

1990

A study of the effect of foreign language study on learned abilities

Mary Sula Linney
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abilities**

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Iowa State University, 1990

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A study of the effect of foreign language
study on learned abilities

by

Mary Sula Linney

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
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1990

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CHAPTER I. INTRODUCTION

During the 1980s, the public renewed its interest in the quality of education at all levels of the American educational system. Reasons for this interest were the knowledge that student learning, curricular coherence, the quality of facilities, faculty morale, and academic standards no longer measured up to expectations (National Institute of Education, 1984). Only half of the students starting college would actually attain the bachelor's degree. The scores on both the Scholastic Aptitude Test and the Graduate Record Examination were declining, and American students were not achieving at the same rate as their counterparts from other nations (National Institute of Education, 1984; Mavrogenes, 1977; Hirsch, 1987). The business world noted the lack of skills in written communication, mathematics, and critical thinking among its workers (Morgenthaler, 1986). Various commissions began to study the topic and produce documents on the state of education as well as recommendations for its improvement (National Commission on Excellence in Education, 1983; Carnegie Foundation for the Advancement of Teaching, 1985; President's Commission on Foreign Language and International Studies, 1979). Education or the lack of it in the United States was a popular issue during the 1980s, as evidenced by the presence of Allan Bloom's Closing of the American Mind (1987) and E. D. Hirsch's Cultural Literacy (1987) on bestseller lists. Educators, legislators, and the general public called for accountability in public education. Not only were they concerned over the funding of education (Grant and Riesman,

1985) but over student outcomes. Business leaders realized that the U.S. economy was dependent on business and industry's ability to compete in the world market (Sanderlin, 1988). The rapidly changing technologies demanded a population skilled verbally, analytically, and quantitatively (Morgenthaler, 1986).

Background

Verbal, analytical, and quantitative skills are desired outcomes of education. Pascarella (1985) found that students make gains in general knowledge from the freshman to the senior year in college. Though how students develop general verbal and quantitative skills in college is unclear, it is possible to measure the gains made. Numerous terms have been used to identify general student learning. Pascarella (1985) terms them as "higher order intellectual processes," Warren (1978) refers to them as "academic competencies," whereas Conrad, Trisman and Miller (1977) use "general academic ability." For the purpose of this research, the term general learned abilities denoting student cognitive development is used to identify general student learning (Pascarella, 1985).

Assessment of the general learned abilities takes different forms at different institutions. Curricular goals and institutional characteristics as well as the diversity of instructional procedures influence the development of general learned abilities and the measurement of them (Ratcliff, 1988). To assess student learning at more than one institution requires the use of broad criteria. That is, they

must be broader than the independent goals and characteristics of one institution. The assessment instruments selected should examine the commonly recognized general learned abilities of undergraduate education. Identifying the gains in student learning attributable to the college years requires the use of a pretest to determine the students' abilities prior to entrance into college. Once the effect of the pretest is removed from the posttest, prior high school experience is not reflected in the posttest score. By removing the contribution of a student's pre-college learning from measures of college achievement, indicators of student gain or development during the college years can be constructed (Astin, 1970a; 1970b).

Colleges and universities recognize the development of verbal, analytical, and quantitative skills as general learned abilities of undergraduate education. Two common assessment instruments used to test these learned abilities are the College Board Scholastic Aptitude Test (SAT) and the Graduate Record Examination (GRE). Both identify verbal and quantitative as two learned abilities measured by their instrument. They also use comparable definitions of learned abilities and similar testing procedures. Therefore, using the SAT to assess pre-college general learned abilities and the GRE to assess undergraduate student learning constitutes a pretest/posttest program of assessment. The difference between the observed GRE scores (post-college measure) and the GRE scores predicted by the students' corresponding SAT scores (pre-college measure) is the student's residual score. This score is used to indicate the increase in student learning during the undergraduate years.

A comparison of an individual's residual scores with the course-taking patterns would indicate the extent to which the residual scores reflect the course work of a student (Ratcliff, 1987, 1989).

The course work for the baccalaureate program varies from student to student. Even though a college catalog may provide general information on course requirements and the general education curriculum, it is not a reliable source in examining course work patterns. The actual courses taken by students and their sequencing of these courses produce nearly as many course taking patterns as students (Boyer and Ahlgren, 1987). Thus, the college transcript provides a more accurate record of a student's pattern of course taking. The catalog describes generally the curriculum options intended for a student's undergraduate program, while the transcripts provide a record of the actual course work comprising the student's program.

While a transcript tells what courses a student chooses, it gives no indication as to why the student makes the course selection. Studies indicate that scheduling convenience, individual preference, ability or skill in a discipline, or the lack of skill development are some of the reasons which influence course work patterns (Boyer and Ahlgren, 1987). It may be possible that the specific courses taken and the sequence in which they are studied may affect what is learned. If students increase their maturity level and knowledge with each year of college education, then seniors taking a freshman level course may experience different kinds and levels of learning than do freshmen in that course.

Though the college transcript provides information on the student's

course taking patterns, it does not provide the data on the content of the courses and the process through which they are learned. That is, sections of the same course may emphasize and include different materials depending on each instructor's perspective and background. Moreover, teaching styles as well as learning styles bring even more diversity to the individual sections of a single college course. Thus, these differences suggest that while the college transcript may be a more valid source of information about a student's educational experience than the college catalog, it also has its limitations. That is, the more an instructor is able to personalize a course, the less continuity there will be among sections of the same course. This makes measuring student's educational experience increasingly more difficult.

Foreign language courses have not consistently been a part of the formal general education curriculum. During the colonial times in the United States, Latin and Greek were essential parts of the college curriculum. College then was for the general education of a small governing elite (Rudolph, 1985), but by 1900, those going to college were very different. They were the children of the bourgeoisie, and the curriculum reflected their demands of utilitarian and scientific offerings. Yale was among the first to drop Latin as a requirement for the bachelor's degree, charging it was impractical (Rudolph, 1985). After 1900, the country never placed importance on the study and mastery of languages as did other countries (Levy, 1974). Immigrants to the United States at the end of the 19th century and the beginning of the 20th century abandoned their mother tongue. In effect, the study of a foreign

language was traditionally limited to those students who aspired to college entrance (Levy, 1974).

In the late 1950s and in the early 1960s, foreign languages received recognition as important to the curriculum. First, President Eisenhower's National Defense Education Act saw foreign languages as necessary tools for future American citizens who would be contending with hostile forces across the world (Grittner, 1979). President John Kennedy's "New Frontier" then accepted foreign language learning as a necessary part of the Peace Corps. During his early years in office, President Lyndon Johnson in his "Great Society" stressed cooperation among all the multilingual, multiethnic groups in America. The Vietnam War and the issues surrounding this war changed the student population. Many students became political activists and, in this role, they challenged not only the issues of the war, but also general education at the university. They demanded relevancy in the curriculum. In complying with this demand, many universities and colleges removed their foreign language requirements and added courses favored by the students. By 1974, only half as many students were enrolled in foreign languages as in 1968 (Grittner, 1979). Colleges and universities in a 1970 survey showed a significant decline in foreign language enrollments at a time when there was steady growth of college enrollments. Foreign languages again were not as important in the college curriculum as they once were (Levy, 1974).

In the 1980s, foreign languages were again being added to college and university entrance and exit requirements. Among the reasons cited

for including the study of a foreign language in general education was that it was recognized as aiding in the development of general learned abilities (Grittner, 1979).

Since the 1960s, there has been evidence of student dissatisfaction with the curriculum. Students demanded that the traditional curriculum be replaced by courses considered to be relevant to the times. The Vietnam War, student militancy, and these calls for relevancy brought unsettled conditions to the universities. Among them were violent student uprisings, demands by blacks and other minorities for programs centered in cultural pluralism, and a revival of humanistic psychology which focuses all education on the study of oneself (Veysey, 1985). No longer were there specific courses required of all students. Instead, many new courses of the seminar type were introduced to satisfy the student demands for relevancy and vocationalism (Fuhrmann and Grasha, 1983). At the extreme were colleges like Evergreen State and Hampshire where students were given freedom to construct the substance of their undergraduate program of study, and faculty felt the need to sell their wares to students (Grant and Riesman, 1978, p. 249). The result of these trends was that students tended not to take courses from the broad range as previously required through general education, but to limit themselves to variations of the same focus (Boyer and Ahlgren, 1987). The public began to realize that these so-called reforms were producing college graduates who were often illiterate and quantitatively inept (Grant and Riesman, 1978, p. 261). It was presumed that students had not exercised their freedom of choice among courses well and that constraints were

needed to insure that students select and develop their general learned abilities.

Colleges and universities found that relaxing the general education requirements and increasing elective options did not produce community and continuity. The public, weary of the campus protests and the higher costs of education, questioned the productivity of the faculty in the light of insufficiently educated graduates. In turn, the legislature, pressed by the demands of social legislation and diminishing resources, wanted measures of accountability (Grant and Riesman, 1985). As a result, by 1985 60% of the 1,310 four-year institutions surveyed by the Carnegie Foundation for the Advancement of Teaching were reviewing and revising their basic general education requirements. They sought to address the imbalances that had risen in the undergraduate education. Again, colleges began to reemphasize broad aims of education and deemphasize narrow specialization and career preparation (Carnegie, 1985).

During the decade of the eighties, there has been a movement toward limiting the general education requirements to courses which develop the basic verbal and quantitative skills and give students competencies which will help them adapt to change brought about by technology and the social environment (Cahn, 1981-82). In doing so, institutions have moved away from permissive, sometimes unlimited, lists of general education courses popular during the 1960s and 1970s toward a structured, institution-directed plan of general education (Carnegie Foundation, 1985). The College Board, a proponent of this philosophy, suggested a national

standard for the undergraduate curriculum, which included the following subjects: English, the arts, mathematics, science, social studies, and foreign language (Dunford, 1986-87). This movement toward a more structured general education curriculum should provide a strengthening of students' verbal and quantitative skills.

The demands for structured undergraduate common learning experience for students, often known as the core curriculum, have led to the adoption of a one- or two-year foreign language requirement by an increasing number of institutions (Rohter, 1987). The reasons for inclusion of this requirement for the baccalaureate are quite diverse. Some argue that foreign language processing involves both hemispheres of the brain and this learning alters cerebral organization (Zimmerman, 1982). Other arguments list greater cognitive flexibility (Zimmerman, 1982; Wiley, 1984-85) and the maturing of verbal skills more rapidly (Lide, 1983; Adelman, 1981; Grittner, 1979). Some mention the need to be aware of cultural diversity (College Entrance Examination Board, 1983) and the need for language fluency to compete internationally (Williams, 1986). Though each argument views the benefits of foreign language study in a different light, collectively they have influenced the inclusion of the requirement in core curricula. This change reflects a return to the basic liberal arts subjects and away from the self-awareness/relevancy curriculum of the '70s (Grittner, 1979). An emphasis of the 1980s has been on literacy (Richardson, 1983; Hirsch, 1987; Bourque, Hancock, and Loew, 1984) and those subjects which promote reading, writing, and quantitative skills.

This movement to include a foreign language requirement in the general education curriculum has implications for the future of the discipline. Generally, the requirement is met through one or two years of foreign language study at the elementary or first year and intermediate level or second year. Two years of study will not produce a nation of linguists (Bahrlick, 1984). That is, students generally do not acquire skills necessary for an intermediate level of proficiency in conversation, composition, and reading until they complete the third year of the university courses (Zimmerman, 1982; Higgs, 1985).

According to Lambert and Moore (1984), second language attrition studies indicate that students who take five college courses and who earn high marks retain large portions of their original foreign language knowledge. On the other hand, students who take only one year and receive average marks generally perform on foreign language exams at the level of those without training (Bahrlick, 1984). This lack of permanent learning weakens the case for the foreign language requirement if oral proficiency becomes the primary goal (Met, 1988). For this reason, foreign language instructors need to consider the other benefits of foreign language study (Bourque et al., 1984) since many students will not have the desire nor the time needed to pursue the second language to a high degree of proficiency.

Even in light of these implications, institutions are adding or reinstating the second language requirement in their general education requirements because research indicates that foreign language study may develop general learned abilities of students, aside from facility with a

second language (Bourque et al., 1984). There is an apparent correlation between second language learning and mental dexterity, flexibility or creativity (Jarvis, 1980, p. 36). The study of a foreign language also influences performance on those skills measured by the College Boards Scholastic Aptitude Test (SAT) (Sheils, 1977; Eddy, 1981) and the American College Testing (ACT) (Timpe, 1979). Research points to verbal skills as those which benefit most from study of a foreign language (Timpe, 1979; Wiley, 1984-85). Students show significant improvement in both native language vocabulary and reading comprehension (College Board, 1986).

One of the four arguments advanced for reinstating the foreign language requirement at Iowa State University was that "foreign language study alters thinking patterns, increasing one's ability to abstract . . ." and to improve learning abilities through cognitive change (Frink, 1982, p. 11). Learning a foreign language requires a set of study skills which range from rote memorization to problem solving (College Board, 1986). It also demands that the mind learn to categorize, analyze, and discriminate among words and structures (Herron, 1982). At the same time, students learn to discriminate among sounds and to reproduce them (Bourque et al., 1984). In essence, learning a foreign language is learning how to learn (Herron, 1980). The studies and arguments previously mentioned tend to support the assumption that the study of a foreign language improves skills in the areas of literacy and general learned abilities.

Statement of the Problem

Though there have been numerous pedagogical studies since the 1960s on the effects of foreign language study in the elementary school and high school (see Chapter II), little has been written about the effects of foreign language study at the college level. At a time when the inclusion of foreign language study as part of the general education requirements for a baccalaureate degree is being advocated, most of the prior research reflects information on a younger student population in a different learning environment. The results of this previous research suggests that, but does not determine if, the study of foreign language contributes to college students improved general verbal, quantitative, and analytical abilities. However, there is a need to further validate this argument and to investigate other factors within the scope of course taking which influence student learning.

Purpose of the Study

The purpose of this study is to examine the influence of foreign language study at the college level on the verbal, quantitative, and analytical skills as measured by the Graduate Record Exam (GRE). Also included in this study is an examination as to the effects of the number of foreign language courses taken, the particular language studied, and the entry point of first foreign language study. To accomplish this purpose, the following research objectives were established:

Research question 1. To determine the nature and extent to which there are differences in the GRE residual scores of students who have

studied foreign languages in college and those who have not.

Research question 2. To determine the effect of length of college-level foreign language study on GRE residual scores.

Research question 3. To determine the extent to which gains in general learning vary by foreign language studied.

Research question 4. To determine the nature and the extent to which the point in the curriculum where a student begins foreign language study at college affects the GRE scores.

Samples and Sources of Data

The sample consisted of the transcripts and test scores of students who had graduated or were estimated to graduate in the 1986-87 or 1987-88 academic year from four institutions, Georgia State University, Ithaca College, Mills College, and Stanford University. The college calendar for Georgia State and Stanford was divided into quarters, whereas Mills used terms and Ithaca semesters. Data in the form of college transcripts, student test scores on the SAT, and GRE scores were gathered on each participant. The 9 item-type categories of the General Test of the GRE were the measures of general learned abilities. The SAT verbal and mathematical sub-scores were used as variables to control for academic abilities of these students as they first entered college. Transcripts were examined to determine courses taken, sequence of courses and grades received. Information about the college curriculum was drawn from the college catalog of each institution. It provided data on foreign language offerings and details as to which areas of study

required a foreign language for graduation.

The residual score for each item-type was calculated in order to determine the student gains in general learned abilities during the time of the baccalaureate program. The residual score is the difference between the student's actual score on the GRE and the score predicted on the corresponding SAT test. The resulting score was the student gain score and had been calculated for each person in the sample group.

Data from two sample groups were available for Georgia State University, Ithaca College, and Mills College. The first sample group from Georgia State consisted of 151 students. The second sample group consisted of 120 students. Both groups included transfers from Clayton State College. Transcripts showed the following foreign languages studied by members of the sample: French, German, Latin, Russian, and Spanish.

In sample group 1 from Ithaca College, there were 146 students. The second sample group was some larger with 192 students. The foreign languages studied were French, German, Italian, Spanish, Russian, Latin, and Hebrew. The smallest samples were from Mills College. There were 62 students in the first group and 44 in the second group. Languages studied by the Mills students included French, German, Italian, Japanese, Latin, and Spanish. While French, German, and Spanish are taught at Mills, students also enrolled in other languages offered by nearby colleges and universities.

There was only one sample group from Stanford available at the time of the research. That group consisted of 105 students. Stanford foreign

language students availed themselves to a wide range of languages. These included: Arabic, Chinese, Dutch, French, German, Hebrew, Indonesian, Italian, Japanese, Korean, Polish, Russian, Spanish, and Swahili. All data sets with missing values were excluded from the statistical analysis.

The data and sample test scores for this study were taken from senior students at four colleges and universities. The institutions included were Georgia State University, Ithaca College, Mills College, and Stanford University. The following data collected from the college catalogs were general information on the curriculum, foreign language courses offered, and specific foreign language requirements. Transcripts provided data on courses and grades received. Scores on the SAT and the GRE were gathered on each participant.

Treatment of the Data

The statistical analysis used to examine the four research questions was the analysis of variance-one way (ANOVA). This technique is used to test for differences among the means of two or more groups. One-way ANOVA tests if the subgroups of each research question differ on one factor. For this study, ANOVA is used at the .10 level of significance to determine the nature and extent to which foreign language study impacts on learned abilities. This level of significance is appropriate for exploratory studies. The Scheffé method for making post hoc comparisons was used to examine pairs of means with unequal-sized samples.

Assumptions

1. One learns what one studies.
2. Courses are the primary unit of learning.
3. Courses on a transcript remain constant in content over time.
4. The variables are assumed relevant to the study.
5. The data are assumed to be correct.

