

THE RELATIONSHIP BETWEEN TOEFL SCORES
AND GPA SCORES OF INTERNATIONAL
GRADUATE STUDENTS AT OKLAHOMA
STATE UNIVERSITY

By

HUI-MING CHANG

Bachelor of Arts
National Taiwan Normal University
Taipei, Taiwan
1967

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1974

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of the Oklahoma State University
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Thesis Approved:

Bernard R. Beldin

Thesis Advisor

Daniel D. Ray

Imogene L. Land

John L. Schweitzer

Norman D. Durhan

Dean of the Graduate College

1172804 |

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CHAPTER I

INTRODUCTION

One of the most frustrating dilemmas facing a comprehensive university is the one concerning the education of international students who, on the one hand are bright and well-motivated but who, at the same time, are faced with communicating and learning in a language with which they had little experience. An additional problem is that universities have little information about the actual language proficiency of the international student.

In 1963 the Test of English as a Foreign Language (TOEFL) was developed through the cooperative effort of over thirty organizations, public and private to provide information about the English language proficiency of the English speaking adults. A National Council of the Testing of English as a Foreign language was formed, composed of representatives of private organizations and government agencies concerned with testing the English proficiency of non-native speakers of English wishing to study at colleges and universities in the United States. The program was financed by grants from the Ford and Danforth Foundations and was, at first, attached administratively to the Modern Language Association. In 1965, the College Board and Educational Testing Service (ETS) assumed joint responsibility for the program (Educational Testing Service, 1981). The Test of English as a Foreign Language (TOEFL) measures abilities in English. People whose native language is not English can take this universally accepted test to determine their

proficiency with the English language. Colleges and universities where English is the language of instruction require a TOEFL score. Students seeking admission to undergraduate or graduate programs in such schools are required to submit their TOEFL scores. Graduate schools use the TOEFL scores as a measure of a student's ability to meet the foreign language requirement for doctoral programs. Scholarship committees use TOEFL scores as part of their screening and awarding processes.

There are no passing or failing scores on the TOEFL. Each institution requiring TOEFL scores determines for itself what scores are acceptable. The maximum total score is 800; the minimum is 200. In general, a score of 600 or above is considered excellent and a score of 400 or below is regarded as poor. Specifically, however, a score is considered good or bad based on the requirements of the institution to which the student has applied. Even at the same university, the requirements may vary for different programs of study. Over the past several years, the average TOEFL scores (based on 586,185 foreign students seeking admission to institutions in the United States who took TOEFL from September 1976 through August 1980) is a little over 500 (Educational Testing Service, 1981).

Statement of the Problem

TOEFL is a measure of English language proficiency. Proficiency in the English language is an important factor in the success of foreign students studying at the American institutions. Will TOEFL predict academic performance when performance is measured in grade point average? Will students who traditionally receive high TOEFL scores, e.g. students from India, also have higher grade point averages? The ETS survey shows

the mean of TOEFL scores (1978-1980) of India students is about 50 points higher than scores of Chinese students.

Should TOEFL scores be used as the only requirement for foreign student admission? If the TOEFL scores is predictive of grade point average than a higher scores is desirable for admission; however, if there is a non-significant relationship between TOEFL and grade point average, then the higher TOEFL score is an unreliable approach to admission.

Purpose of the Study

The purpose of this study was to investigate the relationships between the scores of Test of English as a Foreign Language and grade point average of international graduate students at Oklahoma State University.

Hypotheses

For convenience the twenty-four hypotheses are presented in six groups. All hypotheses concern grade point average and TOEFL scores. The hypotheses in Group I concern all students.

Group I

Hypothesis 1: there is no relationship between the scores of English as a Foreign Language (TOEFL) and grade point average (GPA) of international students.

Hypothesis 2: there is no significant relationship between the scores of Listening Comprehension (LC --Subtest Section I of TOEFL) and GPA of international graduate students.

Hypothesis 3: there is no significant relationship between the

scores of Structure and Written Expression (SW -- Subtest Section II of TOEFL) and GPA of international graduate students.

Hypothesis 4: there is no significant relationship between the scores of Reading Comprehension (RV --Subtest Section III of TOEFL) and GPA of international graduate students.

The hypotheses of Group II concern only graduate students from India.

Group II

Hypothesis 5: there is no significant relationship between the scores of TOEFL and the GPA of Indian graduate students.

Hypothesis 6: there is no significant relationship between the scores of LC and the GPA of Indian graduate students.

Hypothesis 7: there is no significant relationship between the scores of SW and the GPA of Indian graduate students.

Hypothesis 8: there is no significant relationship between the scores of RV and the GPA of Indian graduate students.

The hypotheses of Group III concern only graduate students from China.

Group III

Hypothesis 9: there is no significant relationship between the scores of TOEFL and the GPA of Chinese graduate students.

Hypothesis 10: there is no significant relationship between the scores of LC and the GPA of Chinese graduate students.

Hypothesis 11: there is no significant relationship between the scores of SW and the GPA of Chinese graduate students.

Hypothesis 12: there is no significant relationship between the

scores of RV and the GPA of Chinese graduate students.

The hypotheses of Group IV concern only graduate students from other countries.

Group IV

Hypothesis 13: there is no significant relationship between the scores of TOEFL and the GPA of other country students.

Hypothesis 14: there is no significant relationship between the scores of LC and the GPA of other country students.

Hypothesis 15: there is no significant relationship between the scores of SW and the GPA of other country students.

Hypothesis 16: there is no significant relationship between the scores of RV and the GPA of other country students.

The hypotheses of Group V concern only male international graduate students.

Group V

Hypothesis 17: there is no significant relationship between the scores of TOEFL and the GPA of male international graduate students.

Hypothesis 18: there is no significant relationship between the scores of LC and the GPA of male international graduate students.

Hypothesis 19: there is no significant relationship between the scores of SW and the GPA of male international graduate students.

Hypothesis 20: there is no significant relationship between the scores of RV and the GPA of male international graduate students.

The hypotheses of Group VI concern only female international graduate students.

Group VI

Hypothesis 21: there is no significant relationship between the scores of TOEFL and the GPA of female international graduate students.

Hypothesis 22: there is no significant relationship between the scores of LC and the GPA of female international graduate students.

Hypothesis 23: there is no significant relationship between the scores of SW and the GPA of female international graduate students.

Hypothesis 24: there is no significant relationship between the scores of RV and the GPA of female international graduate students.

Grade Point Average

The Oklahoma General Catalog describes the grade point system and the grade point average as follows:

Grade Point System. The following grade point system is used in calculating the grade-point average:

Grade "A" yields 4 grade points per semester credit hour.
 Grade "B" yields 3 grade points per semester credit hour.
 Grade "C" yields 2 grade points per semester credit hour.
 Grade "D" yields 1 grade point per semester credit hour.
 Grade "F," "I," "P," "W" and "NP" yield 0 grade points per semester credit hour.

Grade-Point Average Calculating. In calculating grade-point averages for all purposes other than for graduation, the total number of grade points earned is divided by the total number of hours attempted; for graduation, the hours and points earned first in a repeated course will be ignored. The grade of "I," "P," "NP," "W" or the mark of "N" will not affect the overall grade-point average. (Oklahoma State University General Catalog, 1982, pp. 41-42).

Admission to Graduate College--

International Students

Admission to Graduate College. Qualified graduates of colleges and universities of recognized standing are eligible to seek admission to the Graduate College, Applicants may obtain application forms from the Graduate College office and must

submit in duplicate, to the Graduate College, the completed forms along with official transcripts of all academic work and degrees received.

(1) The student should request the institutions previously attended to send two copies of the official transcript to the Graduate College, Oklahoma State University, if the student does not have copies available.

(2) The transcript must show the complete scholastic record, bear the official seal of the institution and be signed by the issuing officer.

To assure adequate time for processing prior to enrollment, application forms and transcripts should be received by the Graduate College at least 30 days prior to expected enrollment. Transcripts and other credentials become the property of the University and must remain on file in the Registrar's office.

International applicants are expected to submit applications, transcripts, results of English Proficiency Test (TOEFL examination, etc.) by March 1 for Fall enrollment and by July 1 for Spring enrollment.

As a condition of admission to regular graduate study at Oklahoma State University, all persons for whom English is a second language shall be required to present a score of 550 or above on the Test of English as a Foreign Language (TOEFL) regardless of the number of semesters or terms completed in other institutions of higher education or prior enrollment in English language programs. Persons who present a TOEFL score of 500 or above who demonstrate unusual academic promise may be admitted to graduate study on probationary status, but the number of such persons will not exceed two percent of the regularly enrolled graduate student population of the previous Fall semester (Oklahoma State University Graduate Catalog, 1982-83, p. 21).

Definitions of Terms

TOEFL (Test of English as a Foreign Language). TOEFL measures abilities in English, evaluates the English proficiency of people whose native language is not English. TOEFL consists of three subtests: Listening Comprehension, Structure and Written Expression and Reading Comprehension and Vocabulary. The total score is ranged from 200 to 800.

LC (Listening Comprehension). Listening Comprehension is the first section subtest of TOEFL. It measures abilities to understand spoken

English. Listening Comprehension score is ranged from 20 to 80.

SW (Structure and Written Expression). Structure and Written Expression is the second section subtest of TOEFL. It measures ability to recognize language that is appropriate for standard written English. Structure and Written Expression score is ranged from 20 to 80.

RV (Reading Comprehension and Vocabulary). Reading Comprehension and Vocabulary is the third section subtest of TOEFL. It measures ability to understand nontechnical reading matter. RV score is ranged from 20 to 80.

GPA (Grade Point Average). Grade point average reflects academic performance of students. It is determined on a scale of 0 to 4.0 per unit. A = 4.0; B = 3.0; C = 2.0; D = 1.0; F = 0.0.

International Students (Foreign Students). International students are students foreign to the United States and whose native language(s) is not English.

Assumptions

Komwachayungyuen in 1977 at the Florida State University conducted a study to identify the relationship of the TOEFL scores and actual English language proficiency in order to make a content-referenced interpretation of the TOEFL scores. All results consistently show that TOEFL is a good predictor of English language proficiency regardless of sex or level of education. It is therefore assumed that the TOEFL scale accurately reflects the language proficiency of the sample of subjects in this study.

Limitations of the Study

This study was limited to the population of Oklahoma State

University international graduate students who represent 26 different countries. These students are studying in 39 different departments at the OSU campus.

CHAPTER II

REVIEW OF RELATED LITERATURE

Bostic (1981) conducted a study in 1981 at East Texas State University to observe the predictive validity for academic achievement of the Test of English as a Second Language (TOEFL) as it was used in Oklahoma colleges and universities for admission procedures at the freshman level and attempted to provide insight into the improvement of these counseling procedures toward the likelihood of the student's academic success.

Observation was made of 154 freshman foreign students admitted to Southeastern Oklahoma State University under two admission policies. Policy One admitted students to the university upon their completion of prescribed English as a Second Language (ESL) courses. Policy Two admitted students on the basis of minimum TOEFL scores. Academic achievement as indicated by each student's grade point average (GPA) was compared to determine the admission procedure with most predictive validity.

No significant difference was found between the two sets of means. It indicated that the admission procedure of Policy One requiring ESL courses appears no more nor no less reliable than the admission procedure of Policy Two requiring minimum TOEFL scores. Significant positive correlation was found between TOEFL scores and composite grade point average and between TOEFL scores and nonverbal grade point average. No significant correlation was found between TOEFL scores and verbal grade

point average.

Bostic (1981) concluded that the convenience and universality of the TOEFL scores to be the most desirable method for screening and advising foreign applicants prior to admission as university freshmen.

