of verbal battery. The descriptions of the following four subtests are paraphrased from: Robert L. Thorndike and Elizabeth Hagen, Examiner's Manual: Cognitive Abilities Test, Boston: Houghton Mifflin Co., 1971, pages 14-21.)

Subtest 1: The student chooses among five options the best synonym for a particular word; no context is given.

Subtest 2: The student chooses the best word from among five options to fill in a blank in a sentence.

Subtest 3: The student selects the word from five possible choices that is analagous to another group of words given in the test item. For example, given the words eye, ear, mouth, the student must choose the analagous word from the list: nose, smell, head, boy, speak. "Nose" is the correct response in this case.

Subtest 4: The student is furnished a list of parallel relationships with one term missing, and must choose the missing word from a list of five options. For example, drink:milk :: eat:food.

4.1.5 Second-level (created) independent variables.

4.1.5.1 Personal. Two variables were created from the information contained on our data collection instrument: one related to the age of the students and the other related to their language background.

OLDER: To create this variable, we split our population into quartiles. The first quartile contained students whose ages ran from 191-206 months; the second from 207-209 months; the third, 210-212 months, and the fourth, 213-227 months. This variable was found to be nonsignificant in our preliminary regression analyses and was eliminated from the final analysis.

LANGBACK: To construct this variable, we divided our population into four groups, based upon the information in the language-related questions in our data collection instrument. The four categories created were as follows: (1) anglophone, with no other foreign language in the background (409 cases); (2) anglophone, with some foreign language in the background (0 cases); (3) foreign-born anglophone, i.e., someone who was born outside the United States but appeared, from the information available in the permanent record file, perfectly able to use English to conduct their everyday lives (14 cases); and (4) foreign born non-anglephone, i.e, an individual who was not yet able to use English easily (8 cases). Nine cases could not be assigned to one of these groups because of missing data. Once we had discovered that all groups except the "anglophone-no language" group were quite small, we realized that an analysis using all four categories of the LANGBACK would not be fruitful because of lack of statistical significance with such small groups. In an intermediate analysis, we constructed a second LANGBACK variable, which

grouped the "anglophone-no language" individuals in one group, and all the rest in another. This variable did not prove significant in our preliminary regression analyses, and the final regression analysis was done with "anglophone-no language" cases only.

4.1.5.2 Second-level (created) academic independent variables. In addition to grade point average for all the academic areas included in our data collection (English, foreign language, social science, mathematics, science, music, and a commulative GPA covering all of the preceding except music), we created for each subject area a measure of the total time spent in the study of that area by adding the Carnegie units taken in grades seven through eleven in that period. Finally, we created a number of other variables, which we will list and discuss below. The list includes those variables used in our preliminary regression analyses, and indicates those which we dropped in the final analysis, since they proved to be non-significant in our earlier regression runs.

FLGPA: This is the foreign language grade point average, which involved mutipling the grade received by the number of Carnegie units for all foreign language courses taken by each subject, and dividing that total by the number of Carnegie units.

HIGHLANG: This variable identifies for each student the foreign language in which that student had taken the most language courses, and was intended to show any differential effect that the study of different foreign languages might have.

HIGHLVL: This variable identifies the highest level (year) of language study attained, and was designed to indicate any differential effect that length of language study might have. This variable was shown to be non-

significant in preliminary analyses and was dropped from the final regression run.

NXTLANG: This variable is analogous to HIGHLANG but is intended to identify the foreign language studied for the second-longest period of time. Since only 47 students had two languages, the group affected by this variable is small.

NXTLVL: An analogous variable to HIGHLVL, it applied to a very small proportion of our total population, since only 38 students took level one of a second language, six took level two, and three took level three or higher. This variable was found to be nonsignificant in preliminary analyses, and was dropped in the final regression run.

LANGTOT: The sum of the codes for HIGHLANG and NXTLANG (see explanation above) re-coded, to reflect the investigators' intuition about the effect of various languages on the dependent variables. For instance, since we hypothesized that the study of Latin would have the most impact on our dependent variables (SAT verbal test, etc.), we assigned Latin the code 6. The succeeding codes for the other languages were: French, 5; Spanish, 4; German, 3; Italian, 2; and Russian, 1. Thus, the LANGTOT for an individual who had studied Latin and Spanish would be ten. This variable proved to be non-significant in our preliminary regression analyses, and was dropped from the final regression run.

HIGHTOT: The value for this created variable is determined by multiplying the value of HIGHLANG by the value for HIGHLVL for each case. It is intended to provide a measure for the amount of language instruction, by language, for each student and is designed to identify any differential

effect that there might be between languages. The variable HIGHTOT proved non-significant in our preliminary regression, and was eliminated from the final regression run.

NXTTOT: This variable is exactly analgous to the variable HIGHTOT, except that it is formed by multiplying the variables NXTLANG and NXTLVL. Preliminary runs showed this variable to be non-significant; it was eliminated from the final regression run.

LVLTOT: The sum of HIGHLVL and NXTLVL. This variable is intended to provide a measure of the total experience that a student had in studying a foreign language, irrespective of the grade received and the foreign language involved. This proved to be the most powerful language-related variable in our regression, and was retained in the final analysis.

JRHILANG: In order to determine whether an early start in junior high school foreign language study had a differential effect, we formed four groups of students: (1) no language in grades seven and eight; (2) some foreign language in seven, none in eight; (3) some foreign language in eight, none in seven; and (4) language in both grades seven and eight.

4.2 Dependent variables (all are first-level)

4.2.1 Eleventh Grade Test of Academic Progress (TAP). National stanine, standard score, and national percentile were collected for all six subtests (social studies, composition, science, reading, mathematics, literature), as well as the composite for the TAP. In our analysis, however, we used only the percentile score for composition, reading, and the composite.

The composition subtest consists of eight small, narrowly focused section tests on specific mechanics of composition in the following five areas: capita-

lization, punctuation, grammar and usage, organization, and spelling. In three themes and one letter, common problems in writing are placed before the student. In addition, three sections require the student to organize material and one section requires him to make choices in English usage. In the reading subtest all items follow the same format: a reading passage is presented which is followed by questions concerning the passage. Questions are of five basic types: (1) identifying factual details and relationships explicit in the passage, (2) demonstrating comprehension of the passage, (3) using information gleaned from the passage to make judgements, (4) evaluating authors' themes and purposes, and (5) making judgments about reading passages on the basis of observation. (The above descriptions are paraphrased from: Manual for Administrators, Supervisors, and Counselors, Test of Academic Progress, form S, Boston: Houghton Mifflin Co., 1972.)

4.2.2 PSAT. We obtained from the permanent records the most recent and prior test scores for Verbal and Mathematics PSAT, as well as the percentiles for these scores. In the analysis, however, we used only standard scores of the most recent administration of the test.

4.2.3 SAT. We obtained the most recent, along with any prior scores for the Verbal and Mathematics test of the SAT, as well as the subscores for Reading, Vocabulary, and the Test of Standard Written English (TSWE). Only the most recent scores were used in our analyses, however.

In a recent ETS report, the Scholastic Aptitude Test administered in November 1970 was described as follows:

> The 85 verbal questions (of the SAT-verbal) include four item types: antonyms, analogies, sentence completion, and reading comprehension questions based on reading passages. Each of the two verbal subscores is based on two of the four item types; the vocabulary

subscore is based on 25 antonyms and 20 analogies, and the reading subscore is based on fifty sentence completion and 25 reading comprehension items. (Source: Linda Cook and Nancy Wright, "Test Analysis of College Board Scholastic Aptitude Test, November 1978 administration." Report number 80-51, Educational Testing Service, May, 1980, page 2.)

The Test of Standard Written English (TSWE) is described as follows in the CEBB publications, "ATP Guide for High Shools and Colleges, 1979-81.":

> The TSWE is a 30-minute multiple-choice test which is administered with the SAT. The TSWE evaluates students' ability to recognize standard written English, the language of most college text books and the one they will be expected to use and in the papers they will write for most college courses. The scores are not intended to be used by colleges in making admission decisions but are meant to help place students in appropriate freshman English courses."

4.2.4 SRA. Percentile scores and standard scores for the sub-scores (ability, expected competence, English usage, math usage, social studies, reading, natural science reading, word usage) and the composite, were recorded for those students (a total of 74 cases) who took the SRA test in their ninth or tenth grade year. (This is an optional test in the MCPS.) SRA test data were not included in any of our regression anslyses.

5.0 Statistical analysis procedure and results. In this section we will describe our initial research hypotheses, and indicate how the data with which we ended up proved not to be susceptible to the type of statistical analysis which we had orginally envisioned: analysis of covariance. We will then describe the type of analysis used, stepwise regression, and report the results of the analyses performed.

5.1 Original plan for statistical analysis. We stated our major research question as follows: do students who have studied a foreign language in secondary school score higher on the SAT-Verbal than do students who have not studied a foreign language? A number of sub-questions presented themselves:

1. When the factor of verbal ability is controlled, do students who have studied foreign language in secondary school score higher on the SAT-Verbal than do students who have not studied foreign language?

2. Do students who have studied <u>two</u> foreign languages score higher than those who have studied only one?

3. Do students who have studied a foreign language for a lengthy period score better on the SAT-Verbal than students who have studied foreign language for a shorter period?

4. Does the language studied have a differential effect on SAT-Verbal scores? For example, do students of German tend to score higher on the SAT-Verbal than students of Spanish?

5. Does the grade point average <u>in foreign language study</u> have a differential effect on SAT-Verbal scores? For example, do students who have done well in their study of French (having earned a "B" or above in all French course work) score higher on the SAT-Verbal than students who have received a C+ grade or below?

From the research questions just enumerated, we had anticipated an experimental design of the post hoc variety which we have represented in Table 11. We had hoped to gather data on the variables which we have already discussed in Sections 3 and 4 for two groups of students: those who had studied some foreign language, and those who had studied no foreign language at all. For both of these groups of students, we would use some of our data as "pre-measures" to establish the comparability of the two groups. The "treatment" of the two groups would differ in several respects, depending upon the individual academic schedules of the students for whom we obtained data. We would be able to take into account such indicators as overall academic performance and performance in various subject areas, as well as the amount of time spent in the study of various relevant subjects. Finally, we could use as criterion measures not only the overall SAT-Verbal score, but also the subscores for vocabulary, reading, and the TSWE. In addition we could use as criterion measures the composition and reading scores of the Test of Academic Progress, which is administered by the MCPS in the eleventh grade.