Limitations of the Study

The analysis of foreign language study and its effect on general learned abilities should provide insight as to the particular course work pattern in foreign language, if any, is the most effective. The study includes data from a variety of institutions. That is, large public universities as well as a small private women's college and a large private university took part in the study. While certain similarities among the organizations of universities can be described, each university is a unique culture with its own environment and climate (Feldman, 1969). However, the broad scope of the GRE General Test does not examine the unique characteristics of institutions but rather the general learned abilities of their graduates. Thus, conclusions drawn from a study of the data collected are valuable to the extent that they add or reaffirm studies on precollege populations. However, as research on foreign language study and its effects on general learned abilities at the college level was limited, this study was to be considered experimental in nature. With this in mind, there is some concern that in experimental studies a type I error might be made if the level of significance (p) set

by the researcher is too great (.10) and the effect size (r) or the magnitude of a difference or relationship in a sample or population is too small. The level of significance may be increased in order to spotlight a difference which may not show up at a .05 level of significance. Therefore, the danger lies in possibly validating findings which in essence are not significant.

Use of the Graduate Record Examination General Test scores as the only measure of those learned abilities influenced by the undergraduate education also limits the validity of the study. Though the GRE is a nationally referenced test, it is limited by the information it produces and, therefore, places boundaries on the study. No insights as to how this learning occurred can be gained through the use of the GRE, and it is necessary to avoid assuming more. In using only one assessment instrument, it is possible that no differences in general learned abilities between the foreign language group and the non-foreign language group will be found when, in reality, there are differences. This is a particular danger if the level of significance (p) is set too low.

This study only focuses on the impact of one discipline, foreign languages, and does not take into account the broad course work patterns of students. Therefore, there is a possibility that the effect or the lack of effect on general learned abilities does not result from the foreign language study or the lack of it, but from other course taking. However, the studies reviewed in Chapter II do not give evidence of this occurring.

Furthermore, only those foreign language courses which use the

language as both subject and mode of instruction were included. That is, the study did not include those courses listed under foreign language courses which are taught in English. Some literature and culture classes fall into this category. The college catalog acted as the source for determining these courses.

Definitions of Terms Used

1. Course: The smallest single unit for analysis in a college curriculum.
2. General Learned Abilities: Cognitive development in verbal, quantitative, and analytical skills as examined by the Graduate Record General Test (Ratcliff, 1989).
3. Scholastic Aptitude Test (SAT) Scores: A nationally referenced test of verbal and quantitative skills taken by high school seniors. Students may have taken the SAT examinations more than one time prior to admission. In cases where the student took the SAT more than once, the SAT score date immediately preceding the entrance into the baccalaureate program was used. In the case of transfer students, the SAT scores immediately preceding entrance into the institutions under study were used. The purpose of the SAT is as a precollege effects measure. Thus, the examination taken closest to the effects to be analyzed is the most desirable.
4. Graduate Record Examination General Test: A nationally referenced test of verbal, quantitative, and analytical skills taken by graduating college seniors. The purpose of the examination is as a

measure of college effects on students' verbal, quantitative, and analytical abilities.

5. Verbal Ability Tests: A sub-score of the GRE that measures one's ability to reason with words in solving problems. It consists of four question types: analogies, antonyms, sentence completion, and reading comprehension (GRE Information Bulletin, 1986-87).

6. Analogy type questions: Test the ability to recognize relationships among words and the concepts they represent and to recognize when these relationships are parallel.

7. Antonym type questions: Test the ability to reason from a given concept to its opposite.

8. Sentence completion type questions: "Test the ability to recognize words or phrases that both logically and stylistically complete the meaning of the sentence" (GRE Information Bulletin, 1986-87, p. 32).

9. Reading comprehension type questions: "Measure the ability to read with understanding, insight, and discrimination" (GRE Information Bulletin, 1986-87, p. 33).

10. Quantitative Ability Tests: A sub-score of the GRE that measures basic mathematical skills, understanding of elementary mathematical concepts and ability to reason quantitatively and to solve problems in a quantitative setting. There is a balance between questions requiring arithmetic, algebra, and geometry.

11. Quantitative comparison type questions: Test the ability to reason about the relative sizes of two quantities or to decide no decision can be made for lack of information.

12. Discrete quantitative type questions: Measure basic mathematical knowledge assumed common to the backgrounds of all examinees and the ability to solve actual or abstract situation problems.

13. Data interpretation type questions: Test one's ability to synthesize and select information and to determine if enough information is provided for a decision.

14. Analytical Ability Test: A sub-score of the GRE that examines analytical reasoning and logical reasoning.

15. Analytical reasoning type questions: "Test the ability to understand a given structure of arbitrary relationships among persons, places, things or events, to deduce new information from the relationships given and to assess the conditions used to establish the structure of relationships" (GRE Information Bulletin, 1986-87, p. 40).

16. Logical reasoning type questions: Test the ability to understand, analyze, and evaluate arguments.

17. Literacy: Uses "reading and writing as operations in the service of a goal to accomplish transactions within a specific context" (Richardson, Fisk and Okun, 1983, p. 4).

18. Entry Point: The semester/quarter in the student's academic career when he/she begins studying a particular discipline.

19. Residual Scores: "The residual differences between the observed GRE scores (post-college measure) and the GRE scores predicted by the students' corresponding SAT scores (pre-college measure)" (Ratcliff, 1988, p. 7).

Significance of the Study

Steven M. Cahn, in his article "Rethinking Requirements" (1981-82), argues that foreign language learning is an essential component of the core curriculum. As previously noted, educators indicate this discipline offers a number of other benefits which are recognized as aiding a student's verbal and analytical skills (Bourque et al., 1984; Jarvis, 1980). However, some of the arguments at the college level are based on an intuitive feeling gained through experience in teaching foreign language rather than on actual data collected. This study, on the other hand, in using data collected for the effects of foreign languages on college students' development, is an important addition to the limited literature on the value of foreign language study at the college level. Those groups most interested in these findings would be foreign language educators, members of college/university core curriculum committees, and funding agencies.

CHAPTER II. REVIEW OF LITERATURE

Introduction

A review of the selected literature identified design methodology and factors associated with the general impact of college on students' intellectual skills and the effects of the study of a specific discipline--foreign languages--on the development of learned abilities. The review is divided into seven parts beginning with research measuring college impact on students' intellectual skills. Included in the review are general education as it relates to intellectual skill development and assessment of learning. Parts III through VII are a presentation of the literature surrounding the effect, historically, theoretically, and quantitatively, of foreign language instruction and study on learned abilities.

Measuring College Impact on Students' Intellectual Skills

In Four Critical Years, Astin (1977) reviewed several studies (Campbell, 1965; Lenning, Numday, & Mary, 1969; Ownes, 1953; Rosamann & Others, 1975) indicating that students' basic skills and knowledge of academic materials increase substantially after they enter college. However, no study has demonstrated completely that these increases are solely or primarily the effects of the college experience, only that it is a significant factor. Grade point average, awards, extracurricular achievements, and acquisition of special skills and competencies are some of the variables used in measuring the impact of college on students' intellectual skills and attainments (Astin, 1977). However, the use of

grades as a measurement, according to Astin (1977), "reflects only how the student is performing relative to other students at a given point in time, not necessarily what has been learned" (p. 101). Assessing general learned abilities requires studying the curricula and facilities of institutions. As curricular requirements vary from institution to institution, the general learned abilities developed may also tend to differ.

Increasing costs of financing higher education have caused the general public and state legislatures to be concerned with knowing which institutional characteristics are associated with how much students learn (Rock, 1970). A common assumption is that better professors, libraries, and atmosphere will result in more knowledge. Rock studied 6,855 students from 95 moderate to small colleges to determine which characteristics of institutions promote learning. In comparing SAT score and GRE area test scores, Rock concluded that students who go to more selective colleges tend to achieve more in the area of the humanities than do students who go to less selective institutions. In contrast, students approach higher levels of science skills where the college requires more course work in that area regardless of major.

Nichols (1964) studied 356 merit finalists attending 91 colleges. He found that the college a student attends has an effect on the GRE score; however, he also indicated that the strongest predictor of the GRE score is the SAT score. Thus, students attending more selective institutions likely would have greater general learned abilities upon entrance. The relatively high abilities of these students would be

reflected in the SAT scores, which in turn would be stronger predictors of their GRE scores than would their college experience. This would tend to support Rock's statement (1972) that "most people assume that a student who goes to Harvard will learn more than a student who goes to Normal State as they assume that better professors, libraries, and atmosphere will result in more knowledge of science, humanities, and social sciences" (p. 149). However, Rock continues that one must consider that the Harvard student is more knowledgeable on entrance. Those things which are thought to promote student learning such as class size, library, and average ability have not been shown to influence GRE scores (Nichols, 1964). On the other hand, Feldman (1969) found that correlations between variations in institutional characteristics and variations in student change, or perhaps non-change, in attributes such as knowledge, skills, and attitudes may not be directly interpretable. That is, the size of the library may not show direct effect on student learning. The library is a part of the total institutional environment which affects differences in students.

There have been indications that institutional control (public vs. private) may influence the learning environment. Feldman (1969) writes that colleges within these classifications are quite diverse with respect to college impact or college induced change in student attributes. Among the attributes affected are knowledge, skills, personality traits, interests, values, and behaviors. The diversity of colleges stems from their environmental differences, and the broad classifications public and private may conceal the environmental differences of colleges that cause

the change in student attributes. The environmental differences are created through the demographic characteristics of the school such as size and affluence. These classifications are too broad to pinpoint differential effects in learning, however.

Nichols (1964) compared the effects of different colleges on student ability. The sample group of 381 merit finalists took the GRE prior to their college graduation and provided data on the choice of their major field of study. Using the mean GRE residual scores and the data on majors, Nichols found that the college a student attends did have an effect on the GRE score. However, he also found that other variables demonstrated stronger effects: the SAT (which was the strongest predictor of the GRE), initial characteristics such as I.Q., and the major field of study. Differences among major fields were generally larger and more significant than among colleges. Two majors which demonstrated the strongest influence on the GRE performance were engineering and English. The first, engineering, tended to increase the quantitative scores and decrease the verbal scores, with the opposite true of English majors.

Nichols also found a tendency for the quantitative scores to fall when the verbal score rose and vice versa. The state colleges and technical institutions tended to increase the quantitative scores relative to the verbal scores, whereas the northeastern men's colleges showed the reverse. To illustrate the point further, the mean GRE-Quantitative (GRE-Q) score at Harvard was 24.3 points lower than the mean GRE-Q score at the Massachusetts Institute of Technology. These findings

relative to the tendency of students attending different colleges to perform differently on the GRE verbal and quantitative subtests relate to studies done by Astin in 1962 and 1963. He found that the technical institutions and state universities facilitate Ph.D. aspiration and science careers, while the northeastern men's colleges had a negative effect on Ph.D. aspirations. These findings suggest that there may be basic differences between the environment at colleges which impact on the development of general learned abilities.

In a study of the characteristics of the overall college environment, Rock, Centra and Linn (1970) found two college characteristics, income per student and the proportion of faculty with doctorates, which improved learned abilities as measured by the GRE. The study included 93 colleges divided into three groups according to the two college characteristics. Rock used the SAT scores to identify student learning prior to college. The 54 colleges in group 1 were characterized by high income per student and a large portion of the faculty with doctorates. This group had a positive mean residual score in all three GRE Area Tests (Social Sciences, Humanities and Natural Sciences) and the total. Those 29 colleges in group 2 with low income per student and a small proportion of the faculty with doctorates produced negative mean residual scores in all three area tests and the total. However, group 3, with 10 colleges, was also characterized by low income per student but had a large portion of faculty with doctorates. It had the largest positive mean residuals for Social Sciences, but the mean residuals for Humanities, Natural Sciences, and total were negative. Rock's study did not examine data on the

differential effect that colleges may have with different types of students. That is, two schools may have equal mean residuals, yet one college may achieve this with small gains for below average students and large gains for above average students and vice versa.

Centra and Rock (1971) studied the student perceptions of "faculty-student interaction" or the extent to which students felt that faculty were interested in teaching and in students as individuals. Indications in the study were that students perceived "faculty-student interaction" as differing from academic department to academic department. Certain departments were seen as fostering interest in teaching and the student, whereas others were not. These perceptions were shown to be significantly related to student achievement residuals. This relationship would lend credence for the need to further explore the effect of faculty within the academic department on student learning in college.

The preceding research on the impact of college on students' intellectual development was not conclusive even though it did identify characteristics of colleges and universities which may affect students' intellectual development. However, no attempt was made in the studies to examine the effect of students' enrollment in specific courses on their learned abilities. Thus, the findings of this research referred instead to the more generalized term, intellectual development.

Chickering (1976) charged that most institutions are oriented toward the "opportunistic, conforming-to-persons, or conforming-to-rule levels of ego development" (p. 92), thus treating education as though it were "a

commodity, a collection of discreet items, packaged in a few standard sized boxes, sold by Carnegie Units" (p. 92). Chickering's statement, when coupled with a previous finding that the SAT scores are the best predictors of the GRE results, suggests that there is little current evidence of course work impact on student learning. General education as it relates to the development of general abilities needs to be examined.

College catalogs list general education as that set of courses or disciplines usually required of all students. These requirements will vary from college to college and even within colleges of a university. Historically, general education was thought to be a common thread of knowledge linking educated men and women. However, the anecdotal evidence expressed by the Study Group on the Conditions of Excellence in American Higher Education (National Institute of Education, 1984) and the Association of American Colleges (DeLoughry, 1989) indicated a lack of common course work leading to general learning.

According to Paul Zingg (1984), today "the curriculum outside the major often seems to lack any explicit coherence" (p. 172). That is, the curriculum has moved from being wholly prescribed to greatly elective without a coherent general education plan (Rudolph, ASHE, 1985). The arguments surrounding what constitutes general education have become more complex with the ever increasing body of knowledge and the changes in the student population. At most major universities, undergraduates face hundreds of courses from which to choose each year (Zingg, 1984).

Though numerous courses may fulfill the same core requirement, the degree to which they develop a general learned ability may be very

different. In 1988, the National Endowment of the Humanities commissioned the Higher Education Surveys System to conduct a survey of four-year colleges and universities and two-year colleges on general education requirements. A questionnaire completed by 504 institutions indicated that 96% of the four-year colleges and universities and 90% of the two-year colleges had some general education requirements for all graduates. The largest increase in requirements in the four-year institutions had been in mathematics, whereas only 5% had increased their requirements in the humanities--composition, foreign language, history, literature, and philosophy--since 1983-84. Though the increase in requirements may seem limited, it indicates a move toward a more prescribed curriculum aimed at developing general learned abilities.

The college catalog describes what a college intends to be general education for its undergraduates, whereas the observed general education is viewed on the transcripts. Robert M. Zemsky used the 1986 and 1987 transcripts of more than 25,000 students from 30 universities and colleges to conduct a review of the undergraduate curriculum in the liberal arts (DeLoughry, 1989). The data for the study were taken from transcripts of students in arts and sciences, business, and engineering. The sample included 21 private colleges ranging from small to large and 9 public universities. In examining the scope of studies in the liberal arts, the study found that at one of the sample institutions, 90% of the graduates had taken at least three courses in each of these academic areas: mathematics and the natural sciences, social sciences, and the humanities. Particularly evident was the lack of courses in mathematics

and the natural sciences. At nearly half of the institutions, at least 30% of the students had not completed three courses in this area.

Zemsky also noted that humanities courses were often open to beginning and advanced level students alike. Using the criteria of three or more prerequisites to indicate depth, he found that at 60% of the institutions fewer than 5% of the humanities courses satisfied the measure. On the other hand, at the majority of institutions 15% of the mathematics and science courses had three prerequisites. Zemsky's research showed that most humanities courses tend to be introductory level courses. Students may broaden their knowledge of the humanities but may not increase the depth of this knowledge through sequential course enrollment.

Another way the researchers examined the depth of the curriculum was to look for evidence of a structured learning experience. Zemsky and associates measured the "temporal focus" of courses and considered as focused those courses with at least 75% of the students at the same academic level. Students of the same academic level filled 45% of the humanities courses at only three institutions. Most were open to freshmen and seniors alike, indicating an introductory level; these were not courses where the understanding of a course would require the knowledge gained from a previous course or courses. Mathematics and natural sciences fared better. At nearly a third of the institutions, 45% of the courses in these academic areas were filled with students of the same academic level.

Zemsky's research on undergraduate liberal arts curriculum was

limited to listing percentages of courses offered by institutions in the broad categories of mathematics and natural sciences, humanities, and social sciences. It did not attempt to examine the extent to which general learning was gained nor the impact of individual or clusters of courses on general learned abilities.

Using 2000 students selected at random from three major fields, mathematics, political science, and English, Boyer and Ahlgren (1987) examined patterns of credit distribution at a large midwestern university. The purpose of their study was to learn how students satisfy a minimum number of credits that every undergraduate must earn in each of several broad categories of courses. This minimum number of credits is referred to as the credit distribution requirement. The researchers considered two aspects of how students who graduated from a public research institution had satisfied its minimum distribution requirement--the total amount of credit received outside of the distribution category to which their undergraduate major belongs, and the balance of that credit as spread across the other three distribution categories established by university policy (Boyer and Ahlgren, 1987). The ideal student for those who value breadth and depth of credit distribution would have 90 or more credits of extra-major credit distribution and an extra-major specialization index of under 40%. Only four students (three English and one political science major) approached this distribution, whereas about one-third of the mathematics majors fell into a low distribution/high specialization category (1987). That is, the mathematics majors tended to take more general education courses related to their field and

fulfilled only the minimum requirements in the areas of communication, social science, and humanities.