ETS (1980) conducted a study based on domestic examinees to exam the reliabilities and standard error of measurement of TOEFL. The reliabilities were computed using the Kuder-Richardson Formula (20). For Section 1 (Listening Comprehension), the reliabilities for the seven forms range from .86 to .89. For Section 2 (Structure and Written Expression), the reliabilities range from .81 to .87. The range for Section 3 (Reading Comprehension and Vocabulary) is .86 to .90 and for the total test, the reliabilities range from .93 to .95. The standard error of measurement for Section 1 is about 2.2 points; for Section 2, about 2.9 points; for Section 3, about 2.5 points; and for the total score, about 14.6 points. That is, for the total score, the corresponding intervals extend 14.6 on either side of the reported score for two-thirds of the examinees and 29.2 points on either side of the reported score for 95 percent of the examinees.

ETS (1980) conducted a survey and reported a general tightening of TOEFL requirements, with seventy-four institutions indicating that their current policies reflect higher score requirements than those reported to the program in a survey conducted in 1977. Eleven institutions reported the initiation of TOEFL requirements. Only five institutions reported a decrease in score requirements. With two attributing the decrease to language training programs they had introduced since the 1977 survey.

Oduze (1980) conducted a systematically logical and empirical investigation at University of Missouri-Columbia, on the relationship of TOEFL scores to the academic quality of the first-year Nigerian students

in four Missouri universities, 1975 to 1980, and found that there was no significant relationship between scores earned on TOEFL and the academic achievement according to the first year GPA of the Nigerian students at four Missouri universities tested with regression analysis.

Of the eighteen subhypotheses tested, only one, Listening Comprehension (TOEFL subscore), had a significant relationship to the first year semester grade point average. The $r = .259$, the critical value two-tailed test was $.195$. Odunze concluded that a TOEFL score is not a good indicator of academic achievement in college.

Komwachayungyuen (1977) conducted a study to identify the relationship of the TOEFL scores and actual English language proficiency in order to make a content referenced interpretation of the TOEFL scores. All results consistently show that TOEFL is a good predictor of English language proficiency regardless of sex or level of education.

Gue and Holdaway (1973) conducted a study on the predictive validity of the TOEFL for 123 Thai students at the University of Alberta. Gue and Holdaway used GPA, the weighted arithmetic mean of marks ranging from 1 to 9 as a criterion. The validity coefficients between GPA and the first TOEFL scores was $.59$ and between GPA and the subtests of the first and second TOEFL administrations ranged from $.34$ to $.55$. The coefficients of the second administration were all higher than those from the first administration.

Educational Testing Service (1970) reported the correlations between TOEFL total scores and university ratings ranged from $.76$ and $.87$ (based on the rating at Columbia University, New York University, the University of California at Los Angeles, and the University of Michigan).

Hwang and Disney (1968) at University of Oregon conducted research to study the predictive validity of the TOEFL as predictor of first term

grade point average and grade in English as a second language (ESL), based on 20 Chinese graduate students at that campus. And found a .66 correlation between total TOEFL scores and grades in ESL and a .19 correlation between TOEFL and GPA based on 63 Chinese graduate students.

The American Language Institute at Georgetown University (1966) reported the correlation between TOEFL and ALI test developed at Georgetown for 104 students was .79.

Upshur in 1966 conducted a study to determine the correlation between TOEFL and the Michigan Test of English Language Proficiency. This was based on a total group of 100 students enrolled at San Francisco State College (N = 50), Indiana University (N = 38), and Park College (N = 12) and yield a correlation of .89.

Maxwell (1965) conducted a study at the Berkeley campus of the University of California based on a total sample of 238 students (202 men and 36 women, 191 graduates and 47 undergraduates) and found that a .87 correlation between total scores on TOEFL and the English proficiency test used for the placement of foreign students at that campus.

In summary studies have reported that the TOEFL scores are consistent measures of actual English proficiency. However, the ability to predict GPA on the basis of a TOEFL or the relationship between GPA and a TOEFL score has not been established in the literature.

CHAPTER III

METHOD AND PROCEDURE

Sample and Population

The sample for this study was selected from the 1133 international graduate students from 65 countries enrolled at Oklahoma State University from Fall 1979 to Spring 1981.

In order to be included as a subject for the sample population for this study, the following criteria had to be met:

1. The subject's native language is not English.
2. The subject took the TOEFL prior to admission to Oklahoma State University.
3. The subject took the new three subtest TOEFL, instead of the five section subtest TOEFL used before 1976.
4. The subject had to be a first-year graduate student enrolled at Oklahoma State University.
5. The subject had to be a full-time student with nine or more credit hours of graduate studies.

One hundred and ²⁶twenty-six subjects from 26 countries studying at the Stillwater campus, met the criteria and were selected to be included in this study.

Appendix A lists the countries and numbers of sample students from each country.

There 126 students enrolled at OSU in either the Fall of 1979 or the

Fall of 1980. Their grade point average were recorded at the end of their first year of graduate studies.

Test of English as a Foreign Language

As reported in Chapter I, the Test of English as a Foreign Language (TOEFL) was developed in 1963 through the cooperative effort of over thirty organizations, public and private. A National Council on the Testing of English as a Foreign Language was formed, composed of representatives of private organizations and government agencies concerned with testing the English proficiency of non-native speakers of English wishing to study at colleges and universities in the United States. The program was financed by grants from the Ford and Danforth Foundations and was, at first, attached administratively to the Modern Language Association. In 1965, the College Board and Educational Testing Service (ETS) assumed joint responsibility for the program (Educational Testing Service, 1981). The Test of English as a Foreign Language (TOEFL) measures abilities in English. People whose native language is not English can take this universally accepted test to determine their proficiency with the English language.

TOEFL was composed by five sections of language skills tested prior to September 1976:

Section I: Listening Comprehension

Section II: English Structure

Section III: Vocabulary

Section IV: Reading Comprehension

Section V: Writing Ability

There were 200 questions tested. The same five language skills are tested in the new TOEFL. They are tested in three sections:

Section I: Listening Comprehension

Section II: Structure and Written Expression

Section III: Reading Comprehension and Vocabulary

There are 150 questions tested. The new TOEFL is now used for all international testing in the United States and around the world.

TOEFL score reports give the score on each of the three sections of the test, plus a total score. Scores for the three sections are reported on a scale of 20 to 80. The total score, reported on a scale of 200 to 800, is derived by adding the three section scores and multiplying that sum by ten-thirds.

	Section 1	+	Section 2	+	Section 3	=	Sum	
Example:	46		54		50		150	
	$(150 \times \frac{10}{3}) = 500$							(ETS, 1981)

Reading Comprehension and Vocabulary measures ability to understand nontechnical reading matter.

In the year 1981-82 more than 344,000 people applied to take TOEFL under either the international or the Special Center Testing Program. The test was given at 850 test centers in 135 countries and areas. More than 2,000 colleges and universities in the United States and Canada, as well as in other countries where English is the language of instruction require their applicants who are not native speakers of English to take TOEFL. In addition, many government agencies scholarship programs, and other institutions use the test. Each institutions or agency that requires TOEFL scores decides for itself what scores are acceptable. The TOEFL office does not determine passing or failing scores (Educational Testing Service, 1982-83).

The material for TOEFL was written by specialists of English as a foreign language. Additional material is prepared by members of the TOEFL Committee of Examiners and by ETS test specialists. All item specifications, questions, and final test forms are reviewed internally at ETS for cultural bias and content appropriateness following established and explicit ETS procedures.

In addition, each final form of TOEFL is reviewed by at least one external consultant to ensure that the form is free of any language symbols or content that are generally considered potentially offensive to or inappropriate for major subgroups of the TOEFL test population, or that serve to perpetuate any negative attitude that may be conveyed to these subgroups. These consultants are specialists in cross-culture psychology, anthropology, or English as a foreign language and must have had significant experience living or working abroad. All questions are tried with selected groups of foreign students.

Statistical Analysis

The statistical analysis was performed using facilities at the Oklahoma State University Computer Center. The set of prewritten computer programs called the Statistical Analysis System (SAS) was used to plot regression coefficients, R^2 values, correlation coefficients, and p-values. ✓

The SAS Title, Label and Format capacities were used to identify tables and variables. The SAS procedure PROC PLOT Provided the plots which follow SAS procedure, SYSREG, provided the regression analysis and R^2 values, and the procedure CORR provided the estimates of simple correlation coefficients. Finally, the procedure summary provided means and standard deviations for various groupings of the data. Two computer ?

programs were used; both are shown in Appendix B.

TABLE I
RELIABILITIES AND STANDARD ERRORS OF
MEASUREMENT FOR TOEFL

Section	KR - 20 Reliability	SE of Measurement
I. Listening Comprehension	.88	2.2
II. Structure and Written Expression	.84	2.9
III. Reading Comprehension and Vocabulary	.89	2.5
TOTAL SCORE	.94	14.6

* Table 9. p. 24. ETS Manual (1981).

* Kuder - Richardson Formula (20).

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this study was to investigate the relationships between the scores of Test of English as a Foreign Language (TOEFL) and grade point average of international graduate students at Oklahoma State University.

The sample group was divided into Chinese, Indian and others (24 countries) and divided into male and female. The data for the students as a whole is presented first. ✓

The following hypotheses are not rejected:

Hypothesis 1: there is no significant relationship between the scores of TOEFL and GPA of international students.

Hypothesis 2: there is no significant relationship between the scores of LC and GPA of international graduate students.

TABLE II
VALUES OF THE ESTIMATED CORRELATION
COEFFICIENT FOR SAMPLE GROUPS

	r	p-value	r ²
H 1	.093	.300	.009 (.09%)
H 2	.093	.314	.009 (.09%)
H 3	.107	.232	.011 (1.14%)
H 4	.051	.571	.003 (.03%)

Hypothesis 3: there is no significant relationship between the scores of SW and GPA of international graduate students.

Hypothesis 4: there is no significant relationship between the scores of RV and GPA of international graduate students.

Table II shows the value of the estimated correlation coefficient. All the values are low, the highest being only .107. The observed significant level (OSL) or the p-value is reported for all hypotheses. Values reported are not statistically significant. Further the value of r^2 , the percentage of the variation in GPA explained by the linear regression of GPA on TOEFL score is quite low. The largest r^2 value is only 1.14%.

Figure 1 through Figure 4 illustrates the lack of pattern between GPA and TOEFL. High and low GPA are found throughout the range of TOEFL and subtest scores.

Next are the four hypotheses for each of the three groups of students beginning with the Indian students of Hypotheses Group II. The four hypotheses are:

Hypothesis 5: there is no significant relationship between the scores of TOEFL and the GPA of Indian graduate students.

Hypothesis 6: there is no significant relationship between the scores of LC and the GPA of Indian graduate students.

Hypothesis 7: there is no significant relationship between the scores of SW and the GPA of Indian graduate students.

Hypothesis 8: there is no significant relationship between the scores of RV and the GPA of Indian graduate students.