Insert Table 11 about here

Having developed the research design just sketched, we had chosen analysis of covariance as the most appropriate statistical tool, since this type of analysis would enable us to compare the "language" with the "no language" group on our various criterion measures, while at the same time taking into account differences that might exist between the groups in their prior verbal ability (as measured by grade seven ITBS scores) and differences in academic schedule or ov for academic work recorded in the various kinds of data which we gathered from the school record of our subjects.

Upon completion of our data gathering and data entry procedures, we concluded that we could not perform analysis of covariance on the data set which

Table 11: Research Design

Group	"Pre-measure"	"Treatment"	"Criterion Measure"
Language	ITBS Grade 7 CAT Grade 7 Other measures: -age, sex, etc. -language background	Academic schedule, grades 7-11 Sub-group: -different languages studied -different length of study -different levels of achievement eleventh grade -early start vs. late start -one foreign language vs. more	Most recent SAT-Verbal -Vocabulary -Reading -TSWE Most recent PSAT-Verbal TAP-Composition -Reading -Composite
No language	Same pre-measures Same other measures	Academic schedule, grades 7-11 No foreign language study	Same criterion measure

we had amassed. First, we had gathered information for only 52 individuals (out of the total 440 cases in the computer corpus) who had not taken any foreign language at all. Of these 52, 45 had not taken the SAT-Verbal, which was intended to be our primary verbal criterion. The seven students who had taken the SAT-Verbal were very much on the lower end of the sample we had gathered. For instance, the mean score on the SAT-Verbal was 360, for these seven students, compared to sample means of between 481 and 503 for the three high schools (see Table 10). The downwardly-skewed nature of this non-language group was further documented by the median composite score received on the Test of Academic Progress (TAP) by 44 of the 52 students in the group. The median TAP composite score for this group was 47, which corresponds to the first quartile score of our sample as a whole. The second quartile (synonymous with the median) for our sample as a whole was a TAP composite score of 74. Clearly then, our data put us in no position to make any comparison whatsoever between a "language" group and "no-language" group.

In seeking an alternate method of analysis, we ended by selecting the multiple regression procedure, which we determined would enable us to answer many if not all of our initial research questions quite directly with the possible exception of the major question, which we can answer at least indirectly. We will discuss the answer to our research questions below, but turn now the description of the STEPWISE procedure used in our analysis.

5.2 Description of SAS STEPWISE. (This description is paraphrased from the SAS User Guide.) We selected the "maximum R square improvement (MAXR) model of the STEPWISE procedure. The MAXR method begins its operation (step one) by selecting the single independent variable which produces the highest R square (or proportion of variance) for the prediction of the dependent variable. The program begins step two by selecting the second variable which, when added to

the first, obtains the maximum gain in R square over what was obtained in step one. In doing this, the procedure searches the list of independent variables, pairing each one with the variable selected in step one and comparing the R square gain until the pair of variables is selected which obtains the maximum increase in R square over step one. The program proceeds similarly through the list of independent variables until all are included in the model. Sometimes, as our tables below will show, the program determines that, after adding a new variable at a particular step, other variables, already in the model, should be replaced by an as yet unselected variable in order to maximize R square.

An interesting variant of this procedure enables one to stipulate that certain variables in the list of independent variables must be included at the outset in the procedure. We have used this option in our analysis and will refer to it briefly in our discussion of the regression for the eight dependent variables.

The SAS STEPWISE procedure funtions only on cases where all data values are present for both dependent and independent variables. If a case has a missing value for one element in the regression, it is omitted. Since we had a number of cases in which some data were missing, the Ns noted in regression tables below will be substantially smaller than the total 440 cases in our data set.

5.3 Refining the stepwise regression model. Table 12 gives the complete list of independent and dependent variables with which we began our analysis. Our first task was to reduce our list of 26 independent variables by a substantial amount so that we could concentrate our attention on those variables which were playing the most important role in the prediction equation generated by the program for the dependent variables. In order to do this, we ran a preliminary run of the stepwise procedure, both limited and unlimited (as described above in

section 5.3) for eight different dependent variables: SAT-Verbal, SAT-Reading subscore, SAT-Vocabulary subscore, TSWE, PSAT Verbal score, TAP Composition subscore, TAP Reading subscore, TAP Composite Score. By observing the step at which the computer program entered the various independent variables and by observing the level of significance (having chosen the .05 level to indicate significance), we were able to eliminate a number of variables from our original list of 26 independent variables, which accounted for an insignificant amount of the variance in the regression equation and which were clearly non-significant at the 26th step, the step in which all of our original list of independent variables was taken into account. Table 12 indicates which of the list of 26 were dropped and which were retained for our final regression analysis.

Insert Table 12 about here

Among the created language-related variables, LANGTOT, HIGHTOT, NXTOT, HIGHLVL, and NXTLVL contributed negligible amounts of increase to the R square for virtually all the criterion variables for which we did a separate regression calculation. The same situation was found to be true for all four subtests of the ITBS language group: Spelling, Capitalization, Punctuation and Language Usage. Therefore they were dropped from the final regression analysis.

In addition, we decided to drop from our final analysis the following variables: OLDER was dropped because it was non-significant in our major three regression equations: SAT Verbal, SAT Reading and SAT Vocabulary. LANGBACK proved to contribute negligible amounts to the R square improvement for virtually all criterion measures. Rather then leave LANGBACK out, however, we decided to limited our population to anglophone-no language individuals only. By doing this, we reduced the total number of cases possible for selection by the regression procedure from 440 to 409. We considered this step worth the small lost in N because we can say that the population used for this regression

TABLE 12: Independent and Dependent Variables: Initial List and those Selected for Final Regression Analysis (Variables printed in CAPITAL LETTERS are those included in final regression analysis; see Section 4 for disscussion.)

Abbreviation/Code	Full name
Independent variables	
FLGPA	Grade point average in foreign language
langtot	Sum of codes for HIGHLANG and NEXTLANG
hightot	HIGHLANG multiplied by HIGHLVL
nxttot	MEXTLANG multiplied by NXTTOT
LVLTOT	Total number of levels of FL studied: equals HIGHLVL + NEXTLVL
JRHILANG	Indication of whether student studied Fl in grade 7, 8
HIGHLANG	Most studied language for each student
highlvl	Highest level (year) of language attained
NXTLANG	Next most studied language
nxtlvl	Next highest level (year) of language attained
az	School attended: #1, #2, #3
A4	Sex
A5	Ethnicity
a10	Years enrolled in MCPS
langback	Language background of student
older	age of student, in quartiles
TOTGPA	Overall academic grade point average
ENGGPA	English grade point average
TOTENGCU(omitted from initial run)	Number of Carnegie units of English study
NUMLANG (omitted from initial run)	Number of foreign languages studied
CAT 7A2	Cognitive Abilities Test, Verbal percentile score grade 7
ITBS 7A2	Iowa Test of Basic Skills, Vocabulary percentile score grade 7
itbs 7b2	Iowa Test of Basic Skills, Reading Comprehension percentile score, grade 7
itbs 7c2	Iowa Test of Basic Skills, Spelling percentile score, grade 7
itbs 7d2	Iowa Test of Basic Skills, Capitalization percentile score, grade 7
itbs 7e2	Iowa Test of Basic Skills, Punctuation percentile score, grade 7
itbs 7f2	Iowa Test of Basic Skills, Language Usage percentile score, grade 7
*ITBS 7L2	Iowa Test of Basic Skills, Composite percentile score, grade 7

Dependent variables

PSAT 1A	Most recent PSAT Verbal score
SAT 1A	Most recent SAT Verbal score
SAT 1C	Most recent SAT Reading subscore
SAT 1D	Most recent SAT Vocabulary subscore
SAT 1E	Most recent SAT Test of Standard Written English subscore
TAP 2B	Test of Academic Progress, Composition percentile score, grade 11
TAP 4B	Test of Academic Progress, Reading percentile score, grade 11
TAP 7B	Test of Academic Progress, Composite percentile score, grade 11

analysis is uncontaminated by the kinds of language experience which we were able to identify in our data gathering instrument. Variable A10, years enrolled in MCPS, proved to be unrelated to any of the criterion variables and was dropped. Although variable A2, schools attended, was significant at Step 26 in the regression involving SAT-Verbal, we decided that this factor represented "noise" in the final regression and omitted it, since we were not interested in making comparisons between schools.

While the majority of adjustments made to our list of independent variables during the preliminary phases of our analysis involved dropping those which proved unfruitful, we also added two variables, one of which, TOTENGCU (total Carnegie units accumulated in English courses), had been omitted by error from our initial regression analysis, and NUMLANG (the number of foreign language studied).

5.4 Final Regression Analysis. In this section of our report, we will discuss the results of our analyses for each one of eight dependent variables: SAT-Verbal score, SAT-Reading subscore, SAT-Vocabulary subscore, SAT-Test of Standard Written English, PSAT-Verbal, TAP-Composite score, TAP-Reading subscore, and TAP-Composition subscore.

Table 13 presents the results of the stepwise multiple regression analysis of predictors for the SAT-Verbal. It will be noted that 62% of the variance is accounted for by performance on the ITBS Vocabulary and CAT-Verbal, which are the first two independent variables chosen by the regression routine. The third variable chosen, LVLTOT, accounts for 4.3% of the variance, but is chosen before such other supposedly more powerful predictors of the SAT-Verbal as TOTGPA and TOTENGCU. In all, eight variables contributed to the majority of the variance in SAT Verbal score. They are shown in Table 13.

Table 14 shows the results of the final step of the regression analysis.

At step 15, the last step in this analysis (with 72.4% of the variance accounted for) six independent variables remained significant. The significant test variables which were positively related to SAT-Verbal are: ITBS-Vocabulary, ITBS-Reading, and CAT-Verbal. The ITBS-Composite is significant, but its correlation to the dependent variable is a negative one. The only language-related variables which remain significant at step 15 are: LVLTOT, and TOTENGCU. Language related variables which did not prove significant at step 15 were: FLGPA, HIGHLANG, JRHILANG, NUMLANG, TOTGPA, and ENGGPA.