Among colleges and universities, there is a trend to limit the range of courses an undergraduate student may take to fulfill the general education requirements. In 1988-89, 86% of the colleges and universities indicated they were limiting the range of general education courses which would meet the requirements (Watkins, 1989). This represents a 9% increase over the previous five years in the number of institutions working toward controlling the course distribution in general education. N. E. H. Chairman Lynne V. Cheney (Watkins, 1989) views this trend as leading to a "time when students are sufficiently directed by general education requirements that it will be very difficult to get a baccalaureate degree without studying English, history, philosophy, and foreign language" (p. 28). The decision to limit course offerings and thus give direction to the undergraduate students' general education may impact on general learned abilities.

Due to increased pressures for accountability from state and federal funding organizations (Kreider, 1988), colleges and universities have felt the need to assess student learning. They have attempted to evaluate what students learn, what they should learn, and what was needed to improve their learning (Expert, 1989). Mandates from state legislatures and recommendations from such groups as the American Association of Community and Junior Colleges call for systematic and comprehensive assessment programs which begin on or before admission to college and continue throughout enrollment, culminating with outcomes

assessment upon a student's graduation (Kreider, 1988).

There have been many tests and techniques developed to measure the impact of college on students (Kreider, 1988). However, there has been little assessment of programs which examine course content and the student outcomes produced (Ahlgren, 1981). Institutions such as Northeast Missouri State, Alverno College, and Kean College of New Jersey use a variety of assessment techniques and measure different sets of student outcomes. Some test graduates for knowledge of the subjects studied in college, for critical thinking and other cognitive skills, and for attitudes and values, while others tie assessment to the college mission, to specific degree requirements, or to classroom interaction and instructor behavior (Ahlgren, 1981). Therefore, how student outcomes are assessed and the criteria imposed for assessment varies from institution to institution.

Tests such as the SAT, the ACT, and the GRE were originally designed as admission tools to predict undergraduate and graduate success of students in college. These tests are increasingly used as measures of student achievement and/or learning gains (Kreider, 1988). In 1985, Wilson assessed the relationship of GRE General Test item-type part scores to undergraduate grades. Each of the principal parts of the GRE General Test includes several types of questions or items. These item-types measure specific learned abilities. The verbal item-types are antonyms, analogies, sentence completions, and reading comprehension. Those item-types employed in the quantitative measure are quantitative comparisons, discrete mathematics, and data interpretation. Two item-

types are measured in the analytical part, analytical reasoning and logical reasoning. The scores taken from the item-type tests are more specific in identifying particular learned abilities than those of the three parts--verbal, quantitative, and analytical.

The study sample included 9,375 students from a total of 437 undergraduate institutions. Using the students' data taken from the GRE files, the researcher identified the 12 most populated major fields of study among these individuals. Those representing primarily verbal fields were English, history, sociology, and political science, whereas chemistry, computer science, mathematics, electrical engineering, and economics were selected as representing quantitative item-types on the tests. Three fields, agriculture, biology and education, were not clearly associated with verbal or quantitative item-type.

In order to assess similarities and differences of students with different college majors, means, both equated and unequated, on the GRE item-type part scores were developed for 12 major-field groups. Wilson found that majors in the verbal fields tended to perform better on the vocabulary item-type tests than on Reading Comprehension, which measures the ability to read with understanding, insight, and discrimination (GRE, 1986-87, p. 32). The majors in quantitative fields tended to do the reverse. The same held true on Data Interpretation or the ability to synthesize information with those in the verbal fields performing much better on these items than on other quantitative measures, whereas science and math majors scored higher on all other quantitative items than on data interpretation. Students majoring in the quantitative

fields tended to have higher scores on Analytical Reasoning which tests the ability to deduce new information from the given structure of relationships. On the other hand, those in the verbal fields were more successful on logical reasoning items or the ability to understand and to analyze relationships among arguments or parts of arguments (Wilson, 1985). Wilson concluded that the skills needed for Analytical Reasoning may be an extension of the quantitative skills, whereas the Logical Reasoning items behaved more like those in the verbal ability subtest. Therefore, those students majoring in the verbal fields tended to score higher on Logical Reasoning items than on those of Analytical Reasoning. Wilson claimed that analysis of GRE subscores (i.e., verbal, quantitative, and analytical) would not identify that Analytical Reasoning items tend to exhibit "quantitative" characteristics, while logical reasoning items tend to exhibit "verbal" characteristics; such observations could only be achieved by analysis of GRE item-type scores (Wilson, 1985, p. 35). The results of Wilson's study suggest a value to using the GRE item-type part scores rather than the subscores in developing relationships between undergraduate courses and general learned abilities. The current study will enhance the Wilson findings by examining further the impact of course taking within a specific discipline (foreign languages) on learned abilities.

Theories and Beliefs on the Impact of Foreign Language Study

During the past 25 years, there has been a rapid decline in the percentage of colleges and universities requiring a foreign language for

admission. In 1984, only 9% required a foreign language for admission, compared with 34% in 1966 (Cauvin, 1984; Jassey, 1984) and 85% in 1915 (Cauvin, 1984). Since World War II, there have been changes in the college population associated with these curriculum shifts. First, with the end of World War II, many veterans financed their education with the G.I. Bill of Rights. These were students who were somewhat older and more mature than the recent high school graduate entering college. More women and minorities also began to enter college. The middle and skilled working classes began to realize that some kind of college education was necessary for economic stability. No longer were people able to depend on physical ability alone as their means for financial support (Veysey, 1985). Though serious in their pursuit of a college education, these students were dissatisfied with traditional curricula and called for ones more to their interests. Blacks and other minorities expected academic programs based on cultural pluralism. Students protested the foreign language requirements, arguing that they were not relevant to their educational needs. Many of these students had not taken the college preparatory courses in high school. Thus, many graduated without foreign language study and would have been denied entrance to those institutions with a foreign language entrance requirement. In responding to the concerns of these new students, colleges and universities made changes in admissions requirements as well as those in general education, often dropping foreign language from both.

A common argument against the study of foreign language is that the time spent in acquiring the skill is disproportionate to the benefits

received (Sims, 1977). This may be true if a high degree of language proficiency is the only goal. Such an argument may be appropriate not only to foreign languages, but also to a number of other subject areas such as fine arts and sports. However, if the purpose of studying foreign language in college also includes the development of general learned abilities, the argument may be inappropriate.

During the time of declining foreign language requirements, SAT verbal scores also declined. From 1960 to 1972, the SAT verbal score dropped 20 points, and from 1972 to 1981 it dropped another 30 points, a 50-point decline over 20 years (NEA, 1989). According to the President's Commission, colleges requiring a foreign language for admission had dropped from 34% in 1966 to 9% in the 1980s (Jassey, 1984). Foreign language educators assumed that this decline in SAT scores was directly related to the decline in foreign language study at the high school level.

Since 1981, the SAT verbal score norms began to increase, followed by a slight decline in 1988 (NEA, 1989). Over this same time period, there was an increase in foreign language student enrollments due to newly adopted college requirements. The college foreign language requirement rose from 8% in 1979 to 9.5% in 1982. More students began to study foreign languages in the high schools as a result of the increased emphasis on improvement in education. In order to increase foreign language enrollments, states such as Iowa provided additional financial aid to high schools based on foreign language enrollments.

In 1977, Beaton, Hilton and Schrader used data from two national

studies to examine the decline in the SAT between 1960 and 1972. The data were collected through Project TALENT 1960 and the Base-Year Survey of the National Longitudinal Study 1972. The Reading Tests used by Project TALENT and those used by the National Longitudinal Study were equated using Angoffs Design II. The student population was divided into three groups: high school seniors, college entrants, and SAT-takers separately. Variation within and between these groups was examined in relation to the variables--socioeconomic status, family configuration, high school curriculum, gender, expected college major, and the reading comprehension variable. For the SAT-taker group, researchers also used the SAT verbal and the SAT mathematical scores as dependent variables. All three groups showed a decline in the average reading scores. The decline for SAT-takers was about twice as large as the drop for college entrants and high school seniors. The high school seniors and the college entrants were similar demographic populations with few changes over the 12-year period. However, the SAT-takers changed considerably. Most importantly, the percentage of students taking the SAT increased while the percentage of SAT-takers in the top ability group decreased from 34% to 20%, and numbers from the two lower ability groups increased from about 8% to 19% (Beaton, Hilton, and Schrader, 1977). The study indicated that the number of SAT-takers enrolled in college preparatory courses had decreased between 1960 and 1972. The researchers concluded that much of the change in the distribution of reading ability and the decline in the SAT-verbal remained to be explained (Beaton et al., 1977). On the other hand, the Wirtz Commission in On Future Examination, the

report of the advisory panel on the scholastic aptitude test score decline (Beaton et al., 1977), noted a "clear parallel . . . between student's SAT-verbal scores and the number of foreign language courses they have taken in high school" (Eddy, 1981). Though Beaton's study showed the changes in the population of SAT-takers, it provided only general information on the high school course-taking patterns of this group. The effects of the study of specific courses were not explained. Working with data from a similar population of SAT-takers, the Wirtz Commission explained the decline in SAT-verbal scores by identifying a parallel between the study of a specific subject, foreign language, and the SAT-verbal scores.

College Board researchers analyzed 1980-81 SAT scores and found that children from wealthy white families score highest on the SAT, and children from poor minority families score the lowest (McGlone, 1983). They also found that the second most significant variable next to family income affecting performance on the SAT-verbal was the study of foreign language. McGlone (1983) indicated that Puerto Rican Americans and Mexican Americans (who are typically bilingual) scored significantly better than monolingual minorities. Black students with significant amounts of foreign language study scored 100 points higher on both the SAT math and verbal than their black counterparts with no foreign language.

Early in the 19th Century, the brain was thought to be a muscle needing to be exercised (Jarvis, 1980). At that time, the study of foreign language was regarded primarily as a mental discipline for developing intellectual capacity (Weatherford, 1986). The particular

faculties thought to benefit from this exercise were "perception, imagination, memory, reason, feeling, and will" (Herron, 1982, p. 442). No longer is the brain referred to as a muscle and, in the 1980s, cognitive development has replaced the muscle theory. Herron (1980) defines cognitive development as training the mind, exercising mental faculties, refining correct habits of thinking, and learning how to learn. Expanding on the definition to include stages of cognitive development, Chickering (1976, p. 71) notes,

there is a general sequence from concrete memorization through recognition of relationships among events, instances, and classes, to cognitive processes that construct combinations of relationships, isolate variables or create new combinations or groupings, and culminate in the ability to apply principles or concepts to new situations and evaluate the results.

Students learn by what they do or experience or practice. Within the first course of foreign language study, practice is provided in each of the stages of cognitive development. With increased study, students become more sophisticated in their ability to manipulate and restructure language patterns. Evidence of the relationships between improved cognitive development and foreign language study comes from both cognitive theory and empirical research. Skelton (1957), for example, in an empirical study found a significant relationship among college students between second language study and superior academic performance. He concluded that the study of a second language contributed to the command of one's language, thereby improving one's control of subject matter in fields where language is the vehicle of instruction. However, to increase the use of these learned abilities, it is necessary to

provide undergraduate students not only with basic language skills, but also with heuristic models which teach students to find out how to apply these skills to other areas (Crouse, Gabbard, Wierenga, & Schrader, 1979, p. 64).

From the early 1960s to the 1980s, the SAT scores have declined. Educational researchers continue to seek the cause or causes of this decline. Some believe that there is a relationship between the decrease in the SAT scores and the decrease in the number of students studying a foreign language. Among foreign language educators, there is a belief that the study of a foreign language helps students in their understanding and use of their native language. Research tends to support this theory. Because foreign language study provides students practice in each stage of cognitive development, there is evidence of a significant relationship between foreign language study and superior academic performance (Skelton, 1975).

Elements of Foreign Language Instruction which Develop Learned Abilities

A primary goal of foreign language instructors is teaching fluency in the language. They may have not identified for students other benefits of this instruction. Foreign language teachers may talk about first language growth, yet they may adopt a teaching strategy that minimizes this growth by limiting the scope of instruction to emphasize only language proficiency (Lide, 1983). Thus, in order to impact on first-language growth, foreign language teachers need to consider methods and teaching strategies which affect development of first-language skills

as well. Moreover, Lide (1983) cites the need to determine the extent to which students have been building and reinforcing linguistic knowledge and first language skills in the foreign language class. As students begin to identify and learn new words, new sentence structures, and new senses of known words, this knowledge begins to transfer to their native language and increase literacy (Lide, 1983).

Vygotsky (1962), in his book Thought and Language, showed that complex thinking is the foundation of linguistic development. Observing both groups of children and of adults, he tested his hypothesis. Several of the language tests used a group of 22 blocks, differing from one another in shape and color, and a number of meaningless words. During the course of the experiment, different meanings and new artificial concepts were given the nonsense words. Subjects were judged on the speed and accuracy with which they grouped. He found that learning a new language forces an individual to realign one's whole system of ideas and to reconstitute previous points of view (Fredericks, 1974). Examples of this type of learning are prevalent among children as they learn their own language. For example, a child learns that the same person may have many relationships. That is, the man referred to first as father may also be son, uncle, husband, cousin, and friend. Fredericks observed the phenomena of language learning as his groups would first learn the meaning of a word or expression and the object or objects it designates known as the referent. In some cases, the groups found a word or expression would have one meaning and several referents, whereas in others there would be several meanings and only one referent. Vygotsky's

test using the nonsense words and blocks of varying shapes and colors allowed his students to develop a system of relationships and meanings among the blocks and words. As the students worked with the blocks and words, their thinking changed and more complex systems of relationships and meanings were developed. Finally, they built word families. In order to build word families which represent new knowledge, students need to reorganize previous points of view. Vygotsky (1962) found this process of language acquisition to be one where the new knowledge, both structure and content, relies on change in previous thinking. This mental activity also takes place when foreign language interacts with native language; each benefits from the other. That is, the strength of the native language is the fluid vocabulary acquired through use, whereas the strength of the foreign language is the need to understand grammar and structure. The knowledge of cognates and word families brought from the native language to the foreign language acts to increase vocabulary, whereas the grammar learned through the study of a foreign language improves understanding of one's native language. Vygotsky observed that students who were required to realign ideas and to restore concepts operated at higher levels of intellectual mastery. He suggested foreign language study as an ideal way to develop these cognitive skills. He made this suggestion, reasoning that the acquisition of the native language is gained without an understanding of grammar and language structure, whereas the knowledge of grammar and language is essential to learning a foreign language. This process of language development continually corrects both the initial systematic errors and new ones that

arise along the way. According to Vygotsky's research (1962), the study of foreign language requires students to realign whole systems of ideas and to reconstitute conceptual structures which act to improve their cognitive skills and to operate at a higher level of intellectual mastery.

In his observation and further analysis of these skills, Jarvis (1980) lists as valuable the following:

- developing a sensitivity for nuances in words. That is, words which appear to be synonyms cannot always be used interchangeably.
- learning to understand the power of one's own language through the study of a second language.
- developing skills in hypothesizing about meaning through such devices as guessing, using contextual cues and tolerating ambiguity.
- improving mental dexterity, flexibility and creativity through the manipulation of words into patterns to convey thoughts.

Both the SAT verbal and the GRE verbal can be used to identify the development of these learned abilities. Students who have practiced and learned these skills in high school and college courses should score higher on the verbal test than those students who have not. The residual scores of the GRE verbal for college students studying foreign languages may be better than those without this educational experience.

Foreign language texts contain exercises on sentence manipulation, substitution and sentence combining. These are principle linguistic operations in beginning and intermediate foreign language levels. Lide (1983) contends that most students make these linguistic changes silently

in their mother tongue. This practice, he continues, "gives them an edge over non-foreign language students" (p. 12). This silent use of their own language develops students' awareness to the variety of sentence patterns available in their native language as well as those of the foreign language.

Though the skills necessary for developing vocabulary and for gaining insights into language may also transfer to general reading, there may be reading comprehension abilities developed in learning a foreign language which may also enhance the development of reading comprehension. Reading is not primarily visual; it depends on knowledge of vocabulary and of the skills needed to learn new words through structural and contextual clues (Lomangino, 1986). Al-Rufai (1976) tested reading comprehension of students in Arabic and English languages. First, he tested these fourth year university students in reading comprehension and found that their test mean scores were not significantly different from those of tests taken in their first year. He gave the students instruction and practice in the foreign language for developing the skills necessary to reading comprehension. After two terms of training, the students were again tested, and their mean scores showed significant improvement. He concluded that reading skills and habits can be improved through such a program and are transferable from one language to another. But such a transfer could only take place when the learner used both languages with ease. In other words, the reader must know the language he/she is reading before being able to read for meaning (p. 239).

Reading comprehension in a foreign language is improved by a student's ability to find and identify the implied meaning of words and sentences. This generally refers to inferencing which is "a process of identifying unfamiliar stimuli" (Carton, 1971, p. 45). It requires the learner to use attributes or characteristics of words, whose contexts are familiar, to recognize what is not familiar.

There are three kinds of inferencing skills: intra-lingual, inter-lingual, and extra-lingual. Intra-lingual or clues supplied by the language itself calls for examining prefixes, suffixes and markers of grammatical structure to identify meaning. Through study of the structure of a foreign language, students learn to understand the grammar and linguistic structure of words in their own language. Cues taken from knowledge of other languages are called inter-lingual cues. These include all the possible meanings that may be made on the basis of interchanges or loans between languages, the occurrence of related or similar words known as cognates and the occurrence of sound or phonological transformation between categories (Carton, 1971). The use of inter-lingual skills builds vocabulary in both the first and second language. The third inferencing technique is dependent on the learner's knowledge of culture and is known as extra-lingual inferencing. An example of a sentence completion task which depends on cultural knowledge for a correct response is as follows:

English

At a meal when I am offered bread and do not wish a piece, I say no, thank you.