The four hypotheses of Group III with Chinese students are:

Hypothesis 9: there is no significant relationship between the

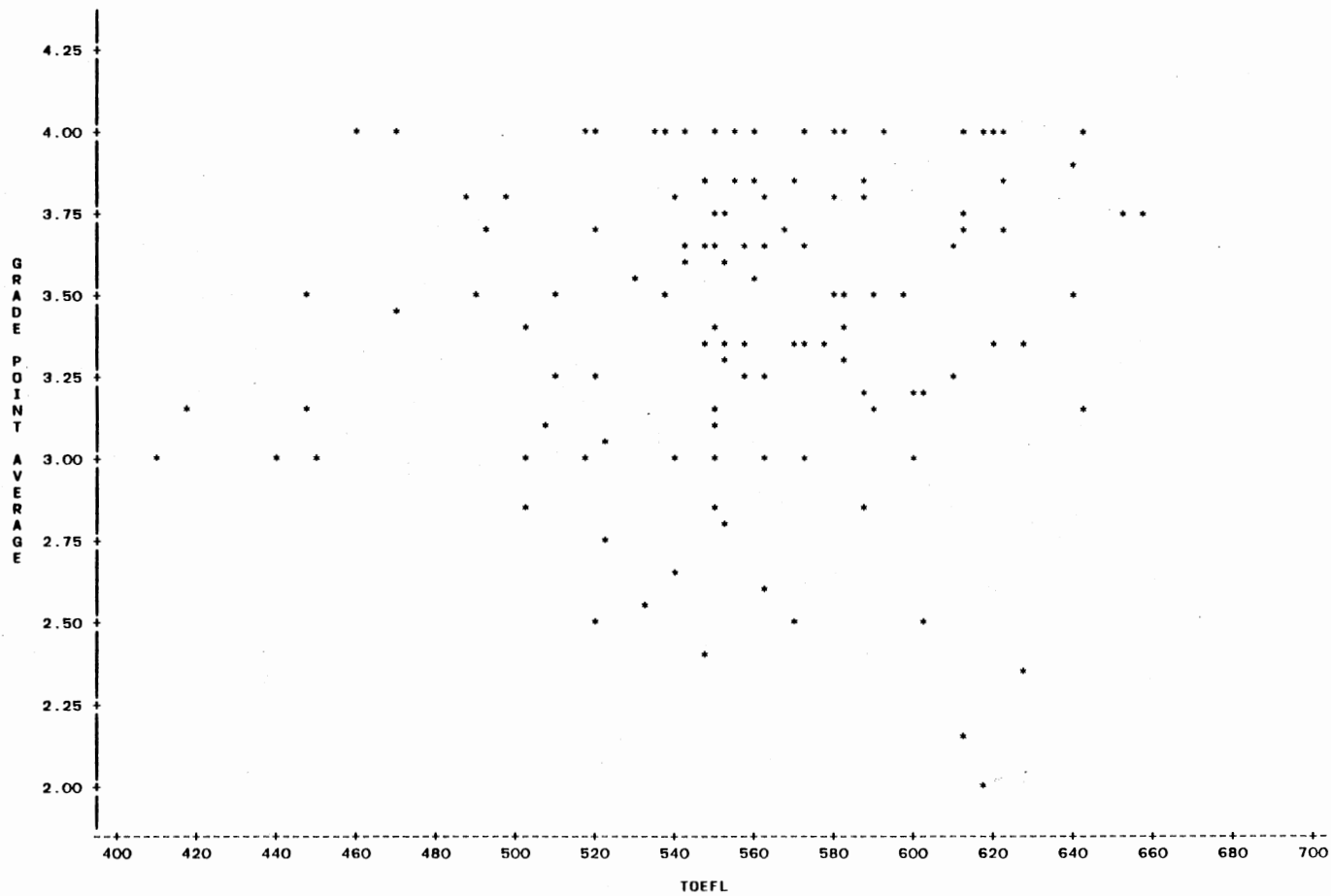


Figure 1. Plot of GPA and TOEFL Scores (Total TOEFL Scores for Whole Sample)