Insert Tables 13 and 14 about here

Table 15 presents the results of stepwise multiple regression analysis of predictor variables for the SAT-Reading subscore. It is reasonable that for the SAT-Reading subscore, the most significant predictor would be the ITBS-Reading subscore rather than the ITBS-Vocabulary subscore. Together, the CAT-Verbal and the ITBS-Reading subtest account for 56.7% of the variance. Once again, LVLTOT was selected as the third most powerful predictor, accounting for 3.5% of the variance. Notice that LVLTOT was chosen by the stepwise procedure before the ITBS-Vocabulary, TOTGPA, TOTENGCU, and ENGGPA. In all, nine variables were chosen in the stepwise process.

At step 15, the last step in our regression analysis, 66.2% of the variance was accounted for by the predictor variables (see Table 16). At this step, the significant factors are: ITBS and CAT scores (but note that the ITBS-Composite is negatively correlated with the criterion), TOTENGCU, and LVLTOT. Six significant variables were found in all, with a seventh, TOTGPA, being marginal. Non-significant, language-related variables are: FLGPA, JRHILANG, HIGHLANG, NXTLANG, and NUMLANG.

Insert Tables 15 and 16 about here

The results of stepwise multiple regression analysis of predictors for the SAT-Vocabulary subtest are shown in Table 17. Once again, ITBS-Vocabulary

Table 13: Results of Stepwise Multiple Regression Analysis of SAT-Verbal to Last Significant Step* N=192

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	ITBS 7 VOC	.73	.540	.540
2	CAT 7 VERBAL	.79	.620	.080
3	LVLTOT	.81	.663	.043
4	ITBS 7 RDG	.82	.680	.017
5	TOTENCU	.83	.693	.013
6	TOTGPA	.84	.706	.013
7	ETHNICITY	.84	.714	.008
8	ITBS 7 COMP	.85	.721	.007

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

Table 14: Maximum R-Square Improvement for Dependent Variable SAT-Verbal N=192

STEP 15 VARIABLE FLGPA ENTERED R SQUARE = 0.72439871 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	14969.25588407	997.95039227	31.54	0.0001
ERROR	180	5695.13187103	31.63962151		
TOTAL	195	20664.38775510			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-13.11593873				
FLGPA	-0.12074282	1.22210739	0.30884115	0.01	0.9214
LVLTGT	1.85941175	0.57440168	331.55151881	10.48	0.0014
JRHILANG	0.14276002	0.38495998	4.29049710	0.14	0.7131
HIGHLANG	-0.17747792	0.61574939	2.62852413	0.08	0.7735
NXTLANG	-0.72192175	0.91675662	19.62019990	0.62	0.4320
NUMLANG	3.99620523	4.21379479	27.88959074	0.88	0.3491
A4	-0.44872034	0.90888901	7.71189451	0.24	0.6221
A5	-1.73701600	0.75674431	166.70191630	5.27	0.0229
TGTGPA	5.21654737	2.92976987	100.30634593	3.17	0.0767
ENGGPA	-1.42150205	1.88393360	18.01337452	0.57	0.4515
TGTENGCU	0.16359636	0.05597553	270.26020574	8.54	0.0039
ITBS7A2	0.17466794	0.04132288	565.29663539	17.87	0.0001
ITBS7B2	0.17502122	0.04012898	601.86139401	19.02	0.0001
ITBS7L2	-0.12927110	0.06347030	131.24809453	4.15	0.0431
CAT7A2	0.17062623	0.05612952	292.37497356	9.24	0.0027

Table 15: Results of Stepwise Multiple Regression Analysis of SAT Reading Subscore to Last Significant Step* N=192

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	ITBS 7 RDG	.70	.485	.485
2	CAT VBL	.75	.567	.078
3	LVLTOT	.78	.602	.035
4	ITBS 7 VOC	.79	.617	.015
5	~~FLGPA~~ **	.79	.628	.011
6	ITBS 7 CMPSTE	.80	.641	.013
	TOTGPA replaces FLGPA	.80	.643	.002
7	TOTENGCU	.81	.653	.010
8	JRHILANG	.81	.656	.003
9	ENGGPA	.81	.659	.003

*"Significant step" mean the first stpe in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 16: Maximum R-Square Improvement for Dependent Variable SAT-Reading Subscore N=192

STEP 15 VARIABLE A4 ENTERED. R SQUARE = 0.66235760 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	14937.43346345	995.82889756	23.02	0.0001
ERROR	176	7614.48320321	43.26410911		
TOTAL	191	22551.91666667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-13.08903641				
FLGPA	-0.29838452	1.48779409	1.74018198	0.04	0.8413
LVLTOT	1.46952750	0.68510494	199.05312531	4.60	0.0333
JRHILANG	0.60399409	0.45398226	76.58000320	1.77	0.1851
HIGHLANG	-0.52789168	0.72319583	23.05183906	0.53	0.4664
NXTLANG	-0.60127296	1.07575082	13.51598606	0.31	0.5749
NUMLANG	2.36925226	4.96806811	9.83955117	0.23	0.6340
A4	0.17516345	1.07959804	1.13917320	0.03	0.8713
A5	-0.77715696	0.88626394	33.26741718	0.77	0.3817
TOTGPA	6.76902020	3.50481338	161.37995476	3.73	0.0550
ENGGPA	-2.83790606	2.21497760	71.02072785	1.64	0.2018
TOTENGCU	0.16075866	0.06621994	254.97574587	5.89	0.0162
ITBS7A2	0.16516879	0.04901008	491.37494817	11.36	0.0009
ITBS7B2	0.24071334	0.04729927	1120.51913695	25.90	0.0001
ITBS7L2	-0.20701728	0.07436014	335.32084227	7.75	0.0060
CAT7A2	0.20821350	0.06662899	422.49254226	9.77	0.0021

is the most important predictor (R square = .485) although this factor does not account for quite as much variance as was the case with the overall SAT-Verbal score (Table 13) where R square = .540. For SAT-Vocabulary, LVLTOT is a more powerful predictor than for any of the other SAT criterion variables, accounting for 7.5% of the variance and chosen at step 2 of the regression procedure, coming before other potentially powerful predictors such as TOTENGCU, CAT-Verbal, and ENGGPA.

Table 18 shows that at step 15, the last step in the analysis, the only language-related variables which retain their significance are: LVLTOT, and TOTENGCU. ITBS-Vocabulary, ITBS-Reading, and CAT-Verbal retained their significance at step 15, while the ITBS-Composite is non-significant at this step. Non-significant, language-related variables in this regression analysis are: FLGPA, JRHILANG, HIGHLANG, NXTLANG, and NUMLANG.

Insert Tables 17 and 18 about here

The results of stepwise multiple regression analysis of the predictors for the Test of Standard Written English are shown in Table 19. The English grade point average shows itself to be a more potent predictor for the TSWE than for any other component of the SAT-Verbal. Once again, the language-related independent variable LVLTOT shows itself to be an important predictor (step 3), though it accounts for much less of the variance (1.6%) than it does for the other subtests of the SAT-Reading and Vocabulary and the overall SAT-Verbal score. In all, foreign language-related variables account for 2.9% of the variance in predicting test scores on the TSWE.

Table 20 shows that at step 15 the ITBS-Composite continues to be the most significant predictor with a positive rather than a negative correlation to the criterion variable as was the case with the SAT-Verbal, Vocabulary and Reading scores. CAT-Verbal is also significant at step 15, as is ENGGPA, which

Table 17: Results of Stepwise Multiple Regression Analysis of SAT Vocabulary Subscore to Last Significant Step* N=192

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	ITBS 7 VOCAB	.70	.485	.485
2	LVLTOT	.74	.555	.070
3	~~CAT-7-VBL~~ **	.77	.590	.045
4	ETHNICITY	.78	.603	.013
5	FLGPA	.78	.614	.011
6	TOT ENGCU	.79	.625	.009
	~~TOTGPA~~ ** replaces FLGPA	.79	.625	.000
	ITBS 7 RDG replaces CAT 7 VBL	.79	.626	.001
7	CAT 7 VBL	.80	.634	.008
	~~FLGPA~~ ** replaces TOTGPA	.80	.634	.000
8	NUMLANG	.80	.639	.005
	TOTGPA replaces FLGPA	.80	.640	.004
9	ENGGPA	.80	.643	.003

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 18: Maximum R-Square Improvement for Dependent Variable SAT-Vocabulary Subscore N=192

MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE SAT1O

STEP 15 VARIABLE HIGHLANG ENTERED R SQUARE = 0.64[illegible]449 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	12026.40985082	801.76065672	21.59	0.0001
ERROR	176	6536.45994085	37.13897694		
TOTAL	191	18562.86979167			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-5.06930593				
FLGPA	0.59653086	1.37845920	6.95517300	0.19	0.6557
LVLTOT	2.12462495	0.63475800	416.08122719	11.20	0.0010
JRHILANG	-0.44612123	0.42062005	41.77878320	1.12	0.2903
HIGHLANG	0.19978487	0.67004967	3.30172659	0.09	0.7659
AXTLANG	-0.50314320	0.99669613	9.46428070	0.25	0.6143
NONLANG	4.15506569	4.60297511	30.26275560	0.81	0.3679
A4	-0.83563160	1.00026062	25.91989872	0.70	0.4046
A5	-2.40886433	0.82113425	319.61436278	8.61	0.0038
TOTGPA	3.85566429	3.24725193	52.35960921	1.41	0.2367
ENGGPA	-1.48470262	2.05220350	19.43873661	0.52	0.4704
TOTENGCU	0.12695914	0.06135358	159.02962941	4.28	0.0400
ITBS7A2	0.17012877	0.04540843	521.32978654	14.04	0.0002
ITBS7B2	0.08791485	0.04382334	149.46635533	4.02	0.0464
ITBS7L2	-0.04560792	0.06889557	16.27526122	0.44	0.5088
CAT7A2	0.12604235	0.06173257	154.82255604	4.17	0.0427

was not a significant predictor variable in the regression analysis on SAT-Verbal, on SAT-Reading, and SAT-Vocabulary. Table 20 shows that the standardized tests from seventh grade are not nearly as good predictors for the TSWE as they are for other test scores of the SAT; contrary to the case with other SAT scores, ENGGPA retains its significance at step 15 as the most powerful language-related predictor for performance on TSWE. Other language-related variables significant at level 15 are: FLGPA and LVLTOT, which is almost significant in this analysis (.055).