German

At a meal when I am offered bread and do not wish a piece, I say thank you.

Using "thank you" in the German sentence means "no, thank you," or a rejection of the bread.

The first two inferencing techniques, intra-lingual and inter-lingual, may contribute to improve learned abilities as measured by the GRE verbal test. Knowledge of suffixes, prefixes, and cognates aids students in determining the meanings of unknown vocabulary. Awareness of markers of grammatical structure can prove helpful in performing the tasks necessary for the sentence completion exam. Reading comprehension is another learned ability which tends to improve through use of inferencing techniques. However, as the Al-Rufai (1976) study indicated, these skills are not automatically acquired but learned through practice. That is, instructors must teach these inferencing skills to students if they are to be learned.

Learning a foreign language depends on a student's ability to develop and use inferencing techniques. To improve these skills among students, foreign language instructors employ several types of exercises. The first is the cloze procedure, an exercise in which words are deleted from a text and respondents are required to replace them. Another exercise useful in developing inferencing is the visual inference test. It is a procedure devised to study the range of reactions individuals exhibit to unrecognizable visual stimuli (e.g., a partial view of an object) and to the addition of information that might make the stimuli

recognizable (Carton, 1971). Foreign language instructors encourage students to take calculated guesses when examining new words or expressions. The accuracy of these calculated guesses depends on the student's ability to draw on inter-lingual, intra-lingual, and extra-lingual knowledge. Both the cloze procedure and the visual inference test strengthen this learned ability.

In the article "Foreign Language Study and the SAT-verbal Scores," Thomas Cooper (1987) identifies specific skills and knowledge obtained from foreign language study which are directly related to the item-types of the SAT-verbal test. The verbal section of the SAT contains four types of questions: Antonyms, Analogies, Sentence Completion, and Reading Comprehension. These divisions are the same as those found on the GRE general test. The SAT Antonym items test vocabulary knowledge. Each item consists of a word in capitals followed by five other words or phrases from which a student is supposed to choose the most nearly opposite in meaning to the word in capitals. Choosing the right words is often dependent on being able to recall the word in context. Many foreign language teachers encourage recalling words in context as a vocabulary learning strategy rather than simply recalling dictionary definitions. According to Cooper (1987), vocabulary learned in context has a better chance of being stored in the long-term memory than that learned through word lists and dictionary meaning. Proficiency in this learning strategy could impact on a student's ability to identify antonyms.

The second verbal section consists of Analogies, which tests the

ability to see relationships between pairs of words or phrases. Knowledge of precise meanings of words is critical to choosing the correct response to this type of question. Building vocabulary in a second language draws attention to the importance of learning precise meanings and the shades of meanings, whereas in the native language the learner has the tendency to disregard subtle relationships among words. Therefore, the second language may aid in sharpening skills necessary to recognize analogies (Cooper, 1987).

The SAT-Verbal Sentence Completion questions test the ability to recognize relationships among parts of a sentence. These questions are similar to the kind used in the cloze tests in foreign language study. Both tests require judgments about grammar and syntax in order to choose appropriate answers. Students with the ability to recognize relationships between and among parts of sentences find greater success on sentence completion tests. In the classroom setting, much of foreign language learning requires an understanding of the grammar and syntax of the language, neither of which is required for fluency in one's first language. This study of grammar and language syntax in the foreign language provides students with knowledge which may be transferred to understanding the structure of the native language.

Lastly, the Reading Comprehension test of the SAT-verbal demands careful, thorough, and attentive reading. Foreign languages offer a favorable environment for developing the techniques necessary for this ability. Students studying foreign language learn to use greater care in reading for understanding due to lack of familiarity with the language.

To further improve vocabulary and syntax in one's first language, Lide (1983) advocates the use of translation from the second language to the first. While translation is not a popular form of language instruction in the 1980s, Lide's argument is that students must find precise equivalents to words, thus increasing vocabulary and development of connotation and denotation in their first language. Many foreign language instructors opt for student-generated short writings which, Lide (1983) contends, result in "short sentences and safe syntax" (p. 14). In other words, used as a tool to increase vocabulary and understanding of syntax, translation can be valuable to the foreign language students in learning more about the language studied as well as their own language.

Vygotsky viewed the study of grammar as of little immediate practical use. Nevertheless, he was a strong advocate of students studying it as a subject of study. His research "clearly showed the study of grammar to be of paramount importance for the mental development of the child" (Vygotsky, 1962, p. 100). Within one's native language, the lower forms of language are prerequisite to learning more complex ones. However, in a second language the learner must know the higher forms before spontaneous speech is possible. Thus, a person's strengths in a foreign language--grammar and syntax--are his/her weakness in the native language and vice versa (Vygotsky, 1962). This same phenomenon appears in the student's ability to use phonetics. In the native language, an individual may have difficulty dividing a word into constituent sounds, yet in the foreign language this may be done easily and writing does not lag behind speech (Vygotsky, 1962).

There are two basic ways to learn a language: (1) either by living in an environment which allows for natural acquisition of the language, or (2) by studying it in an education setting. According to Vygotsky (1962), the first is considered spontaneous, and the second scientific. These processes are closely connected. A spontaneous concept must have reached a particular level of development before a learner is able to absorb a related scientific concept and vice versa. The two processes build on one another. For example, the ability to use a foreign language (the spontaneous concept) is dependent on learning the grammar and structure (the scientific concept) of that language. This process reverses in developing one's native language. There, the language is acquired through immersion in the language environment. However, an understanding of language structure is needed to refine and further develop the language skills. There is also a transfer of the "spontaneous" and "scientific" concepts between the foreign language and the native language. This transfer aids in developing higher level verbal ability (Vygotsky, 1962).

The traditional method of teaching a foreign language was to teach its grammar and to have students translate passages into their native language. In their search to improve students' ability to use the second language, instructors began experimenting with a broad spectrum of methodologies. Nationwide efforts have been made to develop second language facility and a common measure to evaluate second language acquisition (Byrnes, 1987). The American Council of Teachers of Foreign Languages (ACTFL) has established a national proficiency

rating scale based on the Foreign Service Language Test. The ACTFL Proficiency Test measures an individual's ability to use a second language. These tests are not similar to tests which intend to evaluate a student's acquisition of specific course content (Omaggio, 1986). Instead, the students must demonstrate their second language ability in communicative situations.

Methodologies of teaching foreign language used since 1960 have emphasized the active use of the second language. Teachers and students are encouraged to use the second language as the vehicle for communication in the classroom. The major differences among the various methods of foreign language instruction have been the degree to which students are expected to learn language structure and the level of accuracy anticipated in language use. Some methods assume that grammar will be acquired through practice; others do not encourage correction of language errors. Without an understanding of language structure and attention to accuracy, Omaggio (1986) writes that the student language proficiency level will remain low. Moreover, Vygotsky's studies on scientific and spontaneous concepts suggest that, in foreign language learning, few learned abilities can develop unless skills such as knowledge of precise meanings and a recognition of verbal relationships are learned as well.

Canale and Swain (1980) questioned the nature of grammatical competence and its relation to communicative competence. Grammatical competence is the degree to which the learner has mastered the linguistic code. This competence is prerequisite to the attainment of higher levels

of proficiency or communicative competence. Canale and Swain in 1980 proposed a model of communicative competence with four major components: (1) Grammatical competence; (2) Sociolinguistic competence; (3) Discourse competence; and (4) Strategic competence (Omaggio, 1987).

Sociolinguistic competence requires students to recognize the appropriateness of their communication. The degree to which a student is able to combine ideas to achieve cohesion in form and coherence in thought is discourse competence. The last, strategic competence, which requires students to manipulate limited language skills, decreases in importance as the language user's proficiency increases. This component teaches communication strategies to compensate for areas of weakness. Canale and Swain asserted that foreign language instruction which included these four components will lead to a high level of language proficiency.

In the development of communicative competence, foreign language students use what they learn of the linguistic code. They also initially use appropriate memorized communication to generate meaningful utterances. Then, as students practice and repeatedly apply such learning to their communication, it becomes more automatic and subconscious. Omaggio (1987) advocates the development of linguistic competence in the foreign language to promote continued language development among students. She concludes that, without structured language learning based on the linguistic code, and without the use of linguistic code material in a communicative setting, students will not rise above the lowest levels of language competence. Thus, the impact of

foreign language learning on students' learned abilities may depend on how the course was taught.

The literature reviewed in this section indicated that foreign language instruction may promote the development of general learned abilities. However, such development may be dependent upon the type of instruction used.

Impact of Foreign Language Study on Learned Abilities

Foreign language study broadens opportunities, changes one's view of the world, and develops an understanding of the functions of language. William Riley Parker writes that learning a foreign language is a "liberalizing experience because . . . it teaches the limitations which speech patterns of any single language impose upon individual thinking processes or even upon national attitudes and assumptions" (Alatis, 1976, p. 452). Students learn that encoding and categorizing will differ from one language to another, resulting in certain effects of behavior (Alatis, 1976) which develop alternate thought processes (Gurney, 1979).

More specifically, foreign language study is mental discipline. It requires daily preparation and regular active classroom involvement. This practice helps to develop memory, observation skills, powers of analysis and synthesis as well as logical reasoning (Bugos, 1980). Students learn to analyze their own methods of communication in their native language by comparing them to and contrasting them with those of a second language. This ability to compare and contrast languages results in a greater sensitivity to the structure, vocabulary, and syntax of

their native language (Herron, 1980). Second language learning demands precision not unlike the precision of mathematics. Once students begin to see how words and patterns change, they bring this precision to their own language, using it with more care and a greater degree of clarity (Cheney, 1988). Students learn this precision through analyzing sentence patterns, discriminating among word translations, identifying, categorizing word families and clusters of similar structure patterns, and reconstructing these patterns to express their own needs. These are also skills directly related to critical thinking (Jarvis, 1980) and learned abilities.

Much foreign language research reflects observations, experiences, and feelings of foreign language educators rather than the use of the scientific process. For this reason, there is limited documented evidence of the impact of foreign language study at the college level (Eddy, 1981). Areas most frequently studied are the FLES (Foreign Language in the Elementary School) programs, the bilingual programs, and high school instruction. The difference in the age ranges and the maturity levels in these studies, as well as the different educational setting, limit the value of that research to higher education. Nevertheless, they do provide insights and evidence which suggest potential relationships between foreign language study and learned abilities.

There are several studies which concentrate on the high school foreign language study and academic performance at the college level. In a 1957 article, Skelton describes research conducted at Alabama

Polytechnic Institute to determine the effects of previous foreign language study on freshman performance. A group of 1,647 students was first divided into two groups, foreign language (FL) and non-foreign language (NFL). There were 694 students in the FL group and 953 in the NFL. Each group took a series of six tests which included mechanics of expression, effectiveness of expression, reading comprehension, American history, math, and a psychological examination. Although the NFL group had an average of one semester more math and more history, the FL students scored significantly above NFL on all tests.

Wiley (1984-85) compared high school foreign language study and college academic performance. From a population of 44,000 students representing all nine state public higher education institutions in Tennessee, the researcher randomly selected 2,244 students (a 5% sample) from each institution. The sample comprised non-transfer junior and senior full-time students enrolled in 1983 Spring and Summer sessions. Wiley limited the study to non-transfer students so as to insure a comparable cumulative grade point average at each institution. All data were analyzed according to the following:

1. Students were grouped homogeneously according to high school GPA and ACT raw scores.
2. Students were divided into those with and without high school foreign language.
3. Students were grouped by specific high school language groups-- French (N=504), German (N=61), Latin (N=306), Spanish (N=810).
4. ACT composite raw scores were determined for each group.

5. ACT English subtest raw scores were determined for each group.

6. College major or affiliation were determined for each group.

Other variables analyzed included:

7. Institution.

8. Gender.

9. Ethnicity.

Wiley compared students with similar high school GPAs who took a foreign language in high school and those who did not. He found that those with a foreign language background had a cumulative college GPA of approximately 2.80 compared with a 2.58 average for those students with no foreign language. Similar findings resulted when the ACT scores of the foreign language group were compared with those of the non-foreign language group. The control group (those students who had studied no high school foreign language) again showed an overall college GPA of 2.58 with a 2.79 in the foreign language group. Wiley's research suggested that there is a relationship between foreign language study in high school and overall college GPA.

Timpe (1979) studied the effect of high school foreign language study on scores of college entrance examinations. At Southern Illinois University, Carbondale, he selected a group of 7,460 students by their responses concerning the number of half years of foreign language study on the ACT Student Profile Section. Timpe found a positive correlation between foreign language study and college entrance exam (ACT) scores. The groups were further divided into "college prep" students and those considered to be less academically inclined, that is a GPA of 2.9 or

lower. Though both FL groups did better than NFL, the lower academic FL group showed the greatest growth. The difference in gains between high and low ability groups may be an artifact of the ACT test, however, rather than of foreign language study. That is, at a certain point (or score), the test may not effectively differentiate among high ability students. For either of these reasons, lower ability students could show greater gains. NFL students in this group had an ACT composite score of 16.4, whereas the FL student with four years' study averaged 19.9. There was a difference in ACT scores in all item-types--English, math, social science, and natural science. Four-year FL students scored between two and four points above comparable students without FL study. Even though Timpe's study indicated that the more academically gifted tend to take a foreign language, he did not conclude that the ACT results reflected this giftedness.

Skelton (1957) divided a FL group and a NFL group into 10 subgroups according to their intelligence level. The purpose of the study was to determine whether FL learners are more intelligent from the outset. Students were given the Psychological Examinations, which include measures of basic intelligence (problem solving, figure analogies, and number series) and yield a "Q" score. The study included 953 freshmen at Alabama Polytechnic Institute who had no previous foreign language study and 546 who had studied a foreign language for one semester or more. In addition to the psychological test, students also were given a battery of tests on mechanics of expression, effectiveness of expression, reading comprehension, American history, and mathematics. Comparison of the two

groups by intelligence level (that is, 10 groups on six tests) revealed only one time where the NFL exceeded the FL group on the mathematics exam. Shelton attributed the results of this group to an unusual distribution of students. His conclusion was that intelligence alone did not account for the super achievement of the FL group scores.

Jarvis (1980) argued that language students and non-language students are not comparable because students who elect to study foreign languages are a self-selected population. Jarvis assumed that motivation rather than curricular requirements is the reason for students to study foreign language. However, Skelton's research (1957) did not find that the aims and goals of the FL students were significantly different from those of NFL students. Through an examination of homogeneous groups in regard to aims and ideals, FL students continued to outrank the NFL in academic achievement. The Wirtz Commission, the College Board advisory panel on the SAT test score decline, found 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 effect on SAT-Verbal score" (Eddy, 1981, pp. 24-25). At this point, the results of the studies and the relationship between general learned abilities and foreign language study are inconclusive. There is a relationship, but the cause of that relationship is not fully known.

Research on bilingualism and bilingual programs has limited relationship to the present study since the language learning conditions of bilinguals are very different. There is a significant difference

between learning a language in a communicative setting (in the street, family, or immersion program) and learning in the traditional foreign language classroom. The academic environment emphasizes vocabulary and sentence structure (Eddy, 1978). A skillful bilingualist, whose languages are acquired independently, "may not . . . be able to give a ready translation" (Skinner, 1957, p. 78) lacking knowledge of intra-verbal connections between the languages. There is very little similarity between the environment of learning a foreign language in a communicative setting and that of learning it in a traditional classroom setting. The data for this study were taken from students who have studied foreign language in the classroom.

Studies in bilingualism, however, do provide guidance on determining the significance of the beginning point of linguistic competence for cognitive growth, according to the Montreal French-English study (Eddy, 1981). This beginning point is known as language threshold. Bilinguals who have reached a similar degree of competence in both languages do better on the measures of non-verbal intelligence and of verbal intelligence. Cummins developed what he called "the threshold hypothesis," which suggests that the cognitive and academic effects of bilingualism are mediated by the relative levels of competence reached in the first and second language (Eddy, 1981). This may also be measured by the effect of the length of time in foreign language study on learned abilities. That is, students who study a foreign language for several years find their verbal ability in the foreign language assuming a fluency level more closely related to that of the first language, thus

increasing cognitive advantage through transfer between the two languages.

The essence of foreign language learning encompasses verbal skills and, for that reason, it has been long assumed that the greatest impact of foreign language study is on verbal abilities. The Wirtz Commission (Eddy, 1981), in their report to the College Entrance Examination Board, noted a "clear parallel . . . between students' SAT-Verbal scores and the number of foreign language courses they have taken in high school" (p. 24). Between 1960 and 1980, there had been sharp decreases in the number of students taking a foreign language. There also had been sharp increases in the numbers taking college remedial English. These two statistics could be considered as unrelated had it not been for Skelton's (1957) research finding that found 40.6% of the NFL group assigned to remedial English as compared to 16.8% of the FL and 14.6% of the students with two years or better of foreign language study. From this finding, along with those previously discussed, Skelton (1957) concluded 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" (p. 205).

In a more recent study, Cooper (1987) also examined the question on the effect of foreign language study on the SAT-Verbal exam. The population sample of 1,778 students was drawn from 23 metropolitan high schools in the Southeast. The researcher divided the sample into two groups--foreign language students and non-foreign language students. All students had taken both the California Achievement Tests (CAT) and the

SAT. The group means were adjusted for initial differences between groups using the CAT reading scores as the relevant covariate. It was then possible to compare group means on the SAT-Verbal. Differences were significant at the $p < .0001$ level, showing that the foreign language group evinced greater achievement, even though the initial point spread between groups was narrowed by the CAT covariate.