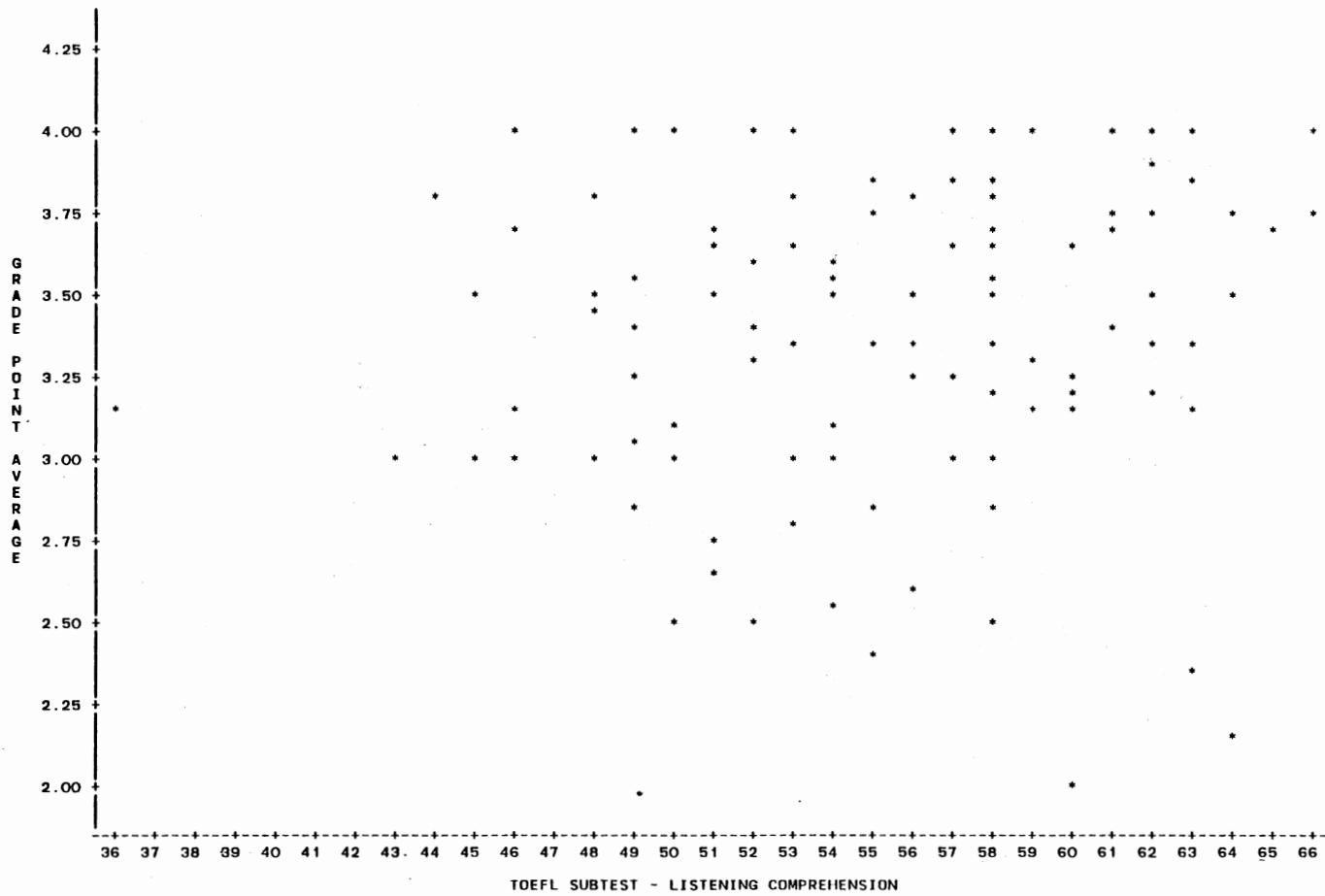


Figure 2. Plot of GPA and Listening Comprehension for Whole Sample

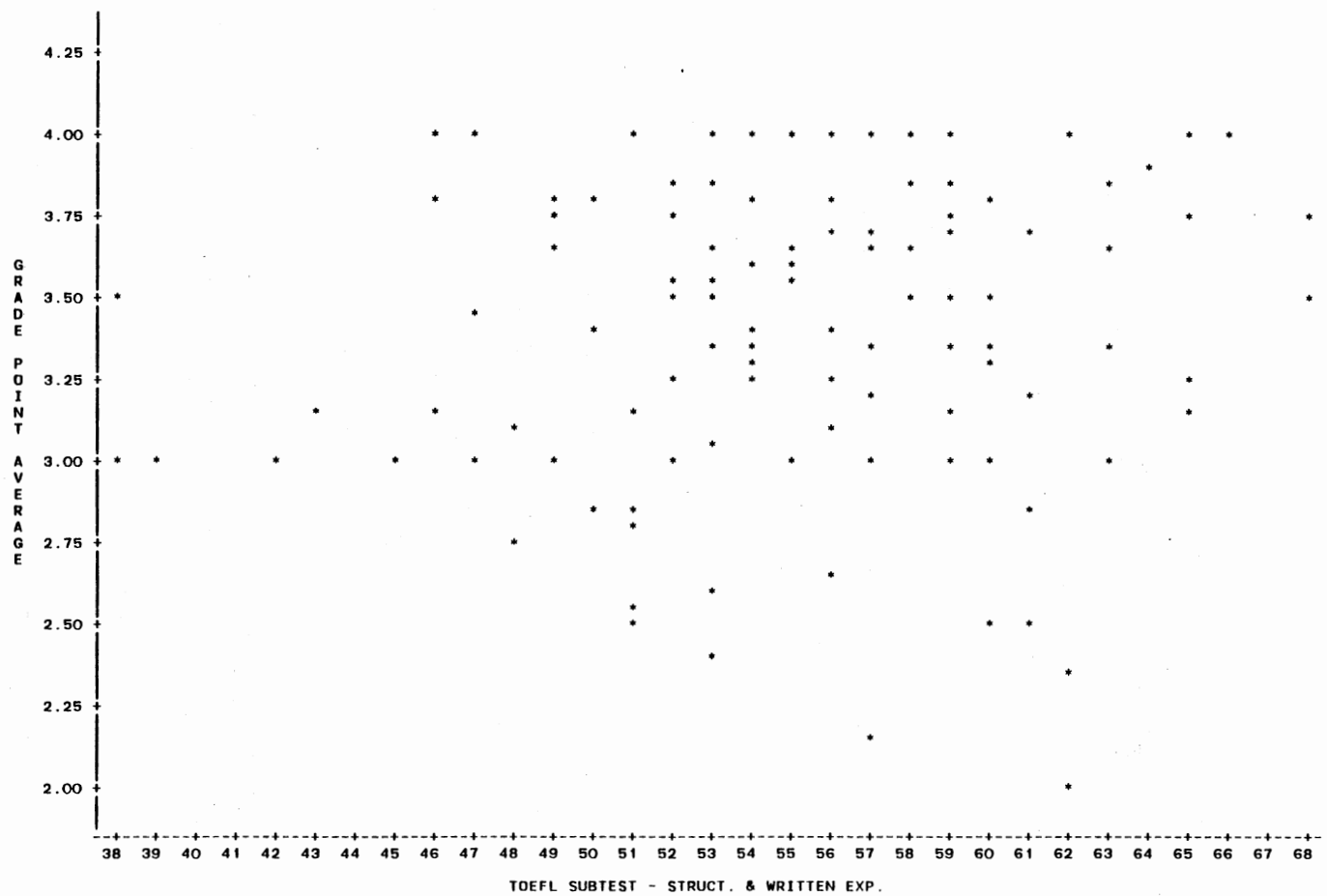


Figure 3. Plot of GPA and Structure and Written Expression for Whole Sample

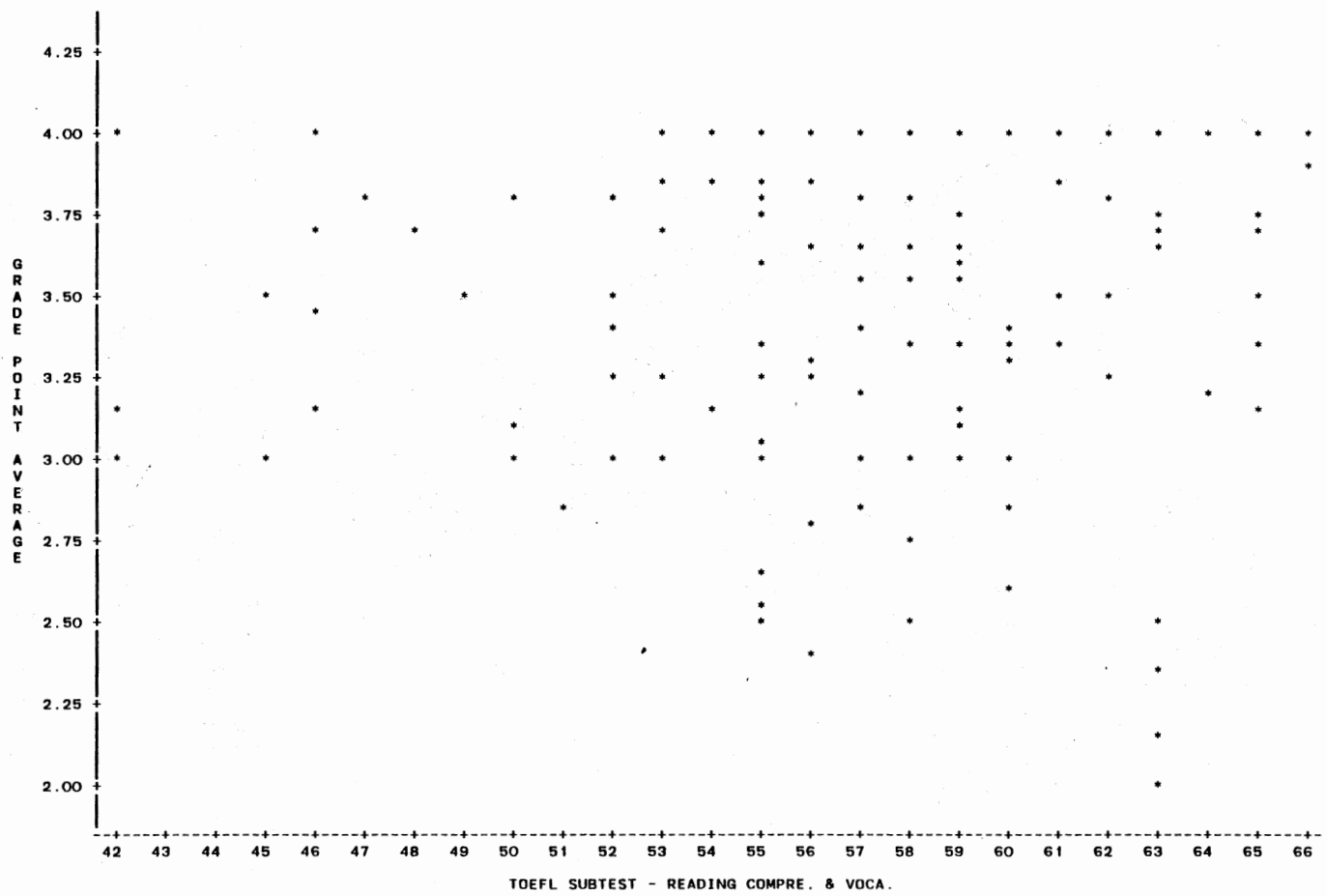


Figure 4. Plot of GPA and Reading Comprehension and Vocabulary for Whole Sample

scores of TOEFL and the GPA of Chinese graduate students.

Hypothesis 10: there is no significant relationship between the scores of LC and the GPA of Chinese graduate students.

Hypothesis 11: there is no significant relationship between the scores of SW and the GPA of Chinese graduate students.

Hypothesis 12: there is no significant relationship between the scores of RV and the GPA of Chinese graduate students.

The four hypotheses of Group IV with other country students are:

Hypothesis 13: there is no significant relationship between the scores of TOEFL and the GPA of other country students.

Hypothesis 14: there is no significant relationship between the scores of LC and the GPA of other country students.

Hypothesis 15: there is no significant relationship between the scores of SW and the GPA of other country students.

Hypothesis 16: there is no significant relationship between the scores of RV and the GPA of other country students.

Table III shows results similar to those of Table II previous all students, that is very low correlations. ✓

None of the 12 hypotheses was rejected. As seen in Table III, the value of estimated correlations are quite low, the highest being only .275. The values for all hypotheses are not statistically significant. ✓²
The r^2 values are very low, the largest r^2 value is only 7.56%.

The following four Figures (Figures 5 - 8) repeat Figures 1 - 4. However, the country of each student is represented by a letter, I for Indian, C for Chinese and O for others. As suggested by the low values of the estimated correlation coefficients, there is no pattern for any of the three country groups for the TOEFL scores or for any of the three subtest scores.

TABLE III
VALUES OF THE ESTIMATED CORRELATION COEFFICIENT
FOR SAMPLE GROUP II, III, AND IV

Group 2 -- Indians	r	p-value	r ²
H 5	-.011	.958	.01%
H 6	.008	.970	.01%
H 7	-.120	.878	1.44%
H 8	.121	.574	1.46%
Group 3 -- Chinese			
H 9	.222	.208	4.93%
H 10	.234	.184	5.48%
H 11	.275	.115	7.56%
H 12	-.100	.574	1.00%
Group 4 -- Other Countries			
H 13	.092	.458	.85%
H 14	.070	.573	.49%
H 15	.132	.283	1.74%
H 16	.062	.613	.38%

The eight hypotheses, 17 through 24, for male and female students are as follows:

Hypothesis 17: there is no significant relationship between the scores of TOEFL and the GPA of male international graduate students.

Hypothesis 18: there is no significant relationship between the scores of LC and the GPA of male international graduate students.

Hypothesis 19: there is no significant relationship between the scores of SW and the GPA of male international graduate students.

Hypothesis 20: there is no significant relationship between the scores of RV and the GPA of male international graduate students.

The four hypotheses for Group V, female students are:

Hypothesis 21: there is no significant relationship between the scores of TOEFL and the GPA of female international graduate students.

Hypothesis 22: there is no significant relationship between the scores of LC and the GPA of female international graduate students.

Hypothesis 21: there is no significant relationship between the scores of TOEFL and the GPA of female international graduate students.

Hypothesis 22: there is no significant relationship between the scores of LC and the GPA of female international graduate students.

Hypothesis 23: there is no significant relationship between the scores of SW and the GPA of female international graduate students.

Hypothesis 24: there is no significant relationship between the scores of RV and the GPA of female international graduate students.