Insert Tables 19 and 20 about here

Table 21 shows the results of stepwise multiple regression of the nine most important predictors, for the PSAT-Verbal. As with SAT-Verbal, the strongest two predictors accounting for almost 62% of the variance, are ITBS-Vocabulary and CAT-Verbal. Although not exactly parallel to the results obtained for SAT-Verbal (see Table 13), both analyses contain the same independent variables for the most part: ITBS-Vocabulary, CAT-Verbal, ITBS-Reading, ITBS-Composite, TOTGPA, LVLTOT, and Ethnicity. The SAT regression includes the variable TOTENGCU (step 5) which is not included in the regression analysis at the last significant step of the PSAT; the PSAT includes NXTLANG, and sex, which did not figure in the regression analysis at the last significant step in the SAT-Verbal. While LVLTOT accounted for 4.3% of the variance in the SAT-Vergbal analysis (Table 13), it accounted for only 0.7% in the PSAT analysis.

At step 15 of the regression analysis of the PSAT-Verbal, 71.8% of the variance had been accounted for (see Table 22). The significant variables at step 15 are: ITBS-Vocabulary, ITBS-Reading, ITBS-Composite, and CAT-Verbal (all extremely significant) and LVLTOT (significant to the .04 level). LVLTOT, although added later in the stepwise analysis than for the SAT-Verbal and subscore, nevertheless maintains its significance through the last step of the

Table 19: Results of Stepwise Multiple Regression Analysis of Test of Standard Written English to Last Significant Step* N=192

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	ITBS 7 CMPSTE	.70	.490	.490
2	ENGGPA	.74	.555	.065
3	LVLTOT	.76	.571	.016
4	CATVBL	.76	.581	.010
5	HIGHLANG	.77	.591	.010
6	~~ETHNICITY (A5)~~ **	.77	.597	.006
7	FLGPA	.77	.600	.003
	TOTGPA replaces A5	.77	.600	.000
8	ETHNICITY (A5)	.78	.607	.007

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 20: Maximum R-Square Improvement for Dependent Variable Test of Standard Written English N-192

MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE SATIE

STEP 15 VARIABLE ITBS7A2 ENTERED R SQUARE = 0.60957829 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	9355.75380699	623.71712047	18.32	0.0001
ERROR	176	5992.15985968	34.04636284		
TOTAL	191	15347.91666667			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-2.28176022				
FLGPA	2.82167330	1.31981880	155.61647064	4.57	0.0339
LVLPOT	1.17394134	0.60775505	127.03001820	3.73	0.0550
JRHILANG	0.11226259	0.40272664	2.64559432	0.08	0.7808
HIGHLANG	1.39810230	0.64154540	161.59397572	4.75	0.0306
NXTLANG	-0.45594302	0.95429614	7.77187019	0.23	0.6336
NUMLANG	1.24538889	4.40716206	2.71870858	0.08	0.7778
A4	-0.68595563	0.95770899	17.46608774	0.51	0.4748
A5	-0.98665167	0.78620275	53.62030900	1.57	0.2112
TOTGPA	-5.45932643	3.10911207	104.97263410	3.08	0.0808
ENGGPA	5.61015045	1.96490165	277.54800086	8.15	0.0048
TOTENGCU	0.00867612	0.05874356	0.74267979	0.02	0.8828
ITBS7A2	0.00474063	0.04347673	0.40477669	0.01	0.9133
ITBS7B2	0.00469258	0.04195907	0.42583646	0.01	0.9111
ITBS7L2	0.18988442	0.06596471	282.11490081	8.29	0.0045
CAT7A2	0.12157674	0.05910643	144.04635985	4.23	0.0412

analysis. The non-significant language-related variables are: FLGPA, JRHILANG, HIGHLANG, NXTLANG, NUMLANG.

Insert Tables 21 and 22 about here.

Table 23 shows the result of stepwise multiple regression analysis on the eight most important predictors for the TAP-Composite test score. It will be noted that a very large proportion of the variance (73.1%) was accounted for by the ITBS-Composite score. This appears reasonable to us since both our test battery composite scores and the two tests closely resemble one another. The second most powerful predictor of the TAP-Composite is the overall GPA, though this only accounts for 4.0% of the variance. All thirteen other variables in the regression accounted for only 5.4% of the variance.

Table 24 indicates that at step 15, 82.5% of the variance is accounted for, which is a substantial proportion of the variance. Factors which correlate positively with TAP-Composite are: ITBS-Vocabulary, ITBS-Reading, and ITBS-Composite; CAT-Verbal, TOTGPA, and sex. Those factors which correlate negatively (but significantly) are: ENGGPA and FLGPA. Those language variables which proved to be non-significant in this context are: LVLTOT, JRHILANG, HIGHLANG, NXTLANG, and NUMLANG.

Insert Tables 23 and 24 about here

Table 25 shows the results of stepwise multiple regression analysis of the TAP-Reading subtest. The ITBS-Composite and the CAT Composite account for 63.7% of the variance. The remaining thirteen variables add only 7.5% of the variance tothis for a step 15 R square of the .726 (see Table 26).

As with the TAP-Composite, TOTGPA appears early in the stepwise analysis, this time at step 3, and retains its significance through step 15 (see Table 26).

Table 26 shows the same group of predictors retaining their significance at step 15 as was the case for the TAP-Composite (with one exception): ITBS-

Table 21: Results of Stepwise Multiple Regression Analysis of PSAT-Verbal to Last Significant Step* N=220

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	ITBS 7 VOCAB	.74	.555	.555
2	~~CAT-7-VBL~~ **	.79	.619	.064
3	TOTGPA	.81	.650	.031
	ITBS 7 PDG replaces CAT 7 VBL	.81	.656	.006
4	NXTLNG	.82	.672	.016
5	CAT 7 VBL	.83	.684	.008
6	ITBS 7 COMP	.84	.700	.016
7	LVLTOT	.84	.707	.007
8	ETHNICITY	.84	.710	.003
9	SEX	.84	.713	.003

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 22: Maximum R-Square Improvement for Dependent Variable PSAT-Verbal N=220

STEP 15 VARIABLE FLGPA ENTERED R SQUARE = 0.71827534 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	16657.65064545	1110.51004303	34.67	0.0001
ERROR	204	6533.52662727	32.02709131		
TOTAL	219	23191.17727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-9.51120686				
FLGPA	-0.33410305	1.08773969	3.02154059	0.09	0.7590
LVLTOT	0.96287792	0.46976199	134.55635324	4.20	0.0417
JRHILANG	0.34304959	0.36011525	29.06352421	0.91	0.3419
HIGHLANG	0.47268552	0.61049450	19.19988269	0.60	0.4397
NXTLANG	1.07899608	0.79853914	58.47427110	1.83	0.1781
NUMLANG	-2.67001323	3.69773804	16.69829171	0.52	0.4711
A4	-1.20234441	0.87072705	61.06764745	1.91	0.1683
A5	-1.20937816	0.78516700	75.98321559	2.37	0.1250
TOTGPA	4.23950138	2.67246194	80.59795100	2.52	0.1142
ENGGPA	0.70974950	1.72599509	5.41562489	0.17	0.6813
TOTENGCU	0.07254979	0.05997452	46.86582459	1.46	0.2278
ITBS7A2	0.25079545	0.04051540	1227.20326308	38.32	0.0001
ITBS7B2	0.20230940	0.03696703	959.22514815	29.95	0.0001
ITBS7L2	-0.24561377	0.06566765	448.04324731	13.99	0.0002
CAT7A2	0.20315261	0.05459416	443.47584494	13.85	0.0003

Table 23: Results of Stepwise Multiple Regression Analysis of TAP Composite (grade 11) to Last Significant Step* N-277

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	~~ITBS-7-CMPSTE~~ **	.86	.731	.731
2	TOTGPA	.88	.771	.040
3	~~ITBS-7-VOC~~ **	.89	.789	.018
4	ITBS 7 RDG	.89	.799	.010
	SEX replaces ITBSVOC	.89	.801	.002
5	CAT 7 VBL	.90	.810	.009
	ITBS 7 VOC replaces ITBS 7 CMPSTE	.90	.811	.001
6	~~ITBS-7-CMPSTE~~ **	.90	.816	.005
7	ENGGPA	.91	.820	.004
	FLGPA replaces ITBS 7 CMPSTE	.906	.821	.001
8	ITBS 7 CMPSTE	.91	.825	.004

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 24: Maximum R-Square Improvement for Dependent Variable TAP Composite (grade 11) N=277

STEP 15 VARIABLE A5 ENTERED R SQUARE = 0.82923290 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	13645.03629030	909.66908602	84.49	0.0001
ERROR	261	2809.97454002	10.76618598		
TOTAL	276	16455.01083032			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	21.89665182				
FLGPA	-1.30756368	0.46638696	84.66054160	7.86	0.0054
LVLTOT	0.23233875	0.24300128	9.84210613	0.91	0.3399
JRHILANG	0.06543832	0.18186567	1.39387833	0.13	0.7193
HIGHLANG	0.13995137	0.31285818	2.15437430	0.20	0.6550
NXTLANG	-0.33440824	0.44727420	6.01822092	0.56	0.4553
NUMLANG	1.68176677	2.03252084	8.79052384	0.82	0.3670
A4	-1.48727341	0.45227306	116.42387592	10.81	0.0011
A5	0.10447148	0.36625176	0.87599043	0.08	0.7757
TOTGPA	7.77857585	1.25411053	414.17794271	38.47	0.0001
ENGGPA	-2.86937451	0.88059719	114.30935224	10.62	0.0013
TOTENGCU	0.03698078	0.02751378	19.44973555	1.81	0.1801
ITBS7A2	0.05952122	0.01943727	100.95669074	9.38	0.0024
ITBS7B2	0.06909147	0.01857719	148.91914083	13.83	0.0002
ITBS7L2	0.07004924	0.02717252	71.54988614	6.65	0.0105
CAT7A2	0.08284910	0.02784280	95.32608874	8.85	0.0032

Vocabulary, ITBS-Reading, and CAT-Verbal (the exception is that ITBS-Composite is not significant in this analysis). Sex retained its significance with males receiving the advantage in predicted scores. Both FLGPA and ENGGPA show a significant negative relationship, as was the case with the TAP-Composite score.

Language-related measures that proved to be non-significant were: LVLTOT, JRHILANG, HIGHLANG, NXTLANG, and NUMLANG.

Insert Tables 25 and 26 about here

Table 27 shows the results of stepwise multiple regression analysis of the TAP-Composition subtest. The ITBS-Composite score accounted for 56.4% of the variance for this criterion, showing how strong is the relationship between both parts of the TAP we have studied in this analysis and the composite scores of the ITBS. The second strongest predictor, though much less strong than the previous one, is TOTGPA, accounting for 9.0% of the variance. This also shows continued evidence for the strong relationship which appears to exist between scores on this test and the academic grade point average.