Table 1. SAT-Verbal means of the FL group, the non-FL group and analysis of covariance (Cooper, 1987)

Group	CAT covariate means	Unadjusted SAT-V means	Adjusted SAT-V means
Non-FL (N=445)	58.7	364.1	396.8
FL (N=1,333)	68.1	423.1	412.2

Source	df	MS	F	Sig. of F
CAT	1	12576921.66	3279.63	.0001
Group	1	74926.08	19.54	.0001
Error	1775	3834.86		

According to Weatherford (1986), foreign language courses which emphasize skill development often build students' written and oral communicative abilities. Knowing a single language limits the range of verbal perceptiveness, whereas the learning of a second language develops intra-linguistic (or language) transfer and extra-linguistic (or

contextual) relativity (Cauvin, 1984). Vygotsky (1962) concluded that foreign language study facilitated the mastery of the higher forms of one's native language. He found that approaching language from the organized study or scientific process as done in foreign language learning improved the understanding of grammar, vocabulary, and composition in the native language. Learning a language through acquisition does not allow for the conscious development and refinement of language skills.

The transfer of learned abilities from one foreign language to another (Boyd, 1977) has been assumed among foreign language teachers. However, Boyd's longitudinal study (1977) found improved word association and verbal memory in English among students taking foreign language. Students from two Sydney, Australia, high schools first took a series of tests on verbal memory, word association, and vocabulary in the year 7 classes and again in the year 10 classes. Those who studied a foreign language during the four-year period demonstrated an adjusted mean higher in all cases; however, regression coefficient was only significant on vocabulary items. No effort was made to examine the kind of instruction students received in foreign language. However, it is likely that instructors used common vocabulary learning strategies, such as learning words in context, using contextual clues, and developing a sensitivity for nuances with their students (Cooper, 1987).

Among the learned abilities measured by both the SAT and the GRE is reading comprehension. A variety of the skills associated with learning a foreign language are used to improve reading comprehension as well.

One of these skills, the willingness to hypothesize or infer meaning, is fundamental to both second language learning and to reading comprehension (Jarvis, 1980). The latter, reading comprehension, requires a much larger vocabulary than the native speaker uses in casual conversation (approximately 2240 words). Students can gain only about 5000 words through direct instruction, such as vocabulary lists and exercises. This size of vocabulary is too limited for success in reading comprehension. For this reason, the inference technique, which is making sensible guesses about unfamiliar words, should be employed for vocabulary growth (Hughes, 1986). Two elements of inferencing are often practiced in foreign language classrooms. The first element asks the reader to limit meaning by the topic. This is called overall context clues. The second limits meaning through knowledge of grammar. Hughes refers to this practice as grammatical-constituents. Both increase vocabulary and are equally useful in the development of first language reading comprehension. Carton (1971) writes that inferencing "removes language study from the domain of mere skills to a domain more closely akin to the regions of complex intellectual processes" (p. 57) . Through making inferences, students learn a kind of problem-solving that requires them to synthesize their experience and knowledge in order to process language. However, according to a study made by Al-Rufai (1976), inferencing must be taught and practiced as a part of the foreign language pedagogy in order for it to be effective.

Al-Rufai studied the transfer of reading skills from one language to another. He compared the results of first- and fourth-year reading tests

for 30 fourth-year Arabic university students. He found little significant growth. Students were then instructed in the improvement of their reading comprehension skills in the foreign language (English). The instruction was designed specifically to improve their ability to identify and understand implied meaning. From time to time, students took comprehension tests in the foreign language and showed improvements each time. After two terms of practice, the students' reading comprehension was noticeably improved in both languages. The difference between the mean scores of the Arabic and English tests taken were not significant; however, the differences between the latest mean scores and the earlier ones in each language were highly significant. Al-Rufai (1976) concluded that inferential and critical reading can be developed and improved through training.

In a study of junior high students, Carton (Hancock, 1977) reached similar conclusions concerning inferencing. He found that, while many students have some inferencing skills, continued emphasis and practice in the skill improves the learner's abilities in reading comprehension and problem solving. Hancock suggested the lack of this ability may be a factor in declining SAT scores and recommended that further study of the relationship is warranted. He identified the development of inferencing skills in foreign language study as contributing to the cognitive development of the learner.

In 1983, Westmar College undertook an experimental program to determine reading skills of underprepared students (Semke, 1983). A randomly selected group of 20 students, all reading below the 9th grade

level, were offered a beginning German course instead of remedial reading. The 9 FL students received no training in reading, while the other 11 of the 20 were given intensive instruction in reading. The teaching method used in the German classroom was the Lozanov or Suggestopedia method; that is, the material is presented in a nonthreatening atmosphere with soft lights, baroque music, and comfortable seating. All of these features are aimed at helping students and developing their skills of concentration. Though this method does not emphasize inferencing directly, it does call on the development of memory cues. At the semester's end, both groups had raised their scores by one year, but the German students had a better attendance pattern; that is, fewer dropped out of college. This finding was also apparent in Skelton's study (1957): 15.2% of the NFL group dropped before the end of the Spring Quarter, whereas only 11% of the 2+FL left school.

According to Skinner (1957), there is some danger that different orthographic systems may cause students spelling difficulties. That is, a student may alternate spellings of words between languages using double letters in place of single letters and confusing relationships between sounds and specific letters. However, students clearly benefit from learning to make grammatical and semantic distinctions (Lide, 1983). Many orthographic systems do not transfer from one system to another. Under such circumstances, students must learn a new system for the foreign language which does not relate to the students' native language orthographic system. However, grammar and sentence structure, that is the linguistic features, is often similar among languages. Thus,

students may learn the grammar of their native language, which is an acquired language, through the study of a foreign language, a learned language.

The majority of the research for foreign language study examines its impact on the native language. There are very few studies which examine the effect of foreign language study on general quantitative abilities. However, there are some indications that FL students have better quantitative abilities than NFL. Skelton's (1957) research found 38.1% of the NFL students in the sample assigned to remedial math, whereas only 27.6% of the FL group and 26.9% of the 2+FL group were similarly placed. In Profiles, College-Bound Seniors, Ramist and Arbeiter (1984) reported that the average SAT-Math score of non-FL students was 409, whereas students with one year of FL study averaged 416 on the same test. The SAT-Math scores increased with each subsequent year of FL study. The median score of students with two years of FL study was 463, and the fifth year of FL study students scored 535. The 5+FL group represents a small number of students whose score might be influenced by other factors. However, the 2+FL group showed the most dramatic change (Ramist & Arbeiter, 1984) in math scores. This group was analogous to the overall student population studied. The research of Skelton (1957), which subdivided the groups by I.Q., as well as Timpe's (1979) study on ACT scores support the findings of Ramist and Arbeiter. These studies indicate foreign language study is associated with enhanced quantitative abilities including problem solving, logic, classification, and comparison (Herron, 1982).

Powers and Enright (1987) examined the analytical reasoning skills needed for graduate study. They asked 90 faculty members in 30 graduate institutions open-ended questions on the reasoning skills needed for graduate study. From these replies, the researchers developed a questionnaire which was then sent to 225 graduate faculty members in six academic fields (chemistry, computer science, education, engineering, English, and psychology) at 42 institutions. Using factor analysis, the following skills were identified as critical for graduate study:

- ranking number 1, problem solving in which all the needed information is not known,
- detecting fallacies and logical contradictions in arguments,
- deciding new information from a set of relationships,
- recognizing structural similarities between one type of problem and another.

The replies to the questionnaire cited two primary skill deficiencies:

- accepting the central assumption to an argument without questioning it,
- being unable to synthesize and integrate ideas from various sources.

The findings of this research led Powers and Enright to question whether the range of the GRE questions in analytical and logical reasoning served to identify student strengths in these areas.

Problem solving is also noted in the literature as a skill which is necessary to foreign language learning (Herron, 1982). Students' success in learning the foreign language depends on their ability to use problem

solving techniques. This ability is strengthened through practice. Few subjects offer as much practice as foreign language study. As early as the first foreign language class, students find themselves in a maze of unknown words, structures, and cultural patterns. In order to find meaning to the language, they are required to infer, analyze and synthesize, all techniques of problem solving.

From examining the preceding literature on the effects of foreign language study on learned abilities, two areas of impact are apparent. The first area is content or the language itself. Vocabulary and grammar learned in the foreign language may aid in recognizing an unknown word or usage in the native language. However, in the first years of study, the value of language content to the learned abilities may not be as great as the value of the development of a set of skills needed to learn the language. This second area, referred to as skill development, is a basis for success in learning a foreign language. Students who do not learn the techniques of inferencing, analyzing, and synthesizing will not be able to use the language.

These same skills which are necessary in learning to use a language can improve students' problem solving ability on the GRE General Test. As the GRE General Test is not based on knowledge of specialized content, the students' scores reflect their facility with verbal, quantitative, and analytical abilities. The practice in inferencing, analyzing, and synthesizing required in the foreign language classroom may aid in developing this facility.

Foreign language study broadens opportunities, changes one's view of

the world, and develops an understanding of the functions of language. Students learn how differences of encoding and categorizing in languages affects behavior. They also learn that foreign language study is a mental discipline which requires their daily preparation and active involvement. Though studies have been done at the elementary and high school levels, there is limited documented evidence of the impact of foreign language study at the college level. Those studies which compared high school foreign language study and college academic performance showed that foreign language students scored significantly above non-foreign language students on their overall college GPA and their Freshman English course. The vocabulary developed, the knowledge of grammar required, and the problem-solving skills practiced in foreign language study are shown to improve students' verbal abilities. There is evidence to suggest that the problem solving techniques of inferencing, analyzing, and synthesizing also affect the students' quantitative and analytical abilities.

The Extent of Foreign Language Study Increases Competency in Learned Abilities

According to the studies reviewed, studying a foreign language does improve a student's general learned abilities. Researchers also sought to determine the effect of length of foreign language study on these abilities. The results of their studies indicate that the longer students study a foreign language, the greater their growth in general learned abilities.

Lide (1983) observed that the drop in verbal SAT in 1975 and 1976

correlated with the elimination of the college foreign language as a college entrance requirement. This observation can be examined in the light of length of foreign language study. Research indicates that the SAT scores rose progressively according to the number of foreign language courses taken. The 1981 SAT (SAT, 1983) verbal and math scores were correlated with the study of specific subjects including foreign language. The results of the foreign language profile are found in Table 2. The highest percentage of students studied foreign languages for two years.

Table 2. Distribution of the 1981 SAT-takers according to length of foreign language study

Percentages	Length of FL study
13.0	No FL
13.4	1 year
35.4	2 years
20.2	3 years
13.5	4 years
3.8	5 years

The effect of foreign language study on the SAT scores was most significant at the 2 year level. Students who had taken 2 years of foreign language courses showed a 14% increase in verbal mean scores and a 13% increase in math mean scores over those who had taken no foreign language. Table 3 shows the mean SAT scores in relation to the length of foreign language study (Profiles, 1981). By the fourth year of FL study,

Table 3. 1981 SAT scores in relation to the length of foreign language study

Length of FL study	SAT-Verbal	SAT-Math
0	366	409
1	378	416
2	417	463
3	450	496
4	479	516
5	504	535

students scored an average 100 points or more higher in both tests than those with no foreign language (Profiles, 1981).

Researchers for the Admission Testing Program of the College Board compared the mean scores of those studying a foreign language for four or more years to those with a similar length of study in any other subject. They found that seniors achieved higher verbal and math SAT scores the longer they had studied English, math, physical science, social science, and foreign language. However, the FL students had a higher mean SAT-Verbal than those who had taken 4-5 years of any other subject. They also reported that on both the verbal and the math portions of the test, the mean SAT scores of students who had studied foreign language or a physical science for 3 or more years were higher than the mean scores of the total population tested.

Studies which examine the length of study in a foreign language are usually limited to analysis of the effect of one foreign language. Generally, those colleges requiring foreign language study want the

obligation satisfied in one language. The assumption is that a year of French and a year of German do not have the same effect as two years of French. However, in a 1981 study, Eddy examined a variety of variables attempting to find which had the most effect on verbal ability as measured by the SAT-Verbal. Among the variables he constructed was one which would examine the question of same language versus two or more languages. He used a sample of 440 members of the 1980 graduating class from three Montgomery County Public High Schools. Eddy first determined the academic ability, ethnic composition and gender of the students. He found that the group foreign language was substantially higher in academic achievement than the population of Montgomery County Public Schools. Ethnic minorities were under-represented in the foreign language sample, and the sample was evenly split among the genders. They omitted from the sample those students who had other language environments--non-English schooling, residence abroad, and home experience apart from that of the foreign language classroom.

First level independent variables were those coming directly from the data collection instrument: included gender, ethnicity, and experience in elementary school foreign language study. From this information, they constructed second-level independent variables based on data taken from the collection instrument. These variables included GPA for all academic areas, the total time spent in the study of that area, and a group of language-related variables. Those language-related variables used in the final regression analysis included:

LVLTOT--was the sum of the highest level of language study attained

(HIGHLVL) and the next highest level of language study attained (NXTLUV) which provides a measure of total experience in foreign language study. This proved to be the most powerful language-related variable in the preliminary regression analysis.

JRHLANG--divides the group by foreign language experience in junior high.

FLGPA--was the foreign language grade point average.

NUMLANG--was the number of foreign languages studied.

TOTENGCU--meant the total English Carnegie units.

TOTGPA--was the total grade point average.

ENGGPA--was the English grade point average.

Eddy used the stepwise multiple regression analysis of predictors for the SAT-Verbal. Performance on two tests, Iowa Test of Basic Skills vocabulary and the Cognitive Ability Test Verbal, accounted for 62% of the variance. The third variable chosen by the analysis routine was LVLTOT, accounting for 4.3% of the variance. It was chosen before TOTGPA and TOTENGCU, which are supposedly stronger predictors of the SAT-Verbal (Eddy, 1981).

Eddy then analyzed the results of the predictor variables for the SAT-Reading. The ITBS-Reading subtest and the CAT Verbal accounted for 56.7% of the variance. Again, LVLTOT was chosen as the third most powerful predictor with 3.5% of the variance. It was chosen before the ITBS-Vocabulary, TOTGPA, TOTENGCU and ENGGPA.

Eddy found the most important predictor for the SAT-Vocabulary was ITBS vocabulary, but LVLTOT was a more powerful predictor for this

subtest than for any of the other SAT criterion variables; it accounted for 7.5% of the variance.

After doing similar analysis of predictors on other standardized tests, Eddy made the following observations:

- Students who study foreign languages 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 less foreign language.
- The study of two foreign languages has no differential effect on SAT scores. That is, the number of foreign languages studied is not the significant factor; rather, it is the length of study.
- The language studied has no differential effect on SAT scores.
- Higher grades in foreign language study may increase the effect of this study on SAT scores (particularly the Reading and Vocabulary sub-scores) (Eddy, 1981, p. 89).

These results support the findings previously described in this section. There does seem to be a positive correlation between the length of high school foreign language study and the score on the SAT-Verbal. However, no comparable research was identified to suggest a relationship between length of college foreign language study and performance measures such as the GRE.

Foreign Language Studied Affects Learned Abilities

Though Eddy's research (1981) concluded that the language studied has no differential effect on the SAT scores, several other studies have found there is a difference in the impact on learned abilities according to the particular language studied. Foreign language educators have

often assumed that Latin is the language which has the most effect on English. In testing the hypothesis that the language studied has a differential effect on the SAT scores, Eddy indicated that the coding of LANGTOT (total languages studied) reflects "the investigators' intuition about the effect of various languages on the dependent variables (SAT verbal test, etc.)" (p. 52). Eddy and his associates value coded each language according to the effect it was thought to have on English. They hypothesized that the study of Latin would have the most impact on the SAT-Verbal, and they assigned Latin the highest value when testing LANGTOT.

Historically, Latin has been touted as the language having the most impact on English verbal skills (Lide, 1983). Much of the support for this motion was intuitive or anecdotal. Novelist John Updike, for example, lamented the decline in writing skills and attributed it to the lack of knowledge of Latin. He wrote, "In some curious way, the study of this dead and intricate language enabled writers to write a beautiful clear idiomatic English" (Weatherford, 1986, p. 4). Masciantonio (1977), in an article on the benefits of Latin, clearly identifies its importance to English, stating that "the linguistic relevance of Latin stems from the fact that the English vocabulary that pupils hear, speak, read, and write is derived from Latin" (p. 375). Wall Street Journal reporter Royster writes that "while the nation's mean verbal scores on the SAT had been dropping, the scores of students who had studied Latin went up 23 points" (Herron, 1980, p. 57).

During the late 1960s and early 1970s, a number of elementary

schools required instruction in Latin for their students (Mavrogenes, 1977). These programs generally consisted of 15-30 minutes daily instruction in Latin for middle and upper elementary school students. Most of the programs stressed Latin vocabulary or Latin derivations found in English. Students involved in the study of Latin performed better on the Iowa Test of Basic Skills, the Stanford Achievement Test and the Metropolitan Achievement Test than those with no foreign language background (Mavrogenes, 1977; Eddy, 1978, 1981). These results do not answer the question of the degree to which one foreign language affects learned abilities over another since the effect of other languages on students was not compared.

Another study of a Washington D.C. program compared students from three public elementary school groups. Students who had one year of Latin increased 1.49 years in reading on the Comprehensive Tests of Basic Skills, whereas growth of those with four years of French or Spanish increased only 1.36. The NFL group showed an increase of 1.02 in reading growth. Given the difference in number of years of study among students in the different language groups, the results are even more significant. However, this study did not account for either the differences in instruction nor the ability level of each group.