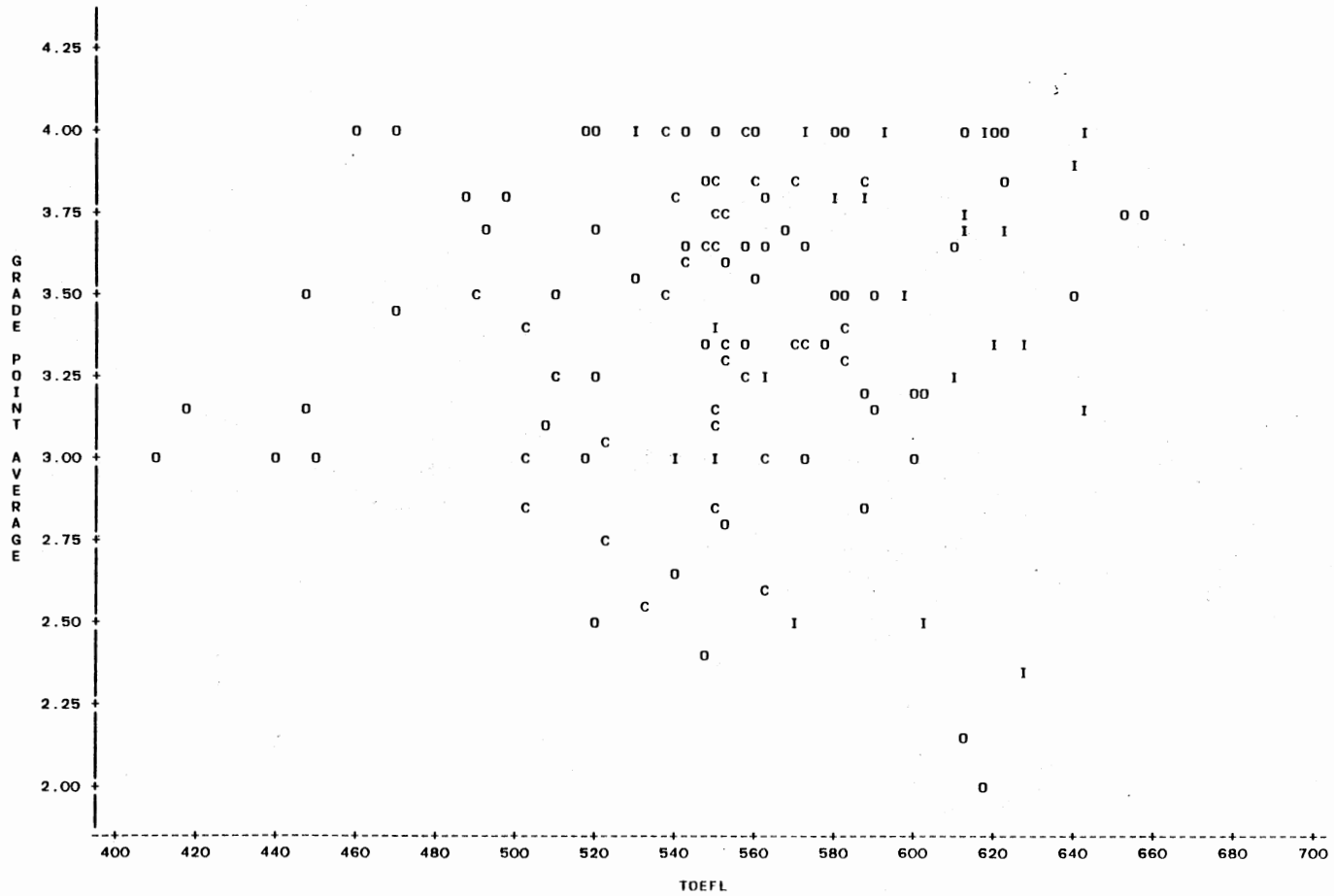


Figure 5. Plot of GPA and TOEFL Divided by Country

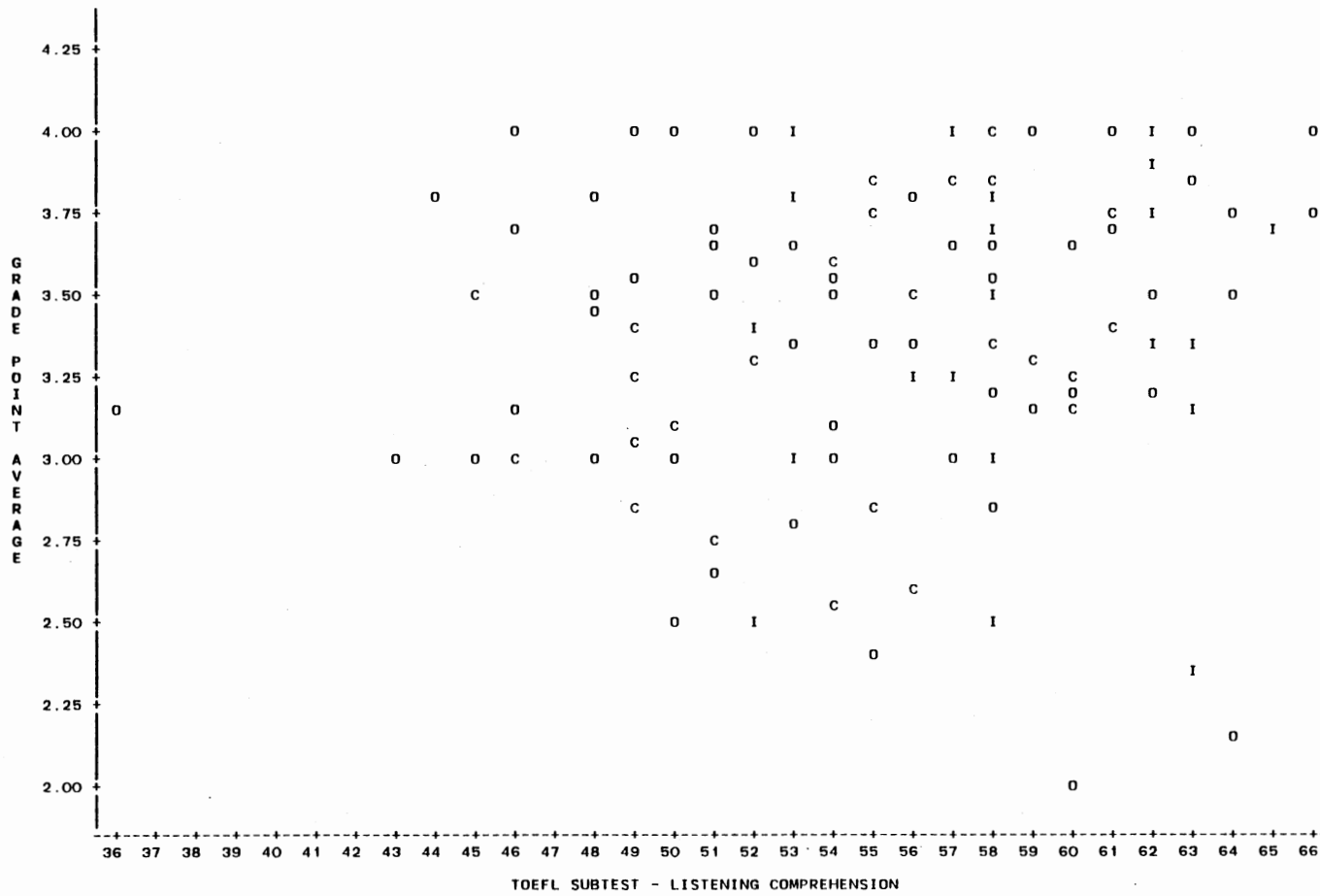


Figure 6. Plot of GPA and Listening Comprehension Divided by Country

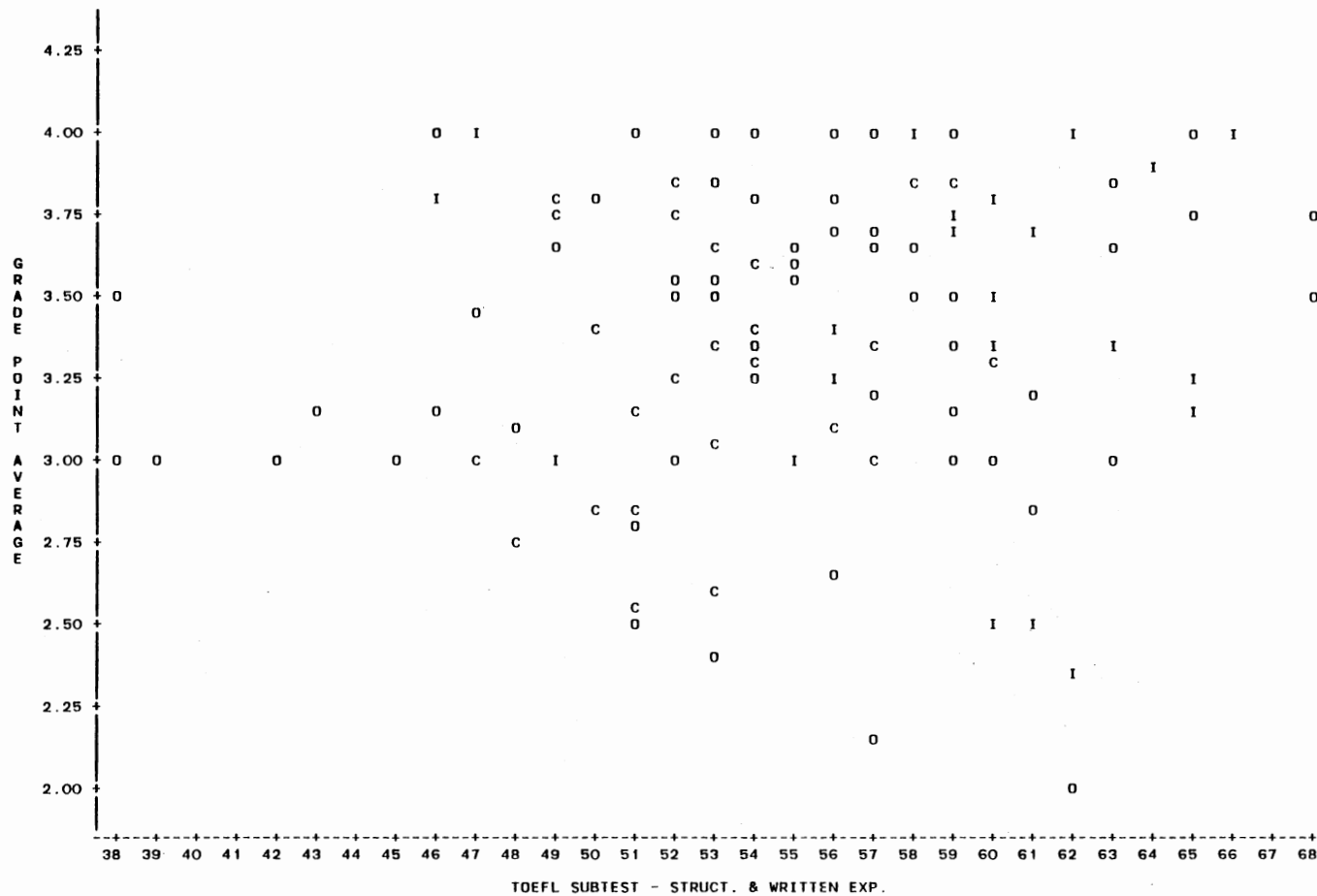


Figure 7. Plot of GPA and Structure and Written Expression Divided by Country

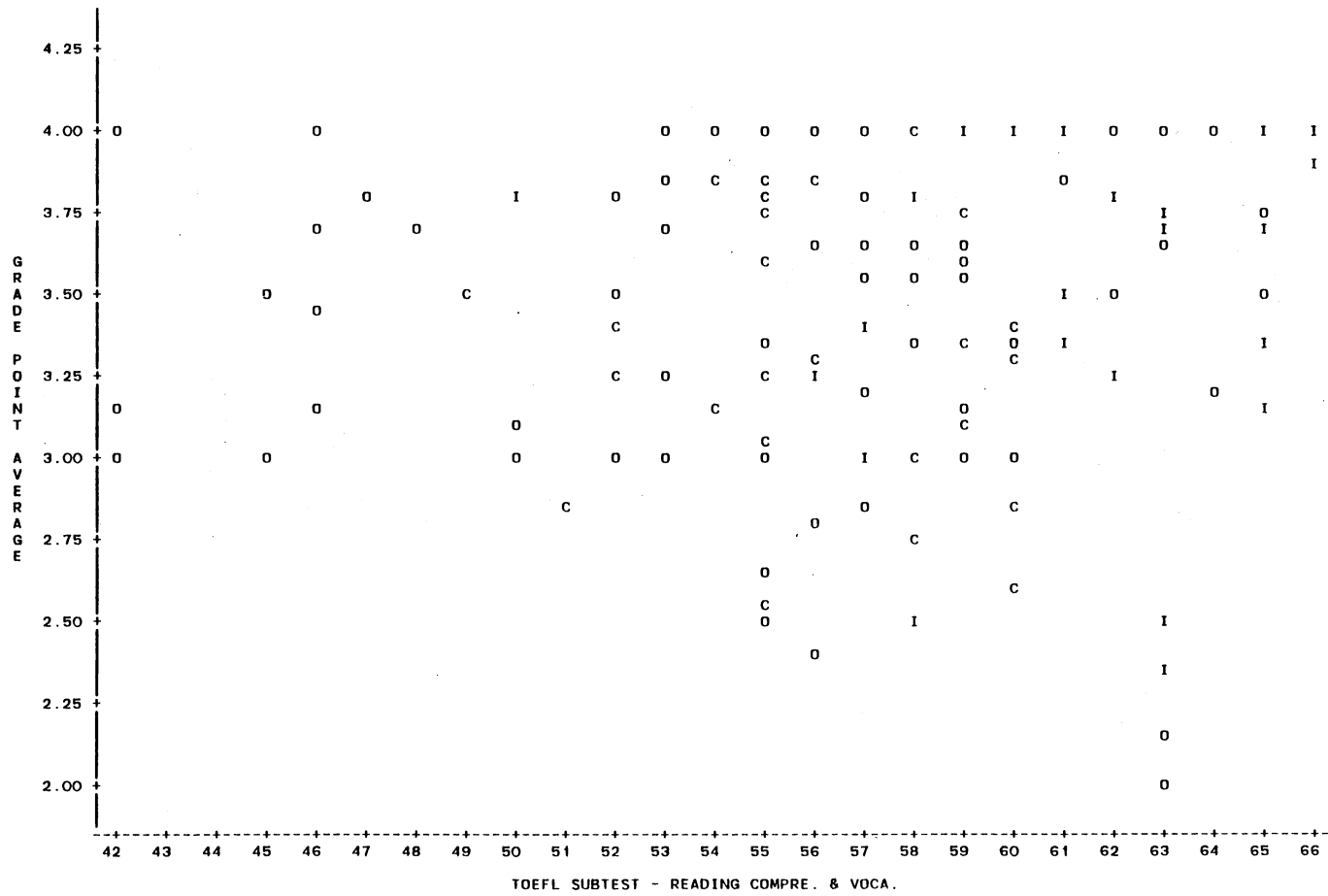


Figure 8. Plot of GPA and Reading Comprehension and Vocabulary Divided by Country

TABLE IV
VALUES OF THE ESTIMATED CORRELATION COEFFICIENT
FOR SAMPLE GROUP V AND VI

	r	p-value	r ²
H 17	.098	.354	.96%
H 18	.086	.413	.74%
H 19	.083	.434	.69%
H 20	.093	.376	.86%
H 21	.065	.172	.42%
H 22	.010	.575	.01%
H 23	.242	.169	5.86%
H 24	-.121	.496	1.46%

None of the eight hypotheses was rejected. As seen in Table IV, the value of the estimated correlations are very low, the highest being only .242. The p-value also are much higher than the level of significance .05, and the r² values are still very low, the largest r² is only 5.86%.

The following four Figures (Figures 9 - 12) repeat Figures 1 - 8. They make a more visible case for accepting the eight null hypotheses. The male student is represented by a letter M, with F for the female. As suggested by the low values of the estimated correlation coefficients, there is no pattern for any of the male or female groups for the TOEFL scores or for any of the three subtest scores.