TAP-Composition is the only dependent variable of all in which JRHILANG appeared in a step before the last significant one (see Table 27, step 4). JRHILANG also retained its significance at step 15. The predictive power of this variable for TAP composition does not appear in any other analysis, and we do not attempt to explain its behavior here.

NUMLANG is a second language-related variable appearing before the last significant step in this regression analysis, though it did not retain its significance at step 15. The only other regression where NUMLANG appeared is that of SAT-Vocabulary (see Table 17). We are not tempted to attribute any particular significance to the appearance in these two regression analyses of the variable NUMLANG, since it does not appear to fit into any pattern.

Overall, only four independent variables retained their significance as predictors of the dependent variable at step 15 of the regression procedure:

Table 25: Results of Stepwise Multiple Regression Analysis of TAP Reading Subtest (grade 11) to Last Significant Step* N=277

SUMMARY TABLE

Step	Variable	Multiple R	R Square	R Sq Change
1	~~ITBS-7-CMPSTE~~ **	.79	.608	.608
2	~~CAT-7-VBL~~ **	.80	.647	.039
3	TOTGPA	.82	.670	.023
	ITBS 7 RDG replaces ITBS CMPSTE	.83	.685	.015
	~~ITBS-7-VOC~~ ** replaces CAT 7 VBL	.83	.688	.003
4	CAT 7 VBL	.84	.702	.014
	SEX replaces ITBS 7 VOC	.84	.703	.001
5	ITBS 7 VOC	.84	.713	.010
6	FLGPA	.85	.717	.004
7	ENGGPA	.85	.719	.002
8	TOTENGCU	.85	.722	.003

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final step in this analysis.

**A line through a variable means that particular entry of the variable has been replaced by another at a subsequent step.

Table 26: Maximum R-Square Improvement for Dependent Variable TAP Reading Subtest (grade 11) N=277

? STEP 15 VARIABLE ITBS7L2 ENTERED R SQUARE = 0.72551444 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	15424.62030281	1028.30802019	45.99	0.0001
ERROR	261	5835.63240477	22.35874485		
TOTAL	276	21260.25270758			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	14.51535818				
FLGPA	-1.56928421	0.67196405	121.94347221	5.45	0.0203
LVLTOT	-0.16544032	0.35018806	4.99030947	0.22	0.6370
JRHILANG	0.23565498	0.26208580	18.07647207	0.81	0.3694
HIGHLANG	-0.66074557	0.45085853	48.02146072	2.15	0.1440
NXTLANG	-0.66732563	0.64456485	23.96568222	1.07	0.3015
NUMLANG	3.09369814	3.00111148	23.75959511	1.06	0.3036
A4	-1.38897550	0.65176868	101.54291186	4.54	0.0340
A5	0.19549388	0.52780290	3.06739839	0.14	0.7114
TOTGPA	8.27721855	1.80730029	468.98141131	20.98	0.0001
ENGGPA	-2.60513380	1.26902467	94.22526314	4.21	0.0411
TOTENGCU	0.07374180	0.03964998	77.33730080	3.46	0.0640
ITBS7A2	0.08301442	0.02801096	196.38057268	8.78	0.0033
ITBS7B2	0.10601694	0.02677151	350.63254112	15.68	0.0001
ITBS7L2	0.00026501	0.03915820	0.00102408	0.00	0.9946
CAT7A2	0.14451690	0.04012413	290.05037371	12.97	0.0004

ITBS-Composite, CAT-Verbal, TOTGPA, and a single language-related variable, JRHILANG (see Table 28).

Insert Tables 27 and 28 about here

Table 27: Results of Stepwise Multiple Regression Analysis of TAP Composition Subtest (grade 11) to Last Significant Step* N=277

SUMMARY TABLE

Step	Variable	Multipler	R Square	R Sq Change
1	ITBS 7 CMPSTE	.75	.564	.564
2	TOTGPA	.81	.654	.090
3	CAT 7 VBL	.82	.670	.016
4	JRHILANG	.83	.681	.011
5	NUMLANG	.83	.685	.004
6	ITBS 7 VOC	.83	.687	.002
7	LVLTOT	.83	.689	.002

*"Significant step" means the first step in which R^2 is within .005 of that attained at step 15, the final stpe in this analysis.

Table 28: Maximum R-Square Improvement for Dependent Variable TAP Composition Subtest (grade 11) N=277

MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE TAP2B

STEP 15 VARIABLE NXTLANG ENTERED R SQUARE = 0.69232029 C(P) = 16.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	15	13791.03025723	919.40201715	39.15	0.0001
ERROR	261	6128.98418320	23.48269802		
TOTAL	276	19920.01444043			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	18.66204682				
FLGPA	0.37353834	0.68864647	6.90916731	0.29	0.5880
LVLTOT	0.40639521	0.35888196	30.11216039	1.28	0.2585
JRHILANG	0.52572975	0.26859244	89.96[illegible]549	3.83	0.0514
HIGHLANG	0.29560002	0.46205170	9.61111897	0.41	0.5229
NXTLANG	-0.00297030	0.66056705	0.00047460	0.00	0.9964
NUMLANG	1.02267934	3.07561815	2.59634338	0.11	0.7398
A4	0.59119848	0.66794973	18.39615517	0.78	0.3769
A5	0.01690771	0.54090633	0.02294422	0.00	0.9751
TOTGPA	4.23122663	1.85216897	122.55170544	5.22	0.0231
ENGGPA	-0.54552573	1.30052993	4.13178548	0.18	0.6752
TOTENGCU	0.00491680	0.04063434	0.34381659	0.01	0.9038
ITBS7A2	0.03227387	0.02870637	29.68202485	1.26	0.2619
ITBS7B2	0.02707088	0.02743615	22.86158658	0.97	0.3247
ITBS7L2	0.[illegible]43089	0.04013035	124.57654451	5.31	0.0221
CAT7A2	0.10481270	0.04112027	152.56816233	6.50	0.0114

6.0 Discussion and recommendations for future research. This concluding section of our report will first discuss results obtained for the most significant language-related variables and will apply these findings to the initial research questions outlined in section 5.1 above. Several suggestions will be made for future research.

6.1 Discussion of results for selected language-related variables.

LVLTOT: This variable was the most consistent foreign language-related predictor of the various criterion variables in our analysis. It was highest in the analysis of SAT-Vocabulary, with .070 increment in R square out of .555 total R square at step 2, and lowest for prediction of the , with .016 R square change out of .571 total R square at step 3. Predictive power for SAT-Reading and Verbal subscores fell in between: SAT-Reading, .035 R square change out of .602 total R square at step 3; SAT-Verbal, .043 R square change out of .663 total R square at step 3. Several observations need to be made in order to best interpret these results. First of all, it is evident that the R square change attributable to the variable LVLTOT is extremely small compared to that of our "pre-measures" of verbal intelligence, grade 7 ITBS and CAT scores. The fact that the regression routine identified this factor at all, in light of the power of the other verbal factors, leads us to believe that, although small, any effect of length of time studying foreign language is nonetheless a significant variable in predicting SAT-Verbal scores and sub-scores.

It would be an error to place too much emphasis on the fact that LVLTOT appeared as a significant predictor of all SAT sub-scores and the SAT-Verbal. SAT-Verbal, Vocabulary sub-score and Reading sub-scores are all very highly intercorrelated, and it would be expected that if LVLTOT is significant in predicting one, it would be significant in predicting others. A recent ETS

unpublished statistical report lists the intercorrelations as follows: Reading sub-score with Verbal, r = .949; Vocabulary sub-score with Verbal, r = .954; Vocabulary sub-score with Reading sub-score, r = .812. ("Test Analysis of College Board Scholastic Aptitude Test, November 1978 Administration," Princeton, New Jersey; Educational Testing Service, May 1980, Appendix B.)

In the regression analysis for the PSAT-Verbal, the variable LVLTOT appears before the last significant step (.007 R square change out of a total R square = .707 at step 7), but does maintain its significance at step 15, the last step in this analysis.

LVLTOT is non-significant in all regression analyses for the TAP. The TAP appears to be so highly sensitive to ITBS scores and to school grades (particularly as expressed in the variable TOTGPA) that there is no manipulable variance left for anything else.

We conclude from this evidence that the length of time of foreign language study is a significant predictor of performance on the SAT-Verbal and various sub-tests. We may infer that a person who studies a foreign language for a long period of time will do better on the SAT than a person having studied for a shorter period of time, other things being equal.

HIGHLANG: The only regression analysis where this variable proved significant was that for the TSWE, where at step 5, the R square increase was .010 out of a total r square of .591 (see Table 19). Since we can see no pattern with only one significant observation, this finding, although significant statistically, is uninterpretable. We conclude that the foreign language studied has no differential effect on SAT and TAP test scores.

FLGPA: This variable makes a significant contribution to the total variance of: SAT-Reading sub-score (R square increase of .011 out of .625 total R square at step 5 [Table 15]); SAT-Vocabulary (R square increase of .011 out

of .614 total R square at step 5 [Table 17]). FLGPA was also significant statistically, though R square increase was very small, in the regression analysis for TAP-Composite (Table 24), TAP-Reading (Table 26), and TSWE (Table 20). Although we must preface our conclusion with the caveat that FLGPA is a variable composed of teacher grades, which have in the past shown themselves to lack consistency, there is some evidence to support the view that higher achievement in foreign language study, as measured by teacher grades, will increase the effect of this study on verbal ability as measured by the SAT-Reading, TSWE, and TAP-Composite and Reading.

NUMLANG: From the regression analyses for this study, there is no evidence that the study of more foreign languages has any effect on verbal ability. Only if by studying more languages, the total length of time studying foreign language is increased (as measured by LVLTOT) does the effect appear.

JRHILANG: This variable achieved significance only in the regression analysis of the TAP-Composition sub-test (Tables 27 and 28); no conclusion can be reached from this single instance of significance.

6.2 Answers to research question. (See part 5.1, above.)

1. When verbal ability (as measured by various ITBS and CAT scores in grade 7) is controlled, students who study foreign language for longer periods of time will do better on various SAT sub-tests and on the SAT-Verbal as a whole than students who have studied less foreign language.