Wiley (1984-85) examined the effect of high school foreign language study on college academic performance. She grouped the students first by high school foreign language GPA and by ACT composite raw scores. The researcher then compared high school foreign language study and overall college GPA using first the high school FL GPA and then the ACT

composite. In both cases, Latin proved to have the greatest effect with a 2.89 mean and a level of significance in the .001-.05 range. French followed (2.81, 2.78), then German (2.77) and Spanish (2.73, 2.76). Those with no high school foreign language averaged 2.58. Wiley concluded that the study of Latin in high school had the greatest effect of any language on college academic performance.

Wiley also found that Latin had the strongest effect among language groups on the overall college English GPA. There were, however, some differences among languages as to the strength of their effect when the analysis was conducted using high school FL GPA homogeneous groups or homogeneous ACT composite raw score groups. In assessing homogeneous high school GPA groups, the data showed that following Latin (2.75), German had the most impact (2.62), then French and Spanish (both 2.60). When this same comparison was done using groups with similar ACT raw scores, again the results indicated that Latin was the most influential foreign language in its effect on cumulative freshman English GPAs (2.69). German and Spanish followed with 2.62, and finally French with 2.56. Using this set of variables, there was a slight change in the effect of Spanish and French. The impact of both Latin and German on the overall English GPA reflected the transfer of derivative root words, prefixes and suffixes between languages.

Cooper (1987) studied the effect of language study on SAT scores addressed. He examined the differential effects of the language studied on SAT-Verbal scores. The study replicated Eddy's. However, Cooper noted that when languages were compared, a significant F-ratio was found

among the groups. According to a post-hoc Scheffé test, means between the Spanish, the Latin, the French and the German students were significantly different at the .05 level of confidence. German ranked the highest, followed by French, Latin, and Spanish. While Eddy's study had not found the kind of foreign language studied to be significant, Wiley's study showed Latin to have the strongest effect, with German second. Instead of providing further evidence for either of those studies, Cooper concluded that the study of German had the most impact on the SAT-Verbal and called for further study of the question. Cooper, concerning the reasons for these results, wrote, "The finding that German students scored the highest of all language groups is surprising. Classic teachers have long been very persuasive about the linguistic benefits of Latin study. Perhaps the superior showing of students of German is due to the fact that this language attracts more serious students than other languages do" (Cooper, 1987, p. 387).

Research indicates that the SAT scores rose progressively according to the number of foreign language courses taken. The effect of foreign language study on the SAT scores was most significant at the 2-year level. However, College Board researchers found that seniors who studied four or more years of English, math, physical science, social science, and foreign language achieved higher verbal and math SAT scores. The foreign language students, though, had a higher mean SAT-Verbal than those who had taken 4-5 years of any other subject. Eddy (1981) in attempting to determine if there were benefits in studying two languages over one language determined that the number of languages taken was not

significant; rather, it was the length of foreign language study which proved significant. Eddy's conclusions would support the hypothesis that one year each of French and German produces the same increase in learned abilities as two years of French. Therefore, the length of foreign language study, not the level, influences the SAT/ACT scores.

The Timing of a Student's First Foreign Language Study in College
May Affect the Student's General Learned Abilities

Foreign language researchers have not examined the effect of when a student first enters in a foreign language course on general learned abilities. In college, a student may elect to enter foreign language study as a freshman, sophomore, junior, or senior. The broader, more general topic of the stages of student development has been left to the area of student development theorists. Theorists such as Arthur Chickering, Jean Piaget, and Lawrence Kohlberg have established that there are wide ranges of maturity and intellectual levels among college students (Delworth, Hanson et al., 1984). However, each of these theorists seems to approach student development from different aspects of growth, thus creating numerous models and theories to explain these aspects. Chickering uses a group of seven vectors or stages. Vector 4, Establishing Identity, is the focal point of all the others. The first vector, Developing Competence, is the basis for a student's academic success in college. It includes intellectual skills, physical and manual skills, and social and interpersonal skills. A sense of competence is defined as "the confidence one has in his ability to cope with what comes and to achieve successfully what he sets out to do" (Chickering, 1969, p.

9). Students in their first year of college often have concerns with competence and lack the ability to cope with the new intellectual skills required.

Cognitive development theorists believe that "development is a progression through an invariant sequence of hierarchical stages with each stage representing a qualitatively different way of thinking" (Delworth, Hanson, 1984, p. 91). For them, development is a product of interaction between the person and the environment. They also note the importance of the student's intellectual and emotional readiness for a particular environment. The role of a learning environment is to create a certain amount of dissonance which the individual cannot handle with the existing cognitive structure. Thus, he/she is pushed to open up to new complexities of the thought process. If the environment proves to be too dissonant for the student's cognitive development, the growth in the area of learned abilities is limited.

According to the theory of Piaget, development moves at an irregular rate from one stage to another higher one. It depends on readiness and a change in the reasoning mode or intellectual understanding which must be able to adjust to that of the next higher level. According to Kohlberg (Delworth, Hanson, 1984), it is important not to introduce reasoning at more than one level above that understood by the student. The identification of an attitude or state of mind needed for growth is also important. The developmental process requires that students learn to shift focus from self to the larger world (Delworth, Hanson, 1984).

No literature was identified which would suggest that the time or

year which a student entered foreign language study in college effects his/her general learned abilities. However, the student development theories indicate that how well students fit the educational environment at a particular time in their development influences their ability to learn. Therefore, if students' cognitive development increases with the length of time in college, students who first study a foreign language as juniors could be expected to gain more than those who began foreign language study as a freshman. Students who had shifted from the narrow scope of self to the broader one of the larger world should be able to understand whole language concepts and to transfer them to use in their native language. The agility with which these skills are used should translate to gains in general learned abilities.

Summary of Observations

During the 1980s, there was public concern in the United States focused on quality and accountability in education. National studies, books on the best seller lists, and articles in both popular and professional periodicals lamented about the state of education. Business and industry discovered the lack of basic skills among recent high school graduates. New technologies and competition in the global market made it increasingly more important to have a populace educated in verbal, quantitative and analytical skills.

Education in the United States had changed from the late 1950s until the 1980s. Academic requirements for entrance into college as well as those for the degree were reduced. This was brought about, in part, by

the changing college population. These new groups of students, veterans, women, and minorities, demanded relevancy in the course offerings. In answer to these demands, colleges and universities became less directive in their general education curriculum. During this same period of time, scores on the SAT tests continued to decline.

Troubled by the decline in students' general learned abilities (that is, verbal, quantitative, and analytical abilities), researchers began to examine reasons for this decline. They found in examining student transcripts that general education course patterns of students varied from the general education patterns as prescribed by the catalog. They also found breadth and depth of general education among students to be lacking. Researchers examined student SAT scores and the reasons for their decline over the past decades. They found that more and more students who had not taken college preparatory courses were now enrolling in college. Fewer of these students were in the top quadrant of their class and their academic preparation did not include as much English, math, science, and foreign language as those students in the college preparatory track. Research indicates that the decline in verbal, quantitative, and analytical abilities is related to students' course taking patterns. The general education courses taken often lack breadth and depth.

Foreign language educators have long believed that the study of a foreign language directly affects students' understanding of their native language. While there is much anecdotal evidence to support this theory, quantitative research is more limited, especially at the post-secondary

level.

According to the studies examined in this chapter, foreign language study in high school does influence verbal abilities in one's own language as measured by the precollege SAT or ACT tests. This influence is strongest after two years of foreign language study. The inferencing techniques used to learn new vocabulary and meaning in foreign languages are important in learning to make calculated guesses. Reading comprehension as well as understanding words in context can be enhanced by a knowledge of this technique. The technique known as inferencing or making calculated guesses, valuable in learning a foreign language, also aids in the development of verbal abilities as measured by the SAT or the ACT.

The study of grammar in the foreign language is necessary to learning the language. On the other hand, the native language is an acquired skill. There is no conscious effort to learn or understand the grammar and structure of the native language when one is acquiring it. However, grammar and structure are important in refining and developing one's native language.

There are several studies which indicated that foreign language study also helps develop quantitative and analytical abilities. Researchers found fewer foreign language students in remedial math courses. They also evidenced improvement in math scores at the elementary school level after students had studied Latin. Analytical reasoning was identified as the most important ability needed for graduate study. Four skills valued in foreign language learning are

problem solving, logical reasoning, classifying, and divergent thinking. These are the same skills used in analytical reasoning. Though these studies are not conclusive, they do suggest that foreign language study may improve quantitative and analytical abilities.

According to the literature, the greater number of foreign language courses studied, the greater the competency in learned abilities. Researchers concluded that four years of foreign language study had the greatest effect on the SAT-verbal scores; that is, its effect was greater than four years of study in any other subject including English.

The evidence on which foreign language studied most affects scores on the SAT or ACT was inconclusive. Some studies pointed to Latin as having the greatest impact, whereas other researchers found German to be stronger than Latin. Yet, others found no significant difference.

No studies have been made on the effects of the timing of a student's first foreign language study on his/her GRE score. However, student development literature suggests that student maturation and success in a course are related.

The literature tends to support the need to investigate the research questions as stated in Chapter I (p. 14). Nevertheless, empirical research on the effect of foreign language study on learned abilities at the postsecondary level is limited. No research could be found on the effect of foreign language study on the GRE. For this reason, this study will be considered experimental in nature. The design and methodology for the present study will be described in the next chapter.

CHAPTER III. METHODOLOGY

The purpose of this study is to examine the influence of foreign language study at the college level on the verbal, quantitative, and analytical skills as measured by the Graduate Record Examination (GRE). Also included in this study is an examination as to the effects of the number of foreign language courses taken, the particular language studied, and the entry point of first foreign language study. This chapter explains the procedures utilized to examine these data. The chapter is divided into the following subsections: design of study, sources of data, treatment of the data, and summary.

Design of the Study

This exploratory study examines the performance of foreign language students and non-foreign language students on the Graduate Record General Examination. In order to determine the gain in verbal, quantitative, and analytical skills resulting from the college years, the study will use the SAT to assess pre-college learning and the GRE to assess undergraduate student learning. This, in effect, results in a pretest/posttest program of assessment. The difference between the observed GRE scores and the GRE scores predicted by the students' corresponding SAT scores is the student's residual score, which is the unexplained variance in the GRE performance attributable to the unexplained variance due to the college years. The residual scores are used as the measures of increase in a student's general learned abilities during the college years.

The purpose of study is to determine the extent to which there is a difference in verbal, quantitative, and analytical skills between students who study a foreign language and those who do not. The review of literature found that foreign language study did affect significantly the scores on the SAT-verbal and the SAT-math. Similar results held true with the ACT test. Studies done on elementary school children taking foreign languages reinforced these findings and also indicated improvements made in quantitative skills.

According to studies made by Eddy (1981), Skelton (1957), and Timpe (1979), students who study foreign language for a longer period of time will do better on the SAT/ACT tests than students who have studied less. Each year of study brought a further rise in scores. Those who studied a foreign language four or five years scored higher on the verbal portion than students who had studied any other subject for an equal length of time (Weatherford, 1986). This study seeks to determine if this finding holds true for college students. That is, students' residual scores increase in proportion to the number of foreign language credits studied. Students will be divided into groups according to the number of credits of foreign language studied. The variance on GRE residual scores will be examined to determine if the number of foreign language credits taken affects general learned abilities as tested by the GRE.

Historically, the study of Latin has been thought to have the greatest impact on a student's verbal skills. However, in the review of literature it became apparent that research is inconclusive in this area. Eddy (1981) found that the language studied had no differential effect on

the SAT. Cooper (1987) noted that the study of German had the advantage over the study of other languages on the SAT-verbal. This study will compare the differential impact of the languages studied on the residual scores of students. The students will be grouped by languages and the variance in GRE residual scores compared to determine if greater differences exist within groups than between groups.

This study will determine the nature and the extent to which the entry point in foreign language study affects the GRE scores. The students will be divided into groups according to the college year they began their study of foreign language. The residual scores for each group will be analyzed to determine if within group variances exceeds between group variance. Within the review of literature, there are no language specific studies covering this question. However, research among student development theorists suggests a strong relationship between student maturity and improved learning.

Sources of Data

Population

The population studied by this research consisted of courses taken in undergraduate education. The course work patterns which included foreign language study were compared to those which did not. Those course work patterns which included different foreign language courses and different entry points of first foreign language study were also compared.

Samples

The random samples studied by this research consisted of transcripts and test scores of graduating seniors who took their undergraduate work at: (1) a major private research university, (2) a doctoral-granting state university, (3) a private comprehensive college, and (4) a women's liberal arts college. The objects of analysis on the transcripts are the courses in foreign languages or the lack of those courses. Table 4 describes the two samples of students and their transcripts. For the purpose of this study, no differentiation was made between institutions or samples of students. That is, no attempt was made to identify students by institution or sample.

Table 4. Description of students in sample #1 and sample #2 and their transcripts

Samples		Stanford ^a	Georgia State	Ithaca	Mills
Number of graduating seniors	S#1	105	151	146	62
	S#2	---	120	192	44
Total number of courses on transcripts	S#1	5,541	2,097	6,249	2,607
	S#2	--	5,505	8,397	1,886
Date of GRE Testing	S#1	Feb. 1988	Feb. 1987	Feb. 1988	Feb. 1988
	S#2		Feb. 1988	Feb. 1989	Feb. 1989
Total number of usable data		% of students studying FL	Total number of FL studied		Total number of FL studied by 10 or more students
		49%	12		8

^aOnly one sample was available from Stanford at the time of this study.

Data Collection

The data were collected from the offices of the registrar at Georgia State University, Ithaca College, Mills College, and Stanford University. Transcripts, the college catalog and GRE general test scores were analyzed to determine the following information:

1. Number of students in each sample
2. Percent of graduating seniors
3. College calendar
4. SAT scores
5. Total number of courses taken
6. Foreign language taken
7. GRE sub-score and item-type scores
8. Point of entry for first foreign language study

The U.S. Department of Education Contract No. OERI-R-86-0016 entitled Development and Testing of a Cluster-Analytic Model for Identifying Coursework Patterns Associated with General Learned Abilities of College Students collected the data used in this study. In collecting the data, there was need for confidentiality, but for this study there was no further need as each student transcript and test score was identified only by a student project code number. The code book identifying students was not available to this researcher. Therefore, the use of code numbers and the unavailability of the code book prevented the researcher from identifying any specific student.

Treatment of the Data

The statistical analysis used to determine the nature and extent to which foreign language study impacts on learned abilities is the analysis of variance-one way (ANOVA). All four research questions of this study can be examined through use of this test at the .10 level of significance. This level of tolerance of error was selected as the study is exploratory in nature. The Scheffé method for making post hoc comparisons will be used.

Analysis of variance (ANOVA) is an inferential technique used to test for differences among the means of two or more groups (Jendrek, 1985, p. 162). The ANOVA technique compares to estimates of the population variance to determine the probability that the difference between them is due to a sampling error. One of these estimates is obtained by computing a sum of squares for each of the samples separately and then combining these in order to obtain one population variance estimate (Elzey, 1985, p. 144). This is called "within-groups" as it is obtained by estimating variances within the samples. The other estimate, "between groups," is computed by obtaining the mean score of each of the samples and then calculating a variance estimate using these mean scores and the size of the samples in the computation (Elzey, 1985).

The first research question is to determine the nature and extent to which there are differences in the residual scores of students who have studied foreign language and those who have not. From the populations of graduating seniors at each of the four institutions, two random samples were chosen. One group contained students who had studied foreign

language in college, and the other was made up of students who had not studied foreign languages. The one-way analysis of variance was used to test one independent variable, in this case the study of foreign language. In order to demonstrate the impact of foreign language study, the residual composite score of the foreign language group would have to be significantly higher than the non-foreign language group. Significance is determined through the F-ratio which uses the between-groups variance estimate as the numerator and the within-groups variance as the denominator (Elzey, 1985). Where groups are more than two, the ANOVA reveals a significant F-ratio, the Scheffé method will be used to make comparisons between sample means. That is, if there is a significant difference in the residual scores of students who studied foreign language and those who did not, using the Scheffé to compare the residual means will determine the direction and extent to which there are differences.

The second research question seeks to determine the effect of length of foreign language study on residual scores. To analyze the data, this study, after obtaining the residual scores, grouped the students by the number of quarter credits they had earned in a foreign language. There were four groups. The first included students who had not studied a foreign language, the second 1 to 15 quarter credits, the third 16 to 30 quarter credits, and the fourth, 31+ quarter credits. The mean residual scores for each group on each of the GRE subtests and the nine item-tests were estimated. If there was a difference in these scores between groups, it was necessary to determine if the difference was great enough to say that length of foreign language study did indeed improve a

particular learned ability (for example, reading comprehension).

Assuming that the ANOVA reveals a significant F, indicating that the length of study does have an effect on residual scores, the Scheffé method will be used to make comparisons between the sample means to determine the extent of the effect.

This study will determine the extent to which gains in general learning vary by the foreign language studied. Again, students are grouped, but this time by the foreign language studied. The statistical analysis used is Analysis of Variance -- one way, with the language studied serving as the independent variable. The languages included are Chinese, French, German, Italian, Korean, Latin, Russian, and Spanish. The mean residual scores of each group will be used to determine performance on the individual GRE item-type tests. Should the ANOVA show a significant F-ratio among the unequal-sized groups, the Scheffé method will be used to determine the effect of studying one foreign language over another.

In examining college transcripts, it was apparent that students begin foreign language study at different points in their college career. This study examines the nature and extent to which the entry point in foreign language study affects the GRE scores. Students are grouped by the college year they first began their foreign language study. The GRE item-test residual scores will determine the effect of entry point on foreign language study. Where the F-ratio proves significant, the Scheffé method will be used to identify the extent of the effect of a particular entry point.

Summary

This chapter explores the procedures used to test the effect of foreign language study on students' general learned abilities as measured by the GRE. Also included are the procedures employed in examining the effects of the number of foreign language courses taken, the particular language studied, and the entry point of first foreign language study.