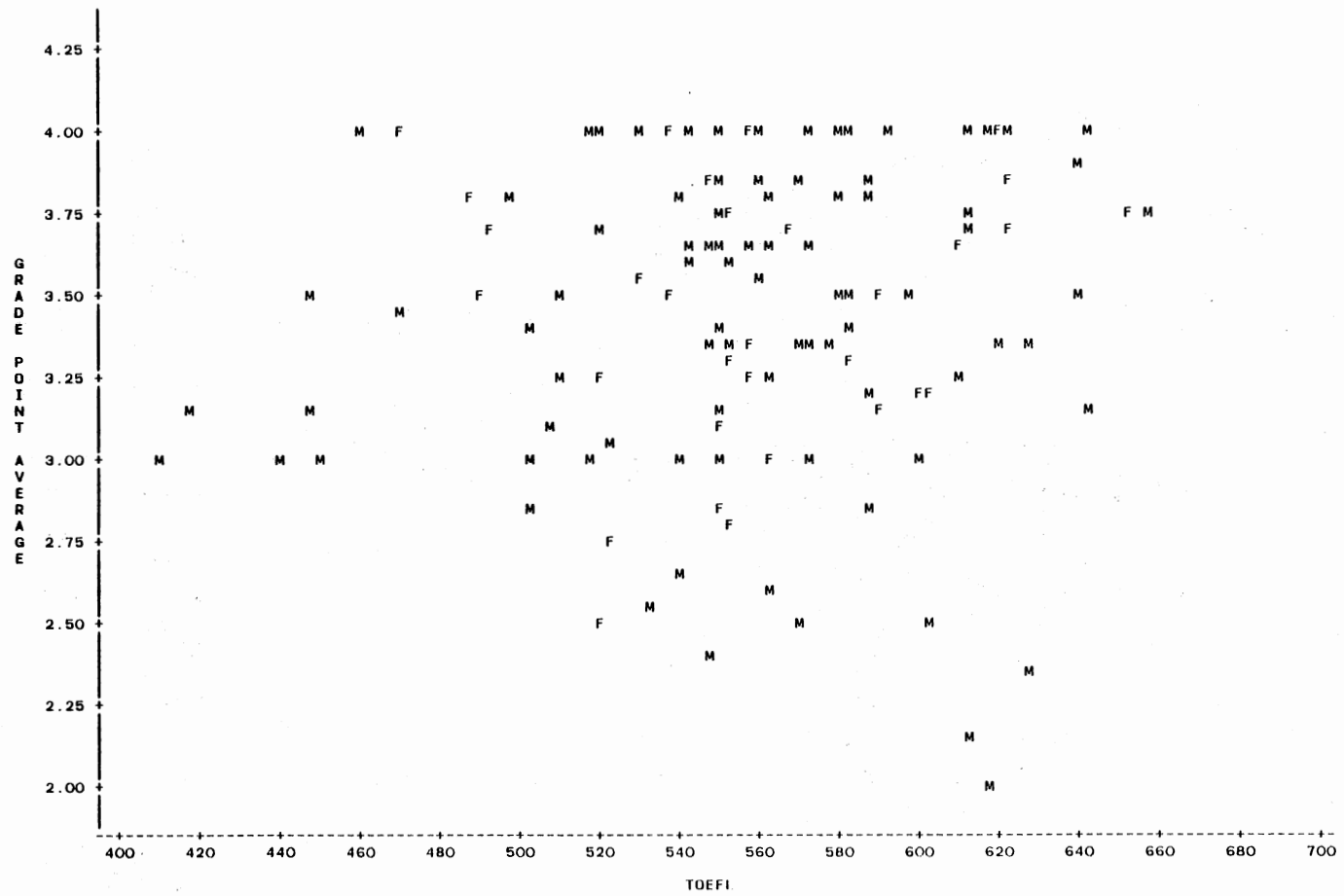


Figure 9. Plot of GPA and TOEFL Divided by Sex

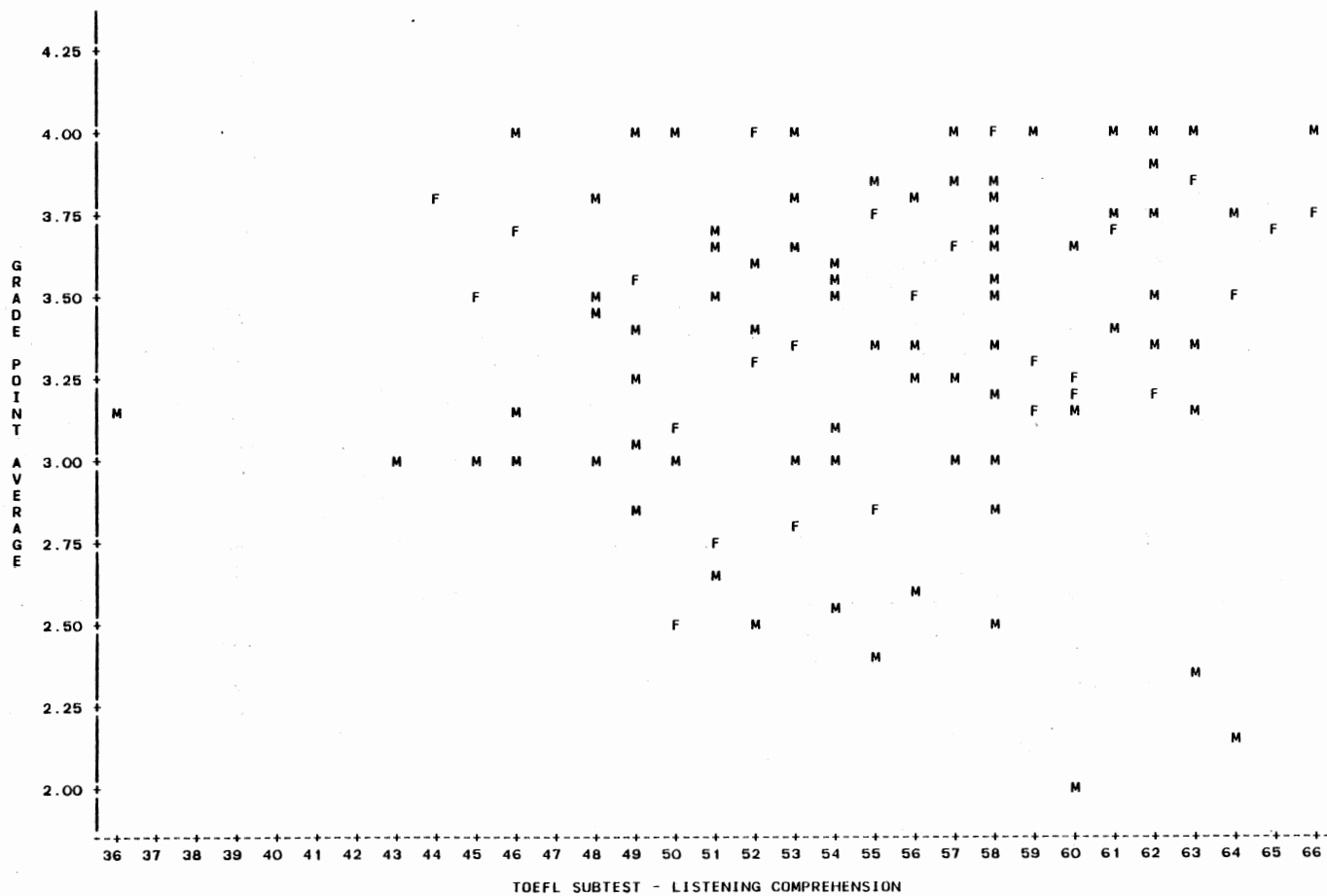


Figure 10. Plot of GPA and Listening Comprehension Divided by Sex

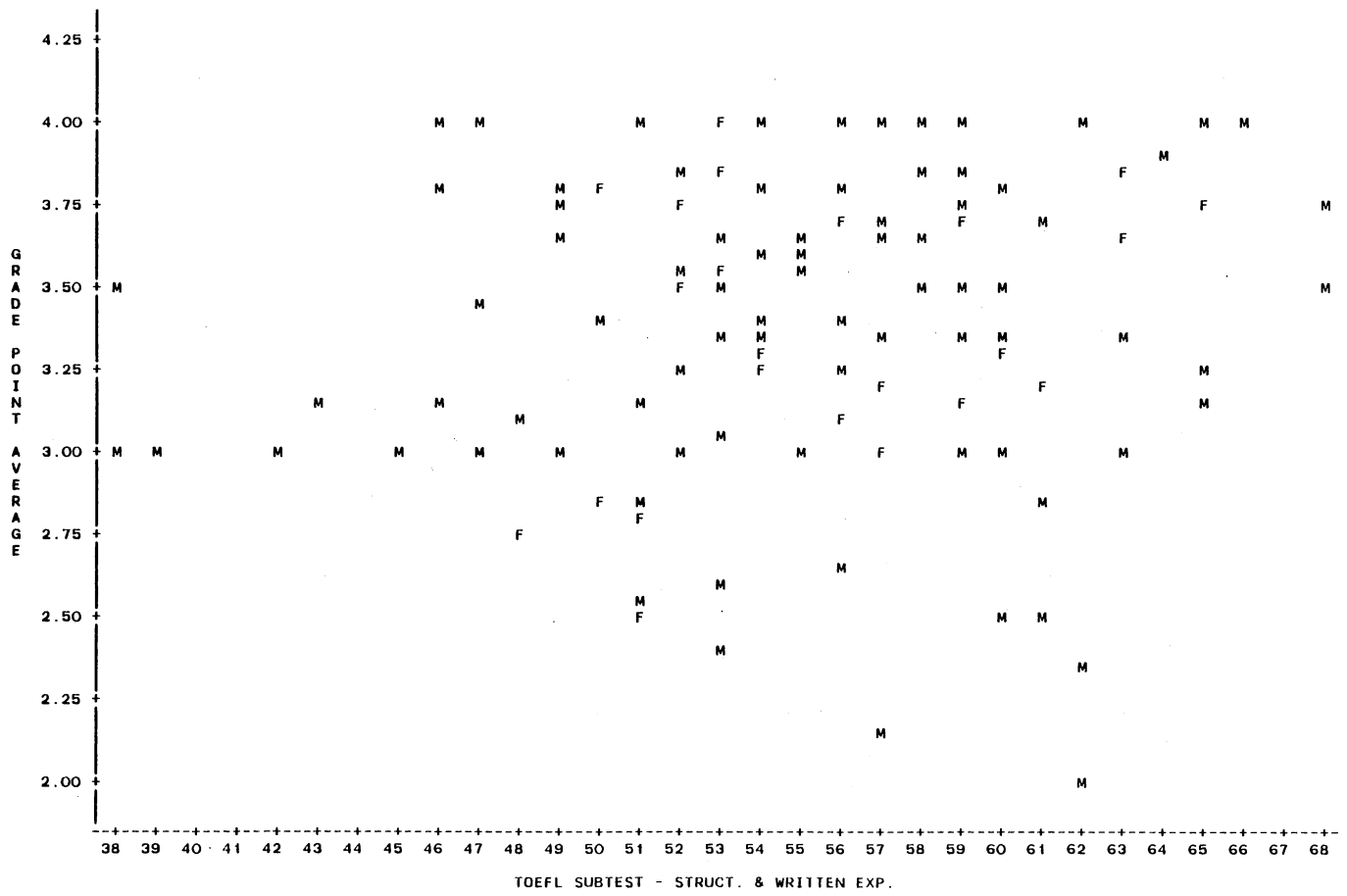


Figure 11. Plot of GPA and Structure and Written Expression Divided By Sex

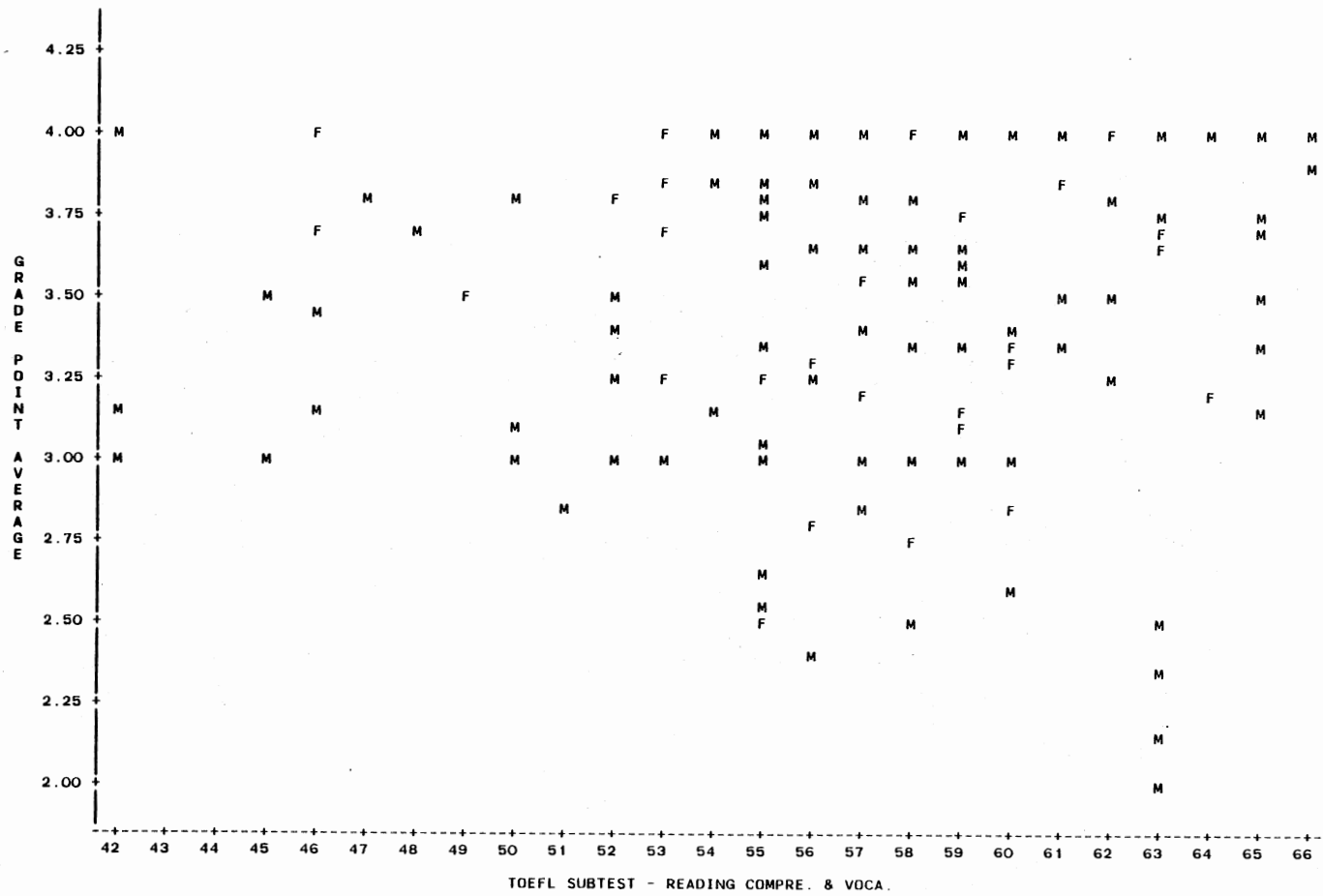


Figure 12. Plot of GPA and Reading Comprehension and Vocabulary Divided By Sex

Summary Table

The data used in this study permit consideration of GPA and TOEFL scores for males, females, Chinese, Indians, others and the combination of sex and country. Table V shows the GPA for this breakdown of our sample.

TABLE V
SUMMARY TABLE: GPA BY SEX AND COUNTRY

	China	India	Other	Total
Female	3.33 (.404)	3.71 (one observation)	3.54 (.419)	3.47 (.416)
Male	3.39 (.401)	3.45 (.517)	3.41 (.504)	3.42 (.418)
Total	3.37 (.397)	3.46 (.509)	3.45 (.481)	3.43 (.463)

(Mean and in parenthesis, Standard Deviation)

TABLE VI
SUMMARY TABLE: GPA BY SEX AND COUNTRY

	China	India	Other	Total
Female	548.1 (.404)	623.0 (one observation)	562.4 (.419)	558.8 (.416)
Male	545.9 (.401)	590.7 (.517)	542.2 (.504)	555.2 (.418)
Total	546.8 (.397)	592.0 (.509)	548.1 (.481)	556.1 (.463)

(Mean and in parenthesis, Standard Deviation)

We note in Table V that male and female average GPA are quite similar, 3.47 for the females and 3.42 for the males. The standard deviation are also similar, .416 versus .481. The Chinese subjects have the lowest average GPA, 3.37 versus 3.46 and 3.45 for Indians and others. However, we note that the standard deviation for the Chinese is somewhat smaller than for the other two groups .397 versus .509 and .481. This indicates both fewer very high and fewer very low GPA scores among the Chinese than among the Indians and others. The higher standard deviation for Indian and others indicates more dispersion in the GPA's for the two groups. This is to be expected for the others as this group contains students from many nationalities and many different educational systems.

Among the Chinese, male and females have the same GPA, 3.39 versus

3.33, but among the others the females have a slightly higher GPA, 3.54 versus 3.41. Table VI shows the average TOEFL scores. In summary this table shows:

1. Indian students had the highest average TOEFL score, 592. This is as expected as India is a country where English is widely spoken among the educated classes.

2. Chinese and others had about equal TOEFL scores, 546.8 and 548.1.

3. Chinese students have the lowest standard deviation, .397 versus .509 and .481.

4. Male and female students have about the same mean score and standard deviation, 555.2 , 558.8 and .418, .416.

5. Chinese male and female students had near equal scores, 545.9 and 548.1, and standard deviations .401 and .404.

6. Other female students did slightly better than males -- about 20 points higher. The standard deviation for females is also slightly lower than that for the males, .419 versus .504.

CHAPTER V

SUMMARY AND CONCLUSIONS AND RECOMMENDATIONS

The conclusions reported here are based upon the TOEFL scores and first year GPA of the 126 foreign graduate students who met the criteria for this study, as specified in Chapter III. They were admitted to OSU between the fall of 1979 and 1980 and had taken the three-section subtest TOEFL used after September 1976. They were from 26 countries, but grouped into Indian, Chinese and others, and males and females.

Grade point averages showed no correlation with TOEFL scores, neither with total TOEFL scores nor with any of the three subtests. No correlation were discovered for any of the groups: Indians, Chinese, males or females.

The lowest GPA scores were observed near the upper end of TOEFL scores (for example see Figure 9). Lower TOEFL scores, below 480, were observed to have GPA's ranging from 3.00 to 4.00. GPA scores below 3.00 had TOEFL scores from 500 to 630.