2. Having studied two foreign languages has no significant effect on SAT scores or TAP scores.

3. Language studied has no differential effect on SAT or TAP scores.

4. There is some evidence that higher grades in foreign language study will increase the effect of this study on SAT scores (particularly the Reading and Vocabulary sub-scores).

These results support the findings of the Wirtz Commission, which reported a positive correlation between length of langauge study and score on SAT-Verbal. Bastian arrived at a similar conclusion in his two-group study (no language versus two years or more language study) where the statistical technique was analysis of covariance, and prior language ability and IQ were controlled. Multiple R for our eight most important variables predicting SAT-V is R=.851 (see Tables 13 and 14); Bastian's was R=.798 (covariates=Otis-Lennon percentile score, GPA, MAT English; main effects=sex, language experience).

It appears that the effect of foreign language study makes itself felt more in the area of vocabulary development than it does in that of English structure use. As may be seen in the above discussion, the most significant effects of foreign language measures appear on tests of English vocabulary knowledge, e.g., SAT-Vocabulary sub score.

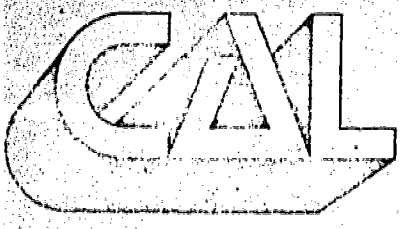
6.3 Future investigations using the present data set. There are several models of investigation that have been pursued by analysts at ETS (for example, the "Growth Model") which should be applied to the corpus of data which we have used for this investigation. An analysis parallel to the one which we have conducted here but using as criterion variable the SAT-Math could be undertaken to see whether the effects that we have noticed for LVLTOT, for instance, are ones which limit themselves to verbal ability as measured by the SAT-Verbal, or whether they are of a different nature and are generalized to the SAT-Math as well. Finally, we have said that the differential effect of the strongest foreign language-related variable (LVLTOT) is felt in the area of vocabulary. It is reasonable to assume that the cause here is foreign language which, because of the cognates that exist between these languages and English, enrich a student's vocabulary to the point where he or she scores higher on some measure of English vocabulary. It would be reasonable to assume that some foreign

languages would be more rich in cognates with English than others. However, the variable in our analysis which was designed to measure this, HIGHLANG, proved to be non-significant. The data in our corpus need to be further analyzed to explore this point in more depth.

15 August 1980

The attached letter describes a project in which we hope you will want to have your child's data included. You should know that the Montgomery County Public Schools screen requests to do such research very carefully, and that the researchers engaged in this endeavor have passed this screening. We are pleased that Rockville High School has been selected as a research site for this project, and feel that we can play a significant role, by supplying the data requested in the attached letter, in what we hope you will agree is a valuable project for foreign language study, not only in Montgomery County, but in the country as a whole.

Sincerely,



Center for Applied Linguistics

August 15, 1980

I am writing to request your permission to use information from your child's permanent record card for a U.S. government-funded study of the relationship between foreign language study and verbal ability in English as measured by the Scholastic Aptitude Test-Verbal. You may rest assured that all information regarding your daughter/son will be strictly confidential, since we will not reproduce her/his name on our data collection form or on our computer coding sheet.

IF AFTER READING THIS LETTER YOU ARE WILLING TO HAVE YOUR CHILD'S DATA INCLUDED IN OUR STUDY, PLEASE SIGN AND DATE THE ENCLOSED BLUE "PARENT CONSENT FORM" AND RETURN IT TO US IN THE POSTPAID ENVELOPE PROVIDED BY SEPTEMBER 5, 1980.

You may be aware of the decline in foreign language study in this country over the past decade. A recent presidential commission called the current situation "scandalous." You may also be aware that initiatives are being taken in local, state and federal agencies to improve the status of language instruction.

One way to encourage foreign langauge study is to document its value, not only with respect to language skill itself, but also with respect to other secondary benefits. One such potential "side effect" of language study, attested to anecdotally by many individuals who have studied languages, is increased awareness of what constitutes good American English usage. The College Entrance Examination Board's (CEEB) Advisory Panel on the Scholastic Aptitude Test Score Decline (Wirtz, 1977) stated that "...a close parallel unquestionably shows up between students' SAT-Verbal scores and the number of foreign language courses they have taken in high school. Those who report having taken four or more such courses...average more than 100 points higher than those...reporting no work in foreign language; and the averages rise progressively with the number of courses taken."

We at the Center for Applied Linguistics (CAL) have received funding from the Education Department to examine the correlation between study of a foreign language and score on the SAT-Verbal test of the CEEB. Our study will gather information from the permanent record cards of the graduating class of June 1981 of Rockville High School. The information we are interested in collecting falls into three categories: 1) background information (age, sex, grade point average, experience abroad, elementary school language experience, I.Q., verbal performance before language study, courses and grades in all academic work from grades 7-12); 2) information about foreign language studied (which language(s), how long, what grades, etc.); 3) SAT Verbal, and any other measure of English language performance at the end of high school. In order to collect this information, we need access to the following cards in your child's permanent record: Personal and Family Information, Attendance Information, Nonsubject Performance Information, Subject Performance Information, Pupil Test Record.

3520 Prospect Street, N.W. Washington, D.C. 20007 (202)298-9292 Cable: CENTAPLING

In some instances, the information we are seeking is kept on forms with other names than those just mentioned. In such cases, we would need to obtain this information from these alternate forms in your child's permanent record file.

Once these data are gathered, we will perform appropriate statistical tests on them to attempt to answer questions like the following: (1) When the factor of verbal performance is controlled, do students who have studied a foreign language in secondary school score higher on the SAT-Verbal than do students who have not studied foreign language? (2) Do students who have studied <u>two</u> foreign languages score higher than those who have studied only one?

We appreciate your interest in this study, and thank you in advance for your willingness to permit us to use the data from your daughter's/son's MCPS permanent record file. The study will be completed by December 1980. Should you be interested in receiving an overview of our results, please call us then. Also, if you have questions about the project which you would like answered before granting us access to your child's record, please call me at the number indicated on the letterhead.

Sincerely yours,

Peter A. Eddy

Peter A. Eddy
Project Director

enclosure

PAE:en

Foreign Language Study and English Language Ability Project
Center for Applied Linguistics/Montgomery County Public Schools

PARENT CONSENT FORM

I have read and understood Peter A. Eddy's letter of 15 August 1980 describing the project "Foreign Language Learning in High School and English Language Ability" and requesting consent to the release by the Montgomery County Public Schools of the information contained on the following cards in my child's permanent record (or on Montgomery County forms which contain the same information): Personal and Family Information, Attendance Information, Nonsubject Performance Information, Subject Performance Information, Pupil Test Record. I hereby consent to the release of such information to the members of the staff of the Center for Applied Linguistics participating in this project and their designees. In doing this, it is my understanding that all data collected will be kept strictly anonymous, and that no reference will be made to information about my child in any reports, published or unpublished. Furthermore, I understand that the only use to be made of these data will be in computerized analysis; that the project investigators will use the data only for the preparation of a technical report and appropriate scholarly and publicity-oriented papers that might be adapted from the final report, and that neither the project investigator nor CAL will use the data collected for their personal financial gain. Finally, I understand that I may be furnished with a copy of the released information records if I so desire.

TO THE PARENTS OR GUARDIAN OF:
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Name of Child _____

Signature of Parent _____

Name of Parent _____
(please print)

Date _____

EXPIRATION JAN '81

DATA COLLECTION INSTRUMENT: Foreign Language Study/SAT Verbal

1.0 Personal and Family Infor ation; Enrollment Information

1.1 Student ID Number 1-1 [ ][ ][ ][ ][ ][ ] 1-6

1.2 High School (1= 2= 3=) [ ]

1.3 Birthdate (month/year) [ ][ ][ ][ ] 1-11

1.4 Sex (1=Male; 2=Female) [ ]

1.5 Ethnicity/Race (1=White; 2=Black; 3=Asian(Chinese, Japanese, Korean, Vietnamese, Cambodian, Lao, etc.); 4=Hispanic; 5=Indian/Alaskan native; 6=Other, specified; 9=Missing/Unknown [ ]

1.6 Student participantion in ESOL (1=Never; 2=Previous; 3=Current) [ ]

1.7 Primary language of pupil (1=English; 2=Spanish; 3=French; 4=Asian or Southeast Asian language; 5=Other, specified; 9=missing/unknown [ ]

1.8 Evidence of language other than English in the home (1=English appears to be primary language of home; 2=one or both parents/guardians appear to speak another language; 3=other, explain below) [ ] 1-16

_____

1.9 If there is evidence ofanother language in the home, what is that language? (1=No other language in the home, i.e. English is primary language of home; 2=Spanish; 3=French; 4=Asian or Southeast Asian language, name below; 5=other, specified; 9=missing/unknown) [ ]

_____

1.10 Number of years enrolled in MCPS [ ][ ]

1.11 Evidence of experience in school environment other than English speaking (1=Yes, explain below; 2=No, no evidence found) [ ]

_____

1.12 Extended residence abroad. (0=none or less than one year; from one to 8 years, indicate number; 9 or more years=9) [ ]

1.13 Experience in elementary school foreign language study (1=Yes, explain below; 2=No, no evidence found) [ ] 1-22

_____

1-23 to 1-78 blank

1-79, 1-80:"01"