In order to determine the gain in verbal, quantitative, and analytical skills resulting from the college years, the study used the SAT to assess pre-college learning and the GRE to assess undergraduate student learning. From these, the student's residual score representing the increase in a student's general learned abilities during the college years was determined.

The purpose of this study was to examine the nature and extent to which foreign language study affects general learned abilities. Course work patterns which included foreign language study were compared with those which did not. The random samples for the study consisted of transcripts and test scores of graduating seniors who took their undergraduate work at one of four institutions. The statistical analysis used to determine the nature and extent to which foreign language study impacts on learned abilities is the analysis of variance - one way (ANOVA). All four research questions of this study were examined through the use of this test at the .10 level of significance. The Scheffé method for making post hoc comparisons was used. The examination of the effect of foreign language study on students' learned abilities used a series of independent variables. In research question 1, the independent

variable is foreign language study, in question 2 length of foreign language study, in question 3 the foreign language studied, and in question 4 students' entry point in foreign language study. Conclusions drawn from the evidence produced may aid in understanding the development of students' learned abilities during the undergraduate years.

CHAPTER IV. RESEARCH FINDINGS AND DATA ANALYSIS

Introduction

The statistical analysis and findings in this chapter were based on data collected from the transcripts and test scores of graduating seniors who took their work at: (1) a major private research university, (2) a doctoral-granting state university, (3) a private comprehensive college, and (4) a women's liberal arts college. The transcripts were the subject of analysis. A review was made of the foreign languages courses taken or the lack of those courses. The graduating seniors participating in the study all took the General Test of the Graduate Record Examination in February 1986, 1987 or 1988. The sample consisted of transcripts and test scores from 764 graduating seniors.

The data were used to study four research questions pertaining to the effect of foreign language study in college on general learned abilities as measured by the Graduate Record Examination. The first question sought to determine the nature and extent to which there are differences in the residual scores of students who study a foreign language in college and those who do not. The other three questions examined the effect of length of foreign language study on general learned abilities. The one-way ANOVA at the .10 level was used to examine each of the questions.

To control for the effects of the incoming ability, this study used Ratcliff's research (1989) done on the same sample. The predictive effects of SAT scores were partialled from GRE item-type scores. SAT

verbal scores were regressed on each of the 4 GRE verbal item-type scores, SAT mathematic scores were regressed on each of the 3 GRE quantitative item-type scores, and SAT total scores were regressed on each of the 2 GRE analytical item-type scores. These residual scores represented the changes students experienced in general learned abilities from the time they entered college to the time of GRE testing during their senior year.

Prior to partialling the effects of the students' SAT scores from their GRE item-type scores, Ratcliff's study (1989) tested the reliability of the GRE item-types for this sample. It also examined the correlation between the GRE item-types and the SAT sub-scores and total scores. Finally, it conducted a regression of GRE item-types on SAT sub-scores to calculate residual scores for each GRE item-type.

Ratcliff (1989) found a strong correlation between GRE item-types and SAT scores at all of the institutions. To determine the extent to which these students showed gains over their pre-college SAT scores, he regressed the GRE raw scores on the corresponding SAT scores. For example, among the Stanford sample #1 he found the SAT Verbal explained 36.86 percent of the variance in the Sentence Completion item-type, 47.88 percent of the variation in Analogies item-type, 40.01 percent of the variation in Reading Comprehension, and 49.64 percent in Antonyms item. The SAT math scores explained 50.17 percent of variation in Quantitative Comparison, 42.38 percent of variation in Discrete Quantitative, and 39.37 percent of variation in Data Interpretation. The SAT Total explained 35.52 percent of variance in Analytic Reasoning and 32.01

percent of variance in Logical Reasoning. In all instances, the regression model proved significant at the .0001 level. This suggested effective control measures for the general learned abilities of students as they entered college as freshmen.

Statistical Findings for Each Research Question

Research Question 1: To determine the nature and extent to which there are differences in the residual scores of students who studied college-level foreign language and those who did not.

The terms nature and extent referred to the effect of foreign language study on general learned abilities as demonstrated by the residual GRE mean scores. These residual mean scores included the following tests:

Residual score for GRE verbal

Residual score for GRE quantitative

Residual score for GRE analytical

Residual score for sentence completion item-type questions

Residual score for analogy item-type questions

Residual score for antonym item-type questions

Residual score for reading comprehension item-type questions

Residual score for data interpretation item-type questions

Residual score for discrete quantitative item-type questions

Residual score for analytical readings item-type questions

Residual score for logical reasoning item-type questions

Residual score for quantitative comparison item-type questions

The above list of residual scores includes the dependent variables used. The independent variables were foreign language study or no foreign language study. The statistical analysis employed was the ANOVA-one way at .10 level of significance.

The original sample included 817 students. However, due to missing values which included SAT scores and demographic information, only 764 observations could be used. The sample was divided into two groups: those who had studied a foreign language in college, and those who had not. Both groups were similar in size, with 375 students having taken a foreign language in college and 389 students having no foreign language in college. Information was not available as to whether either group had studied foreign language in high school. However, the SAT scores were used as measures of prior academic accomplishments on the dependent variables, general learned abilities. In many cases, the student did not self-select the foreign language study, but took it to satisfy the general education requirements of the college/university or those of a particular department within the institution. Stanford University was the only institution which required one year of college level foreign language study of all undergraduate students. Georgia State University and Ithaca College both required foreign language study for specific majors, whereas Mills College offered foreign language study as a choice in fulfilling the distribution requirement. Those students included in the foreign language sample had a varied pattern of foreign language study. The number of foreign language courses any one student took ranged from one course to eighteen courses. Table 5 shows the residual

Table 5. Residual mean scores of students who studied a foreign language and those who did not

Test	Residual scores	
	NFL (N=389)	FL (N=375)
Sentence completion	0.0421	-0.0437
Analogy	0.0381	-0.0395
Reading comprehension	0.0021	-0.0022
Antonyms	-0.1793	0.1860
Quantitative comparison	0.0511	-0.0530
Data interpretation	-0.0529	0.0549
Logical reasoning	0.0138	-0.0144
Discrete quantitative	-0.0206	0.0213
Analytical reasoning	-0.0165	0.0171
GRE-verbal	-0.0970	0.1006
GRE-quantitative	-0.0224	0.0233
GRE-analytical	-0.0027	0.0028

mean scores of the two groups in each of the dependent variables.

The results of the one-way analysis of variance at the .10 level indicated there was no significant difference in the residual scores of students who had studied foreign language and those who had not. Table 6 shows the results of the one-way analysis of variance on the residual mean scores of the item-type questions and the GRE general tests. Only the residual mean scores for the antonym item-test indicated any influence of foreign language study. However, the F-value of 3.77 was not significant at the .10 probability of error. In essence, foreign language study did not significantly affect students' scores on the GRE item-type questions nor on the GRE general tests. Thus, no significant difference in general learned abilities was found between the two groups

Table 6. Analysis of the one-way ANOVA on the residual mean scores of the GRE item-type questions and the GRE general tests

Dependent variable	F-value	PR>F	Adjusted R ²
Sentence completion	0.38	0.5363	0.0005
Analogy	0.29	0.5930	0.0004
Reading comprehension	0.00	0.9832	0.0000
Antonym	3.77	0.0526	0.0049
Quantitative comparison	0.22	0.6420	0.0003
Data interpretation	0.87	0.3518	0.0011
Logical reasoning	0.04	0.8369	0.0001
Discrete quantitative	0.06	0.8034	0.0000
Analytical reasoning	0.01	0.9205	0.0001
GRE-verbal	0.21	0.6499	0.0003
GRE-quantitative	0.01	0.9032	0.0000
GRE-analytical	0.00	0.9888	0.0000

of students.

Research Question 2: To determine the effect of length of foreign language study on residual scores.

According to Eddy's (1981) research on high school foreign language study and SAT scores, the length of study, not the language or languages studied, proved to be significant. In order to examine the same question at the college level, the following steps were taken. First, the researcher determined the total number of foreign language credits taken by each student. As two institutions used semesters, one used quarters and one divided the academic calendar into terms, it was necessary to decide on a common academic unit. The quarter hour was chosen and all semester hours and term hours were converted to the quarter hour unit.

Upon determining the total number of quarter hours of foreign language studied by each student, the sample was divided into four

groups. Group 1 included those who had not studied foreign languages, those in Group 2 had received from 1-15 quarter hour credits in foreign language, Group 3 included students who had from 16-30 quarter hour credits, and Group 4 included those with 31+ quarter hour credits.

The statistical analysis used was the one-way ANOVA, which compared the residual GRE mean scores of each group. The results of the test indicated few significant differences among the groups at the .10 level (see Table 7). There were no significant differences among the groups when residual mean scores were compared on the GRE-verbal, the GRE-quantitative, and their related item-type questions. However, there was a significant difference among the groups on the GRE-analytical and the analytical reasoning item-type questions. Table 8 shows the significant differences between groups as a result of the Scheffé test.

Table 7. Analysis of the one-way ANOVA of length of foreign language study on the residual mean scores of the GRE item-type questions and the GRE general tests

Dependent variable	F-value	PR>F	Adjusted R ²
Sentence completion	0.79	0.4980	0.0019
Analogy	0.87	0.4535	0.0021
Reading comprehension	1.21	0.3054	0.0030
Antonym	2.54	0.0552	0.0062
Quantitative comparison	1.11	0.3439	0.0027
Data interpretation	0.50	0.6850	0.0012
Logical reasoning	0.17	0.9157	0.0004
Discrete quantitative	1.50	0.2141	0.0037
Analytical reasoning	3.35	0.0184	0.0082
GRE-verbal	1.48	0.2182	0.0036
GRE-quantitative	1.43	0.2328	0.0035
GRE-analytical	2.22	0.0839	0.0054

Table 8. Significant differences (.10 level) on the effect of length of foreign language study on GRE scores as indicated by the Scheffé test (critical value of $F=2.08828$)

Dependent variable	FL credit comparison	Differences between means
GRE analytical	0 credits > 31+ credits	2.2183
Analytical reasoning item-type	1-15 credits > 31+ credits*	2.4097
	0 credits > 31+ credits*	2.3608
	15-30 credits > 31+ credits	2.2408

*Significant at the .05 level also.

In Table 8, there was a significant difference on the GRE analytical between Group 1 (0 FL credits) and Group 4 (31+ FL credits). Those with foreign language experience showed less unexplained variance (by the SAT variance) than those with no foreign language experience. The results of the Scheffé test were similar for the analytical reasoning item-type test. However, the most significant difference was between the residual mean scores of Group 2 (1-15 FL credits) and Group 4 (31+ FL credits). Moreover, the residual mean scores of Groups 1 (0 FL credit) and 3 (15-30 FL credits) also were significantly higher than those of Group 4 (31+ FL credit). At the .05 level, differences among two groups remained significant on the analytical reasoning item-type test.

In summary, according to the results of this research, the length of foreign language study at the college level did not improve a student's general learned abilities. In fact, the 41 students who took 31+ quarter hours of foreign language study had significantly lower mean scores on

the analytical areas of the GRE than did any other group of students within the sample.

Research Question 3: To determine the extent to which gains in general learning vary by foreign language studied.

In studies of high school and elementary foreign language students, Latin has had the strongest effect on students' verbal abilities (Wiley, 1984-85; Mavrogenes, 1977). German followed Latin in influencing verbal skills, with French and Spanish vying for third place. However, Eddy's research (1981) concluded that the language studied has no differential effect on the SAT scores. Later, Cooper (1987) replicated Eddy's study and found a significant F-ratio. German was the language which had the greatest impact, followed by French, Latin, and Spanish.

In examining this question at the college level, this study was able to include a wider variation of languages. Chinese, Italian, Korean, and Russian were added to the traditional group of French, German, Latin, and Spanish. All languages included 13 or more students; French was the largest group with 183 students, whereas Korean and Latin were the smallest with 13 each. Using the one-way ANOVA at the .10 level of significance, it was determined that the language studied was not significant to improved scores on any part of the GRE general test, nor for the GRE item type. Table 9 shows the statistical analysis for the GRE general test and for the GRE item-type questions. According to the information in Table 9, there was no significant F-ratio in any area. That is, there was no difference in the effect of the foreign language studied on general learned abilities as tested by the GRE. Though not

Table 9. Analysis of the one-way ANOVA of foreign language studied on the residual mean scores of the GRE general tests

Dependent variable	F-value	PR>F	Adjusted R ²
Sentence completion	0.73	0.6444	0.0104
Analogy	0.99	0.4369	0.0141
Reading comprehension	0.42	0.8887	0.0060
Antonym	0.95	0.4651	0.0135
Quantitative comparison	2.39	0.0204	0.0333
Data interpretation	0.83	0.5617	0.0118
Logical reasoning	0.37	0.9173	0.0054
Discrete quantitative	2.50	0.0155	0.0348
Analytical reasoning	1.76	0.0943	0.0247
GRE-verbal	0.45	0.8710	0.0064
GRE-quantitative	3.00	0.0043	0.0414
GRE-analytical	1.75	0.0952	0.0246

conclusive, this finding adds evidence to Eddy's research (1981) that found the language studied had no significant influence on the SAT scores.

Research Question 4: To determine the nature and the extent to which the entry point in foreign language study affects the GRE scores.

The review of literature in Chapter II indicates that students' cognitive development increases with the length of time in college. For example, students who first study foreign language in their third year of college could be expected to gain more than students in their first year. The more mature student would be able to understand whole language concepts and to transfer them to use in their native language.

In order to test this question, the sample of foreign language students was divided into four groups. All students who began their

foreign language study in the first college year were placed in Group 1. Those in Group 2 first studied foreign language in their second year of college. Group 3 and Group 4 represented those first entering foreign language study in their third and fourth college year, respectively. A one-way ANOVA at the .10 level of significance was used to determine if the college year of a student's first foreign language course has an effect on the GRE scores.

According to Table 10, the entry point proved significant at the .10 level in all parts of the GRE general test residual mean scores and in the residual mean scores of two item-like questions, antonym and discrete quantitative. A Scheffé test was performed to compare the four entry point groups in each of the five tests shown to be significantly different. The results of the Scheffé are found in Table 11.

Table 10. Analysis of the one-way ANOVA on the effect of entry point in foreign language study on the GRE scores

Dependent variable	F-value	PR>F	Adjusted R ²
Sentence completion	1.02	0.3851	0.0079
Analogy	1.73	0.1613	0.0134
Reading comprehension	0.52	0.6712	0.0040
Antonym**	3.49	0.0158	0.0267
Quantitative comparison	2.27	0.0800	0.0175
Data interpretation	0.25	0.8598	0.0020
Logical reasoning	0.67	0.5712	0.0052
Discrete quantitative**	4.43	0.0045	0.0336
Analytical reasoning	1.93	0.1241	0.0149
GRE-verbal**	2.66	0.0478	0.0205
GRE-quantitative**	3.64	0.0129	0.0278
GRE-analytical**	2.27	0.0799	0.0175

**Significant at the .10 level.

Table 11. Significant differences (.10 level) on the effect of entry point into foreign study on the GRE scores as indicated by the Scheffé (critical value of $F = 2.09818$)

Dependent variable	Comparison of entry years	Difference between means
GRE-verbal	4th year - 1st year	2.2897
	4th year - 2nd year	3.4648
GRE-quantitative	3rd year - 1st year	2.0742
GRE-analytical	4th year - 1st year	2.7932
Antonym item type questions*	4th year - 2nd year	1.5299
Discrete quantitative item-type questions	4th year - 1st year	1.2817
	3rd year - 1st year	0.9585

*Remains significant at the .05 level.

Students who took their first foreign language course in their fourth year of college did significantly better on the GRE-verbal than those who first studied foreign language in their first and second year of college. Similarly, residual mean scores on the GRE-analytical were better among students who began foreign language study in their fourth college year over those beginning in their first college year. There was a significant difference found in the GRE-quantitative mean scores. Those students who began foreign language study in their third year had significantly higher residual mean scores than those who began in their first year. Therefore, indications are that beginning a foreign language during the last two years of college improves students' residual mean scores on the GRE general test.

Only two item-type questions reflect a significant difference. The residual mean scores in antonym item-type questions of those students first entering foreign language in their fourth college year were significantly higher than those who began study in their second year. In discrete quantitative item-type questions, those whose foreign language entry points were the third or the fourth college year had significantly higher residual mean scores than did those who entered foreign language study their first college year. In Table 12, which shows the residual mean scores of each group, there is an indication that beginning foreign language study in the fourth college year tends to improve a student's overall residual mean scores on the GRE. These results may indicate that general education courses need not be confined to the first two years of college. Students may benefit from having these courses distributed throughout the four years. However, the significant differences were not apparent at the .05 level, which may be due to the limited number of students (28) beginning foreign language study in their senior year. Further study may be warranted with whole classes of foreign language students.

Summary

This chapter has presented the findings of the statistical analysis used to test each of the four research questions. These questions were formulated to determine the effect of foreign language study in college on general learned abilities, as measured by the General Test of the Graduate Record Examination. The questions examined differences in

Table 12. Residual mean scores of students' first entry point into foreign language study

Dependent variable	FL entry point according to academic year			
	Year 1	Year 2	Year 3	Year 4
Sentence completion	-0.1570	0.1029	-0.1356	0.3894
Analogy	-0.1353	-0.1287	0.0487	0.7394
Reading	-0.0554	-0.1884	-0.0933	0.5919
Antonym	0.3246	-0.2841	-0.1850	1.2458
Quantitative comparison	-0.4182	0.3465	0.4842	0.4578
Data	0.0020	0.0267	0.2154	0.0698
Discrete quantitative	0.3242	0.1509	0.6343	0.9574
Analytical reasoning	-0.3918	-0.0424	0.1635	1.8777
Logical reasoning	-0.0918	-0.0565	-0.0678	0.4318
GRE-V	-0.0231	-0.4982	-0.3652	2.9666
GRE-Q	-0.740	0.5240	1.3339	1.4851
GRE-A	-0.4847	-0.0988	0.0957	2.3096

questions. The dependent variables were used to measure differences between foreign language students and non-foreign language students, and the effects of length of foreign language study, the specific language studied, and the entry point of first study.