It is noted that the average GPA (and standard deviation) for students with a TOEFL score below 550 is 3.39 (.462), while for students with a TOEFL score of 550 or above the mean GPA is 3.45 (.465). It can be concluded that TOEFL is a measure of English language proficiency and it is inappropriate to use TOEFL scores in predicting academic performance.

While poor English language ability may hinder academic achievement, the causes for low GPA among foreign graduate students must be sought

elsewhere. Our data suggests that these students are successfully compensating for any weaknesses in language ability.

Recommendations

It is recommended that admission officials be aware of research findings on the relationship of TOEFL and academic work in the admission of foreign graduate students.

English proficiency is necessary but not sufficient in assessing foreign graduate student success.

Since data suggest that TOEFL scores --within the ranges of our study are poor predictors of academic achievement. Admission committees are advised to pay greater attention to other predictors of academic performance such as indicators of solid academic preparation and strong motivation. Denying admission to students with TOEFL scores below 550 will deprive the University of many otherwise qualified students --students which our data suggest would have good levels of academic achievement.

Our data suggests that the University has little to fear in the way of academic standards by admitting students with TOEFL scores below 550. Should the University be concerned with low levels of spoken ability being a hinderance to social and cultural communications, one course of action which would retain promising students would be to increase opportunities to study spoken, as opposed to written English. Courses in oral English would allow the University to overcome whatever social and cultural hinderances exist and at the same time retain a large number of qualified and academically promising graduate students.

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APPENDIX A

SELECTED SAMPLE OF INTERNATIONAL
GRADUATE STUDENTS

SEX AND COUNTRY COMPARISONS

OBS	ID	LC	SW	RV	GPA	TOEFL	SEX	COUNT
1	137	60	62	63	2.00	617	M	O
2	142	64	57	63	2.16	613	M	O
3	153	63	62	63	2.33	627	M	I
4	36	55	53	56	2.40	547	M	O
5	37	58	60	63	2.50	603	M	I
6	40	52	61	58	2.50	570	M	I
7	99	50	51	55	2.50	520	F	O
8	19	54	51	55	2.57	533	M	C
9	149	56	53	60	2.62	563	M	C
10	136	51	56	55	2.64	540	M	O
11	82	51	48	58	2.75	523	F	C
12	86	53	51	56	2.81	553	F	O
13	20	49	51	51	2.86	503	M	C
14	42	58	61	57	2.87	587	M	O
15	143	55	50	60	2.87	550	F	C
16	17	46	47	58	3.00	503	M	C
17	33	53	55	57	3.00	550	M	I
18	34	45	45	42	3.00	440	M	O
19	38	57	60	55	3.00	573	M	O
20	47	57	63	60	3.00	600	M	O
21	60	58	49	55	3.00	540	M	I
22	87	46	39	50	3.00	450	M	O
23	101	54	59	59	3.00	573	M	O
24	105	54	49	52	3.00	517	M	O
25	114	43	38	42	3.00	410	M	O
26	127	50	52	53	3.00	517	M	O
27	131	48	42	45	3.00	450	M	O
28	45	57	57	58	3.00	573	F	C
29	54	57	52	60	3.00	563	F	C
30	152	49	53	55	3.04	523	M	C
31	30	54	48	50	3.12	507	M	O
32	76	50	56	59	3.12	550	F	C
33	81	60	51	54	3.14	550	M	C
34	6	36	43	46	3.16	417	M	O
35	121	63	65	65	3.16	643	M	I
36	106	59	59	59	3.16	590	F	O
37	126	46	46	42	3.17	447	M	O
38	125	62	61	57	3.19	600	F	O
39	1	60	57	64	3.20	603	F	O
40	111	58	61	57	3.21	587	M	O
41	13	57	56	56	3.25	563	M	I
42	43	49	52	52	3.25	510	M	C
43	89	56	65	62	3.25	610	M	I
44	122	49	54	53	3.25	520	F	O
45	144	60	52	55	3.25	557	F	C
46	49	59	60	56	3.30	583	F	C
47	71	52	54	60	3.30	553	F	C
48	26	55	54	55	3.33	547	M	O
49	29	62	63	61	3.33	620	M	I
50	61	56	59	58	3.33	577	M	O
51	68	63	60	65	3.33	627	M	I
52	84	58	53	55	3.33	553	M	C
53	138	56	57	59	3.33	573	M	C
54	140	53	54	60	3.33	557	F	O
55	21	58	54	59	3.37	570	M	C
56	44	49	50	52	3.40	503	M	C