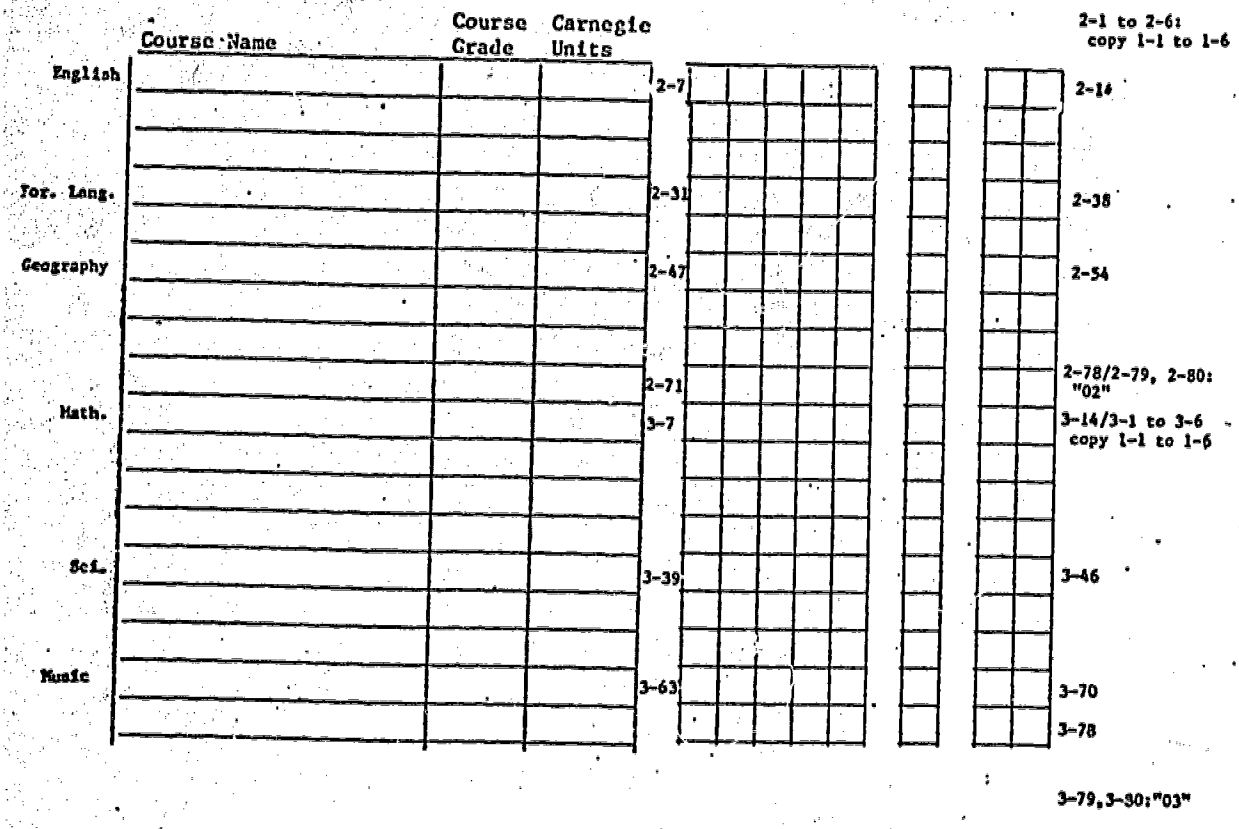
Data collected by _____

Date _____

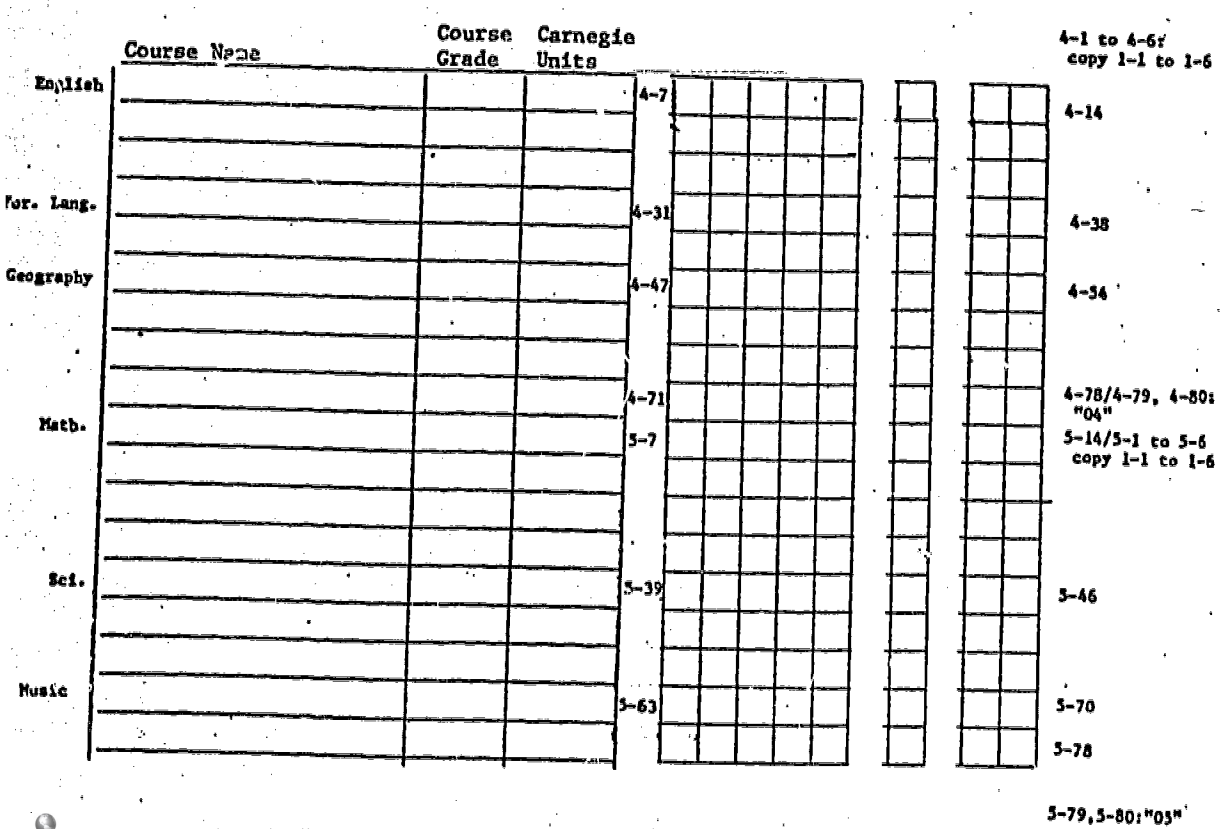
MCPS Form
021-9988, 9/80

2.0 Subject Performance

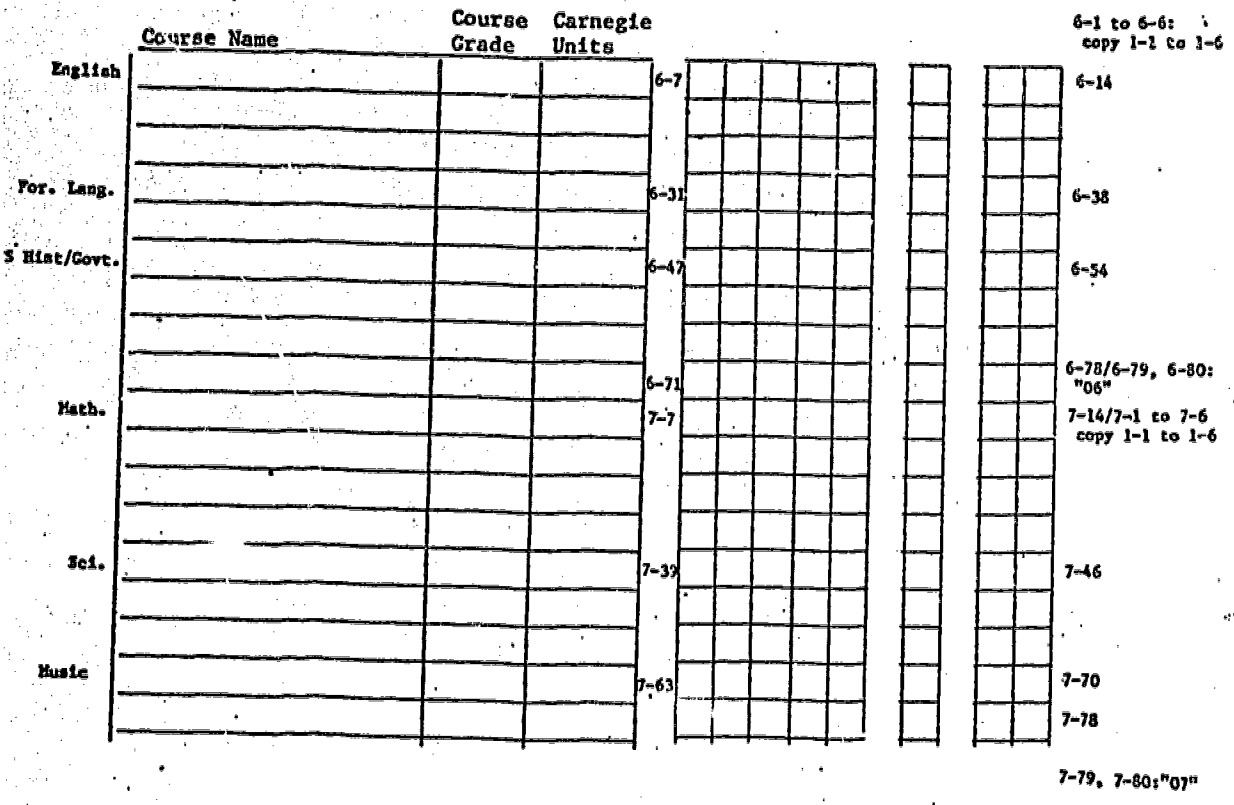
2.1 Seventh grade courses



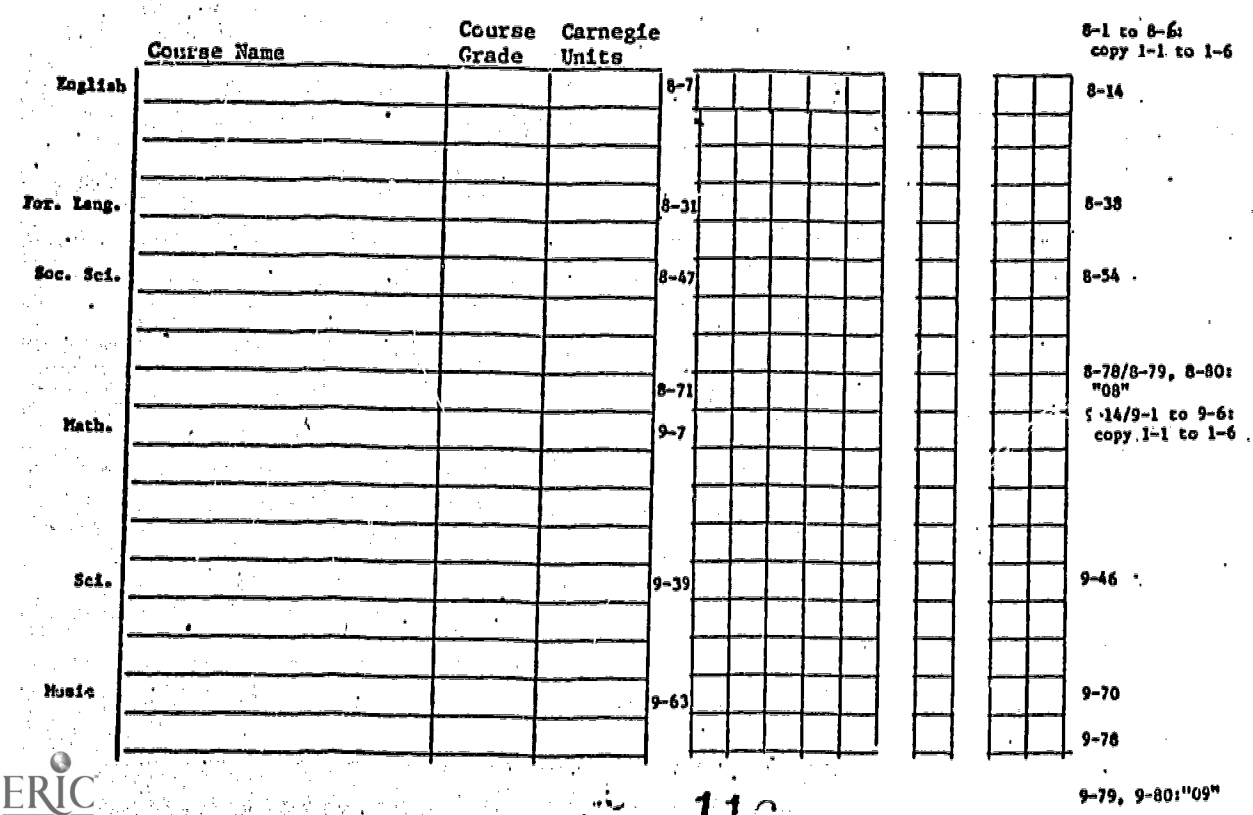
2.2 Eighth grade courses



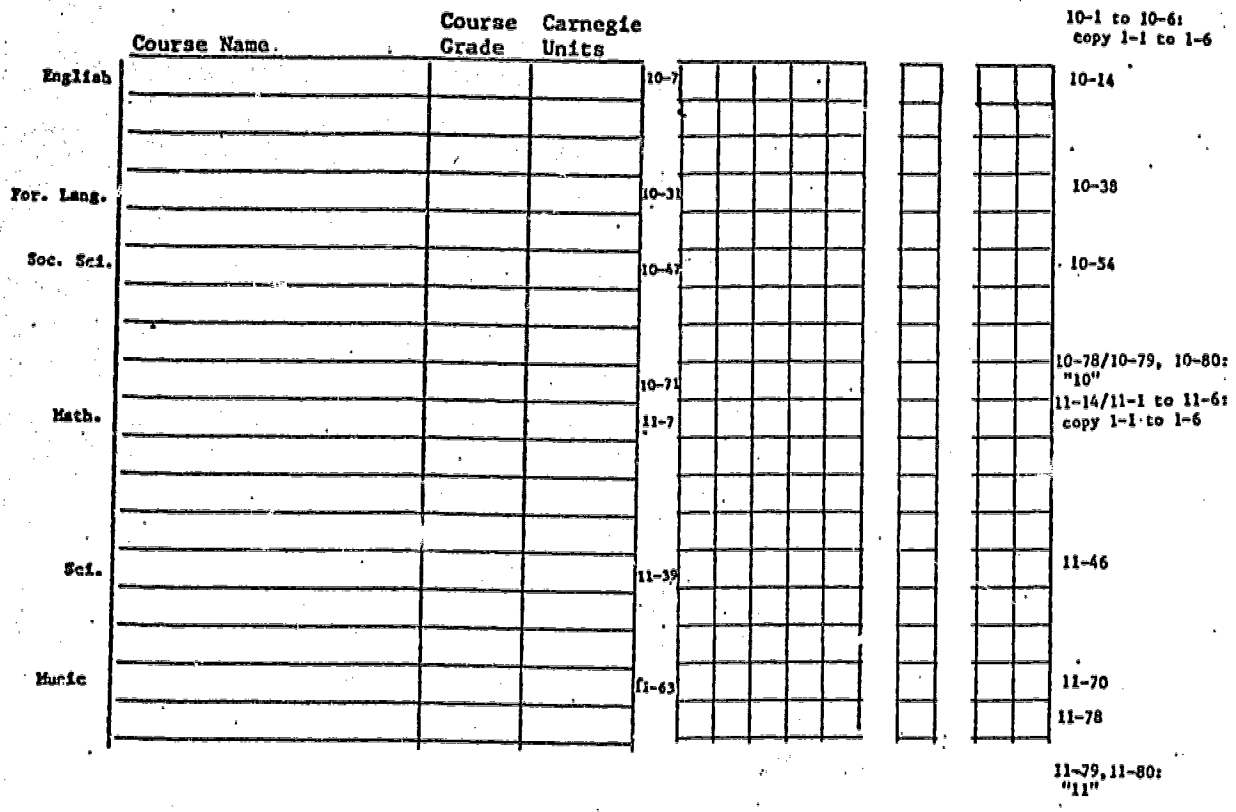
2.3 Ninth grade courses



2.4 Teath grade courses



2.5 Eleventh grade courses



3.0 MCPS Test Data

3.1 Eleventh grade test data: Test of Academic Progress

12-1 to 12-6: copy 1-1 to 1-6

Date Administered	Test	National Stanine	Standard Score	National Percentile
12-7 ☐☐/☐☐ 12-10	TAP-Soc. Studies	12-11 ☐	☐☐	☐☐ 12-15
	-Composition	☐	☐☐	☐☐
	-Science	☐	☐☐	☐☐
	-Reading	☐	☐☐	☐☐
	-Math	☐	☐☐	☐☐
	-Literature	☐	☐☐	☐☐
	-Composite	☐	☐☐	☐☐ 12-45

3.2 Ninth grade test data: CAT, ITBS

Date	Test	National Stanine	Standard Score	National Percentile	
12-46 / 12-49	CAT-Verbal	12-50			12-55
	-Quant.				
	-Non-verbal				12-67/12-68 to 12-78:blank 12-79, 12-80:"12" 13-1 to 13-6: copy 1-1 to 1-6
13-7 / 13-10	ITBS-Vocab.	13-11			13-13
	-Rdg. Comp.				
	-Spelling				
	-Captial.				13-22
	-Punct.				
	-Lang. Usage				
	-Map Rdg.				
	-Graphs & Tbls.				13-34
	-Ref. Matls.				
	-Math Conc.				
	-Math Prob.				
	-Composite				13-46

3.3 Seventh grade test data: CAT, ITBS

Date	Test	National Stanine	Standard Score	National Percentile	
13-47 / 13-50	CAT-Verbal	13-51			13-56
	-Quant.				
	-Non-verbal				13-68/13-69 to 13-78:blank 13-79,13-80:"13"
14-7 / 14-10	ITBS-Vocab.	14-11			14-13/14-0 to 14-6: copy 1-1 to 1-5
	-Rdg. Comp.				
	-Spelling				
	-Captial.				14-22
	-Punct.				
	-Lang. Usage				
	-Map Rdg.				
	-Graphs & Tbls.				14-34
	-Ref. Matls.				
	-Math Conc.				
	-Math Prob.				
	-Composite				14-46

NOTE: If 7th grade test scores are not available, use 5th grade scores; be sure that date is recorded accurately.

3.4 Science Research Associates (SRA) Test (Note: Not taken by all students; Record grade taken, e.g. 10)

	Grade	Test	Percentile	Standard Score	
14-47		Composite	14-49		14-52
		Ability			
		Expected Comp.		-	
		English Usage			14-62
		Math Usage			
		Soc. Stud. Rdg.			
		Nat. Sci. Rdg.			
		Word Usage			14-78

14-79, 14-80: "14"

4.0 PSAT and SAT Scores

4.1 PSAT (Record in reverse chronological order; most recent test first)