In research question 1, to determine the effect of college foreign language study on learned abilities, the student sample was divided into two groups. One group included those with college foreign language study and the other, those without. The one-way ANOVA was used to measure the differences in the residual means of the two groups. The results of the statistical analysis indicated no significant difference between the groups.

In research question 2, which examines the effect of length of foreign language study in college, the number of college foreign language credit was used to determine the length of foreign language study. No consideration was given to the language or languages studied. Students were divided into four groups: no FL credits, 1-15 FL quarter credits, 16-30 FL quarter credits, and 31+ FL quarter credits. Again, the statistical analysis used at the .10 and the .05 levels of significance was the one-way ANOVA. No significant differences were found between the first three groups; however, there were several significant differences between the residual mean scores in group 4 and those in the other groups. Those students in group 4 had significantly lower residual mean scores in the GRE analytical test than those in group 1. This same difference occurred between Groups 1 and 4 in the analytical reasoning item-test; moreover, Groups 2 and 3 also had significantly higher scores

than did Group 4 on this test.

Research question 3 examined the effect of the study of a particular foreign language on general learned abilities. The language groups formed were Chinese, French, German, Italian, Korean, Latin, Spanish, and Russian. The statistical analysis, the one-way ANOVA at the .10 level, did not show a significant difference among the languages.

Finally, the researcher, for the purpose of studying question 4, the effect of the entry point in foreign language on GRE scores, divided the sample into four groups according to the college year in which the student first studied a foreign language. The groups represented the students' first, second, third, and fourth college year. Using the one-way ANOVA at the .10 level of significance, the results indicated that students who began foreign language study in their fourth year of college did significantly better on the GRE-verbal and GRE-analytical than those who entered in their first or second year. There was a significant difference on the GRE-quantitative between those who entered FL study in their third year and those who began study in their first year; the latter received lower residual mean scores.

On two item-type questions, antonyms and discrete quantitative, there were significant differences. In both cases, beginning foreign language study in the second half of their college courses improved residual mean scores.

The following chapter presents a discussion of these findings as they relate to the purpose of this study. Conclusions are drawn and recommendations for further research are made.

CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

During the 1980s, the public renewed its interest in the quality of education at all levels of the American educational system. Among the reasons for this interest were that student learning, curricular coherence, and academic standards no longer met expectations (National Institute of Education, 1984). The scores on the SAT, the ACT, and the GRE were declining and American students were not achieving at the same rate as their counterparts from other nations (National Institute of Education, 1984; Mavrogenes, 1977; Hirsch, 1987). Educators, legislators, and the general public called for accountability not only in the funding of education (Grant and Riesman, 1985), but in student outcomes.

Verbal, analytical, and quantitative skills are desired outcomes of education. Pascarella (1985) concluded that post-secondary education does make a significant difference in an individual's verbal and quantitative knowledge; however, how students develop these skills in college was unclear. Nevertheless, it was possible to measure the gains made. The SAT and the ACT are often used to measure advancement made prior to college, whereas the GRE assesses undergraduate learning at the post-secondary level.

Educators are examining students' transcripts in an attempt to identify course work patterns which contribute significant gains in general learned abilities. Studies are analyzing course work patterns

and comparing them to students' residual mean scores on the GRE (Ratcliff, 1988). The results of these studies may give direction to colleges and universities as they plan their general education curriculum.

Rather than analyzing the effects of a cluster of courses, this research was limited to examining the impact of the study of one discipline, foreign languages, on general learned abilities. The study of foreign languages as part of the general education requirement has again found its way into institutions of higher education. Advocates tend to promote their cause by stating that foreign language study improves one's verbal ability. However, evidence of this claim was not available on the college level.

Thus, this study examined the nature and extent to which foreign language study in college affects general learned abilities as measured by the GRE. Comparisons were first made between residual mean scores of college students at four institutions who studied foreign languages and those who did not. Furthermore, the research also examined the effects of length of foreign language study, of the foreign language studied, and of the college year entry point for the first foreign language study on the students' residual mean scores. The statistical analysis used to measure these differences was the one-way ANOVA. As the study was considered experimental, the researcher used the .10 level of significance.

Prior research, as reviewed in Chapter II, relied heavily on data taken from students in elementary and secondary schools. Only very

limited research on the effects of college level foreign language was available. According to the studies done on high school students, foreign language study at that educational level does influence verbal abilities in one's own language as measured by the pre-college SAT or ACT tests. This influence was found to be the strongest after two years of foreign language study. Among the most valuable techniques in learning a foreign language is that of inferencing or making calculated guesses. This technique has been found to aid in the development of verbal abilities as measured by the SAT or the ACT.

Several studies made on high school and elementary groups indicated that foreign language study also helped develop quantitative and analytical abilities. Four skills valued in foreign language learning, problem solving, logical reasoning, classifying and divergent thinking, are also used in analytical reasoning. However, the results of these studies made on quantitative and analytical abilities were not as conclusive as those made on verbal skills.

Evidence from research on the impact of high school foreign language indicated the greater the number of foreign language courses, the greater the competency in learned abilities. Four years of foreign language study proved to have more effect on SAT-verbal scores than four years of any other subject.

Some studies pointed to Latin as the language having the greatest influence on SAT or ACT verbal scores. However, other researches found German to be stronger than Latin. Finally, others indicated that no particular language was more significant than another. The evidence on

which foreign language most affects the SAT or ACT scores was inconclusive.

No studies have been made as to the effects of the timing of a student's first foreign language on his/her GRE score. Nevertheless, literature on student development suggests that student maturation and success in a course are related.

This literature on the effects of foreign language study on the SAT and ACT scores tended to support the need to expand the research to include the effects of college foreign language study on general learned abilities. In order to measure these effects, it was necessary to choose a test similar to the SAT or ACT. The test chosen was the General Test of the GRE. The analysis then used students' residual scores to determine the impact of foreign language on general learned abilities. As no previous research was available, this study was considered experimental.

Conclusions

This study used four research questions to examine the influence of foreign language study at the college level on verbal, quantitative and analytical skills. Many of the conclusions drawn through this study differ from those of studies reviewed in Chapter II. These differences may have resulted from actual differences between foreign language students in high school and those in college or as a result of the broader curricular offerings at the college level which produced similar results on the GRE. Perhaps, though, the most important consideration is

that this study did not have available information on students' high school transcripts. Therefore, there was no record which indicated if students in the "no foreign language" group had actually studied foreign language in high school. However, the study did employ the SAT test scores as measures of the student's prior development of general learned abilities.

The first research question considered the nature and extent to which there are differences in the residual scores of students who had studied foreign language in college and those who had not. The measure used was the residual scores from the GRE general test and those of the GRE 9-item type tests. According to the studies conducted with high school students, those students who had studied foreign languages scored significantly better on the SAT and the ACT than did students who had not (McGlone, 1983; Skelton, 1957; Wiley, 1984-85; Timpe, 1979; Cooper, 1987; Eddy, 1981). No examination of the item-type scores was done on the high school studies. The differences in scores was of such significance that the Wirtz Commission (1977) pointed to "a clear parallel . . . between students' SAT-verbal scores and the number of foreign language courses taken in high school" (Eddy, 1981).

However, this study found no significant difference in the residual scores of students who took foreign language in college and those who did not. The sample was comprised of graduating seniors at four institutions, Georgia State University, Ithaca College, Mills College, and Stanford University, who took the GRE general test. After examining the transcripts and records, the researcher placed those students who had

studied a foreign language in college in one group, and those who had not in another group. Of the 764 students used, 375 had studied a foreign language in college, whereas 389 had not. The results on the one-way ANOVA indicated there was no relationship between the study of foreign language and the residual test scores. However, in analyzing the residual mean scores of the two groups, the RGRE-V, the RGRE-Q, and the RGRE-A of the foreign language group were greater, but not significantly greater, than those who had not studied foreign language.

The second research question examined the effect of length of college level study on residual scores. Prior research determined that the longer foreign language was studied, the better the score on the SAT (Ramist and Arbeiter, 1984). Researchers acknowledged that the 5+ pre-college years of foreign language study represented a small number of students whose score might be influenced by other factors. However, the group who had 2+ years of high school foreign language showed the most dramatic change in math scores (Ramist and Arbeiter, 1984). By the fourth year of foreign language study, students scored an average of 100 points higher on both the SAT-verbal and the SAT-math than did those with no foreign language (Profiles, 1981).

Studies which examined the length of study in a foreign language usually limited their analysis to the effect of one foreign language. The assumption was that a year of German and a year of French do not have the same effect as two years of one language. However, Eddy (1981) found that the study of two foreign languages had no differential effect on SAT scores. The significant factor was the length of study. No comparable

research was identified to suggest a relationship between length of college foreign language study and the GRE.

In this study, students were divided into four groups. The first had no foreign language courses in college, the second had 1-15 quarter hours' credit in FL, the third, 15-30 quarter hours' credit, and the last, 31+ quarter hours' credit. After analyzing the residual mean scores of the groups, it was determined that on only two tests were there significant differences between the groups. The results of the analysis of the residual mean score on the GRE-analytical test indicated that the group who had not studied a foreign language did significantly better than those who had 31+ credits in foreign language. All groups had significantly higher residual mean scores than the 31+ group on the Analytical Reasoning item-type test. These results may be of particular concern in light of the findings of Powers and Enright (1987) on the analytical skills needed in graduate school. In that study, analytical reasoning was identified as the most important ability needed for graduate study. Foreign language educators indicate that the four skills necessary for analytical reasoning, problem solving, logical reasoning, classifying, and divergent thinking, are valued in foreign language learning (Herron, 1982; Carton, 1971; Jarvis, 1980). On the other hand, the results of this study do not show these skills, if a part of foreign language learning, transferring as general learned abilities. According to Wilson's research (1985), covered in the review of literature, the skills needed for analytical reasoning may be an extension of the quantitative skills. He found majors in verbal fields tended to perform

better on the vocabulary item-type tests. However, the results of research question 1 as well as those of research question 2 did not show that foreign language students (question 1) and foreign language majors and minors (question 2, group 4) excelled on the GRE-verbal or any of the item-type tests within that category.

The third research question examined the extent to which gains in general learning varied by foreign language studied. Much previous research pointed to Latin and German as influencing gains in general learning (Wiley, 1984-85; Cooper, 1987). Eddy's research (1981) concluded that the particular foreign language studied was not significant. In the pre-college studies, the languages analyzed were French, German, Latin, and Spanish. This research broadened the language group to include Chinese, French, German, Italian, Korean, Latin, Russian, and Spanish. More than thirteen students were included in each of the language units. The results of this study tended to agree with Eddy's research (1981). No particular language proved significant. That is, students of one language did not show greater gains in learned abilities than those of another. In the past, Latin has always been thought to improve vocabulary as so many prefixes, suffixes, and root words in English stem from Latin. On the other hand, researchers suspected the advantages shown by German resulted from the type of student who enrolled in German. Nevertheless, even in competing with languages such as Chinese and Russian which have little application to English, Latin and German did not prove significant.

The last research question determined the nature and the extent to

which the initial entry point in foreign language study at college affects the GRE scores. The initial entry point means the semester/quarter in the student's academic career when he/she began studying a particular discipline. The students were divided into four groups according to the academic year they began their foreign language study. Of the total sample, the largest number of students took their first foreign language course during the first academic year, whereas the least number began their study their fourth academic year.

The results of research on this question showed that the initial entry point did make a significant difference on various parts of the GRE. Students who began their study in their last year had significantly higher residual mean scores on the GRE-verbal than those who began their study during the first two years of college. There was no significant difference between beginning in the third or fourth year. Students whose initial entry point was the fourth college year showed significant gains in their residual scores on the GRE-analytical over those who began their first study in their freshman year. This difference did not appear in the other years. On the other hand, the residual scores on the GRE-quantitative were significantly better for the group who began foreign language study during its third year.

The year of the initial entry point only affected two item-type tests. The residual scores of the fourth year group were significantly better on the Antonym item-type test than those of the second year entry point. The results of this analysis proved to be the strongest of the findings. It was significant at both the .10 and the .05 level.

Beginning study of a foreign language in the fourth year also proved significant on the Discrete Quantitative item-type test. This group had better residual scores than those in the second academic year group. However, there was no difference among the other groups. The results of the research on this question reinforced some of the student development theories found in the literature review. These findings indicate that the later a student begins his/her foreign language study, the greater the effect on the GRE scores. Study taken too early in the academic career may fall victim to the immaturity of the student. At that point, the student may not have the intellectual and emotional readiness to see the relationships between languages or to transfer skills learned in one discipline to another. On the other hand, as the students' cognitive development increases with the length of time in college, their focus shifts from self to the larger world (Delworth and Hanson, 1984).

Recommendations

This study was an effort to extend research on the effects of foreign language study on general learned abilities to the college level. The majority of the prior research on the subject was limited to foreign language study at the elementary and high school level. Though this study is considered exploratory, the findings suggest areas which would warrant further research. The results, in general, contradict many of the findings on foreign language study at the secondary level. This may alert college faculty to be cautious in accepting findings on high school studies as applicable to the college environment. The two educational

institutions differ significantly from each other in population, curriculum, setting, and goals. Yet, in the past, foreign language educators have tended to accept findings on foreign language study at one educational level as true for all levels.

The literature review noted numerous examples of high school and elementary foreign language students outscoring non-foreign language students on a variety of measures. In all studies, the FL students excelled over their non-FL counterparts in verbal skills. Some studies also indicated that the high school FL students had better quantitative and analytical skills. In recent years, as colleges and universities began to reevaluate general education requirements, foreign language study has been cited as developing general learned abilities. However, the conclusions drawn from research question 1 in this study indicate that there is no significant difference between the residual mean scores on the GRE of college foreign language students and those students without foreign language study in college. This finding may result from not having information on the prior education of the non-FL students as it is quite likely that some of them may have studied foreign languages in high school. For this reason, it is recommended that this question be further studied using data which include high school foreign language study.

This study made no attempt to consider students' abilities in grouping the students. However, several of the studies on high school foreign language divided the students into groups by ability, and there was a significant difference between foreign language takers and those

with no foreign language background. Therefore, it is recommended that researchers consider the ability factor in future studies.

Another factor to consider is the impact of general education course distribution at the college and university level. If the non-FL students took courses deemed as alternatives to foreign languages courses, it is possible that the results may have been similar. No attempt was made to identify these courses and evaluate their effectiveness in developing general learned abilities. Follow-up research might compare courses within the same distribution categories for like impact.

The results of research question 2 on the impact of the length of college foreign language study do not reflect Eddy's (1981) findings at the high school level. Rather, they tend to concur with Nichols (1964), who found that major fields of study demonstrated a strong influence over GRE performance. That is, there is a tendency for the quantitative scores to fall when the verbal scores rise and vice versa. At the college level, language skills did not appear to transfer between languages with increased foreign language study. Specialization in foreign languages seemed to have a negative effect on general learned abilities. It is possible that students in some majors show a greater loss in verbal, quantitative, and analytical skills than those in others. Nichols (1964) noted that engineering tended to increase quantitative scores and decrease the verbal scores with the opposite true of English majors. College foreign language departments might examine techniques to overcome these negative effects. Foreign language majors in other countries develop the language while studying other subjects. That is,

the vehicle of instruction is the foreign language. Learning the foreign language in this manner might combat over-specialization.

This study, as well as Eddy's research (1981), showed no particular language having a greater effect on general learned abilities. Even with the addition of Chinese, Italian, Korean, and Russian to the traditional group of French, German, Latin, and Spanish, there was no indication that one language outweighed another. With this new information, foreign language educators and counselors may wish to revise their views. In advising students on language selection, it will be more important to give consideration to students' career choices and personal interests rather than the impact of one language over another. Research projects in the future should aim toward matching students to their best fit in foreign language study. That is, students successful in Chinese may demonstrate aptitudes and characteristics not found in students of Spanish.

Many institutions consider the first two years of college as the appropriate time to fulfill general education requirements. However, the results of the research on the initial entry point in foreign language study indicated that there is value in distributing general education throughout the student's college career. Students who waited until the last two years of their college work to begin a foreign language showed significant improvements in general learned abilities. Further study is necessary to determine if these findings resulted from proximity to the taking of the GRE General Test or if they resulted from the increased maturity of the students. If increased maturity is the case,

institutions may need to consider the timing of their general education offerings. More learning may result in the academically challenging general education courses if taken after a student has reached a certain maturity level.

In summary, the findings of this study do not support much of the previous research done on high school and elementary foreign language students. This may have been the results of the data's unknown factors, principally prior education, which entered into the final analysis. Nevertheless, there is enough evidence to indicate that the effect of college foreign language study on general learned abilities (verbal, quantitative, and analytical) may be overestimated. Educators should give stronger consideration to international needs in shaping their arguments for the inclusion of foreign language as a general education requirement. Understanding other cultures and languages has become increasingly valuable to today's citizenry. The lack of foreign language skills is a critical issue. Business and industry, national security, and technology in this country have suffered as a result. There is a need to develop competency in foreign language skills through the use of tested pedagogical methods. Though there is an abundance of methodologies practiced, only limited research addresses the levels of competency achieved. If colleges and universities continue to require foreign language study, foreign language educators, departments of education, and foreign language associations are urged to find the most efficient ways producing the greatest results to teach foreign languages as a viable skill.

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