15-1 to 15-6: copy 1-1 to 1-6

	Test Date	Verbal	Math	Selection Index	Verbal %ile	Math %ile	Sel. Ind. %ile	
15-7	YR							15-21
15-22	YR							15-36

4.2 SAT (Record in reverse chronological order; most recent test first)

	Test Date	Verbal	Math	Subscores: Reading	Vocab	TSWE	
15-37	MO / YR						15-50
15-51	MO / YR						15-64

15-63 to 15-78: blank
15-79, 15-80: "15"

CODING KEY

columns | a | b | c | d | e |

a=grade

1=gr.7
2=gr.8
3=gr.9
4=gr.10
5=gr.11

b=subject (general)

1=English
2=social studies
3=math
4=science
5=music
6=foreign language
9=other

c=subject (specific)

English

0=standard course
1=speech
2=journalism/media/TV
3=writing courses
4=reading courses (remedial)
5=theatre
6=ESOL courses
9=other (includes humanities, language arts, spelling)

Math

0=standard course taken by all (includes IMS)
1=algebra, I and II
2=geometry
3=unified math (all levels, includes SSMC)
4=consumer math, applied math, accounting, application of math, business math
5=advanced math: trig, adv. algebra, elem. functions, analytic geometry
9=other (computer math)

Science

0=standard course taken by all
1=biology (anatomy, physiol, zool.)
2=chemistry
3=physics
4=earth science/environ.sci./phys.sci.
9=other

Social Studies

0=standard course taken by all (gr. 7, 8)
1=U.S. hist. (U.S. hist. & gov., U.S. hist. II)
2=contemporary issues
3=other hist. (ancient/medieval European)
4=law/pol. sci/sociology
5=psychology
6=economics
7=problems of the 20th century
9=other

Foreign Language

0=Intro. to language
1=French
2=German
3=Russian
4=Spanish
5=Latin
6=Italian
7=Other

Music

0=music (no further specificification)
1=band, jazz ensemble
2=orchestra
3=individual instrument
4=chorus/voice/chamber singers
5=music theory
6=electronic music

d=special aspects of course

0=no special aspects
1=honors course, advanced placement, "gifted & talented"
2=accelerated course
3=decelerated course (e.g., algebra 1, pt. 1)
4=summer school
5=nightschool

e=for FL courses only, level

1=level 1
2=level 2
3=level 3
4=level 4
5=level 5
9=lang. course designed for native speakers

the grade column

0=flunk, E/F
1=D
2=C
3=B
4=A
6=satis. or pass
7=unsatis.
8=W
9=LC

the time column

05= .5 Carnegie unit
03= .33 Carnegie unit
10=1.0 Carnegie unit
02= .25 Carnegie unit

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