O = Other
C = China
I = India

SEX AND COUNTRY COMPARISONS

OBS	ID	LC	SW	RV	GPA	TOEFL	SEX	COUNT
57	53	52	56	57	3.40	550	M	I
58	52	61	54	60	3.42	583	M	C
59	88	48	47	46	3.46	470	M	O
60	48	62	68	62	3.50	640	M	O
61	63	51	59	65	3.50	583	M	O
62	66	51	38	45	3.50	447	M	O
63	130	48	53	52	3.50	510	M	O
64	133	54	58	62	3.50	580	M	O
65	135	58	60	61	3.50	597	M	I
66	124	45	53	49	3.50	490	F	C
67	148	56	53	52	3.50	537	F	C
68	67	64	52	61	3.52	590	F	O
69	41	58	52	58	3.57	560	M	O
70	103	54	55	59	3.57	560	M	O
71	59	49	53	57	3.57	530	F	O
72	70	54	54	55	3.60	543	M	C
73	72	52	55	59	3.62	553	M	O
74	22	53	58	58	3.64	563	M	O
75	11	60	55	57	3.66	573	M	O
76	77	51	57	59	3.66	557	M	O
77	93	58	49	56	3.66	543	M	O
78	145	58	49	57	3.66	547	M	C
79	146	53	53	59	3.66	550	M	C
80	118	57	63	63	3.66	610	F	O
81	69	51	57	48	3.70	520	M	O
82	109	58	61	65	3.71	613	M	I
83	134	65	59	63	3.71	623	F	I
84	9	46	56	46	3.72	493	F	O
85	73	61	56	53	3.72	567	F	O
86	15	61	49	55	3.73	550	M	C
87	90	64	68	65	3.73	657	M	O
88	14	62	59	63	3.75	613	M	I
89	97	66	65	65	3.75	653	F	O
90	150	55	52	59	3.76	553	F	C
91	151	56	56	57	3.79	563	M	O
92	8	58	60	58	3.80	587	M	I
93	28	48	54	47	3.80	497	M	O
94	32	58	49	55	3.80	540	M	C
95	113	53	46	50	3.80	497	M	I
96	141	58	54	62	3.80	580	M	I
97	117	44	50	52	3.81	487	F	O
98	83	55	58	55	3.83	560	M	C
99	39	63	63	61	3.83	623	F	O
100	25	58	59	54	3.84	570	M	C
101	24	58	53	53	3.84	547	F	O
102	12	57	58	61	3.85	587	M	C
103	147	57	52	56	3.86	550	M	C
104	104	62	64	66	3.88	640	M	I
105	10	66	54	64	4.00	613	M	O
106	16	61	59	55	4.00	583	M	O
107	35	53	59	60	4.00	573	M	I
108	50	59	65	63	4.00	623	M	O
109	55	49	57	57	4.00	543	M	O
110	74	50	51	54	4.00	517	M	O
111	91	62	66	65	4.00	643	M	I
112	95	50	46	42	4.00	460	M	O

O = Other

C = China

I = India

SEX AND COUNTRY COMPARISONS

OBS	ID	LC	SW	RV	GPA	TOEFL	SEX	COUNT
113	107	59	59	56	4	580	M	0
114	108	53	47	59	4	530	M	I
115	112	57	62	66	4	617	M	I
116	119	46	51	59	4	520	M	0
117	128	53	56	56	4	550	M	0
118	132	49	56	63	4	560	M	0
119	139	63	57	55	4	583	M	0
120	154	59	58	61	4	593	M	I
121	7	62	62	62	4	620	F	0
122	31	49	54	58	4	537	F	C
123	64	49	46	46	4	470	F	0
124	78	52	58	62	4	573	F	0
125	85	58	54	55	4	557	F	C
126	100	57	53	53	4	543	F	0

TOEFL BELOW 550

	GPA MEAN	S.D.	COUNT(N)
All	3.39	.462	45
Chinese	3.30	.432	13
Indian	3.60	.529	3
Other	3.40	.476	30
Male	3.34	.448	34
Female	3.54	.488	12

TOEFL 550 AND ABOVE

	GPA MEAN	S.D.	COUNT(N)
All	3.45	.465	80
Chinese	3.41	.379	21
Indian	3.44	.516	21
Other	3.49	.489	38
Male	3.46	.497	58
Female	3.43	.378	22

APPENDIX B

LISTING OF COMPUTER PROGRAMS

```
1 //CHANG JOB (XXXXX,999-99-9999) , 'HJIMING C' , CLASS=F , TIME=(0.05) , JOB 1771
  // MSGCLASS=E
  **JOBPARM FORMS=9001
  **ROUTE PRINT LOCAL
2 // EXEC SAS
16 //SYSIN DD *
  //
```

1

STATISTICAL ANALYSIS SYSTEM

22:33 TUESDAY, MARCH 8, 1983

NOTE: THE JOB CHANG HAS BEEN RUN UNDER RELEASE 79.5 OF SAS AT OKLAHOMA STATE UNIVERSITY (00420).

NOTE: SAS OPTIONS SPECIFIED ARE:
SORT=4

```
1      TITLE  TOEFL SCORES COMPARED TO GPA SCORES;
2      DATA SUBSC; INPUT LC SW RV GPA TOEFL @@ ;
3      LABEL LC = TOEFL SUBTEST - LISTENING COMPREHENSION;
4      LABEL SW = TOEFL SUBTEST - STRUCT. & WRITTEN EXP.;
5      LABEL RV = TOEFL SUBTEST - READING COMPRE. & VOCA.;
6      LABEL GPA= GRADE POINT AVERAGE;
7      CARDS;
```

NOTE: SAS WENT TO A NEW LINE WHEN INPUT STATEMENT
REACHED PAST THE END OF A LINE.
NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 5 VARIABLES. 433 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 172K.

```
40      PROC SORT; BY GPA;
```

NOTE: 4 CYLINDERS DYNAMICALLY ALLOCATED PER SORT WORK DATA SET.
NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 5 VARIABLES. 433 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.21 SECONDS AND 216K.

```
40      PROC PRINT;
```

NOTE: THE PROCEDURE PRINT USED 0.16 SECONDS AND 172K AND PRINTED PAGES 1 TO 3.

```
40      PROC PLOT; PLOT (LC SW RV GPA)* TOEFL='*';
41
```

NOTE: THE PROCEDURE PLOT USED 0.20 SECONDS AND 180K AND PRINTED PAGES 4 TO 7.

```
41      PROC PLOT; PLOT GPA * (LC SW RV) ='*';
```

NOTE: THE PROCEDURE PLOT USED 0.17 SECONDS AND 180K AND PRINTED PAGES 8 TO 10.

```
42      PROC SYSREG OUT=D1; MODEL LC =TOEFL; OUTPUT P=YHAT1 R=RESID1;
43
```

NOTE: DATA SET WORK.D1 HAS 126 OBSERVATIONS AND 7 VARIABLES. 317 OBS/TRK.
NOTE: THE PROCEDURE SYSREG USED 0.14 SECONDS AND 184K AND PRINTED PAGE 11.

```
43      PROC PLOT DATA =D1;PLOT RESID1*YHAT1='*'/VREF=0;
```

NOTE: THE PROCEDURE PLOT USED 0.12 SECONDS AND 180K AND PRINTED PAGE 12.

```
44      PROC SYSREG OUT=D2; MODEL SW =TOEFL; OUTPUT P=YHAT2 R=RESID2;
45
```

NOTE: DATA SET WORK.D2 HAS 126 OBSERVATIONS AND 9 VARIABLES. 250 OBS/TRK.
NOTE: THE PROCEDURE SYSREG USED 0.14 SECONDS AND 184K AND PRINTED PAGE 13.

```
45      PROC PLOT DATA=D2; PLOT RESID2*YHAT2='*'/VREF=0;
```

NOTE: THE PROCEDURE PLOT USED 0.12 SECONDS AND 180K AND PRINTED PAGE 14.

2

STATISTICAL ANALYSIS SYSTEM

22:33 TUESDAY, MARCH 8, 1983

46 PROC SYSREG OUT=D3; MODEL RV =TOEFL; OUTPUT P=YHAT3 R=RESID3;
47

NOTE: DATA SET WORK.D3 HAS 126 OBSERVATIONS AND 11 VARIABLES. 207 OBS/TRK.
NOTE: THE PROCEDURE SYSREG USED 0.14 SECONDS AND 184K AND PRINTED PAGE 15.

47 PROC PLOT DATA=D3; PLOT RESID3*YHAT3='*/VREF=0;

NOTE: THE PROCEDURE PLOT USED 0.13 SECONDS AND 180K AND PRINTED PAGE 16.

48 PROC SYSREG OUT=D4; MODEL GPA=TOEFL; OUTPUT P=YHAT4 R=RESID4;
49

NOTE: DATA SET WORK.D4 HAS 126 OBSERVATIONS AND 13 VARIABLES. 176 OBS/TRK.
NOTE: THE PROCEDURE SYSREG USED 0.15 SECONDS AND 184K AND PRINTED PAGE 17.

49 PROC PLOT DATA=D4; PLOT RESID4*YHAT4='*/VREF=0;

NOTE: THE PROCEDURE PLOT USED 0.12 SECONDS AND 180K AND PRINTED PAGE 18.

50 PROC SYSREG OUT=D5; MODEL GPA=LC SW RV; OUTPUT P= YHAT5 R=RESID5;
51

NOTE: DATA SET WORK.D5 HAS 126 OBSERVATIONS AND 15 VARIABLES. 153 OBS/TRK.
NOTE: THE PROCEDURE SYSREG USED 0.15 SECONDS AND 184K AND PRINTED PAGE 19.

51 PROC PLOT DATA=D5; PLOT RESID5*YHAT5='*/VREF=0;

NOTE: THE PROCEDURE PLOT USED 0.13 SECONDS AND 180K AND PRINTED PAGE 20.

52 PROC CORR; VAR LC SW RV TOEFL GPA;

NOTE: THE PROCEDURE CORR USED 0.13 SECONDS AND 172K AND PRINTED PAGE 21.

NOTE: SAS USED 216K MEMORY.

NOTE: SAS INSTITUTE INC.
SAS CIRCLE
BOX 8000
CARY, N.C. 27511

1 //CHANG JOB (XXXX.999-99-9999), 'HUIMING C', CLASS=F, TIME=(0.05), JOB 1876
// MSGCLASS=E
2 ***JOBPARM FORMS=9001
16 ***ROUTE PRINT LOCAL
// EXEC SAS
//SYSIN DD *

1

STATISTICAL ANALYSIS SYSTEM

13:54 TUESDAY, MARCH 22, 1983

NOTE: THE JOB CHANG HAS BEEN RUN UNDER RELEASE 79.5 OF SAS AT OKLAHOMA STATE UNIVERSITY (00420).

NOTE: SAS OPTIONS SPECIFIED ARE:
SORT=4

```

1 TITLE SEX AND COUNTRY COMPARISONS;
2 DATA SUBSC; INPUT ID LC SW RV GPA TOEFL SEX $ COUNT$ @@;
3 IF SEX = '1' THEN SEX = 'M'; IF SEX = '2' THEN SEX = 'F';
4 IF COUNT = '1' THEN COUNT = 'I'; IF COUNT = '2' THEN COUNT = 'C';
5 IF COUNT = '3' THEN COUNT = 'O';
6 LABEL LC = TOEFL SUBTEST - LISTENING COMPREHENSION;
7 LABEL SW = TOEFL SUBTEST - STRUCT. & WRITTEN EXP.;
8 LABEL RV = TOEFL SUBTEST - READING COMPRE. & VOCA.;
9 LABEL GPA = GRADE POINT AVERAGE;
10 LABEL COUNT = COUNTRY;
11 CARDS;

```

NOTE: SAS WENT TO A NEW LINE WHEN INPUT STATEMENT
REACHED PAST THE END OF A LINE.
NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 8 VARIABLES. 280 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.10 SECONDS AND 172K.

```

75 PROC FORMAT PRINT;
76 VALUE $S M=MALE F=FEMALE;
77

```

FORMAT: \$S

LOW VALUE	HIGH VALUE	LABEL
F	F	FEMALE
M	M	MALE

```

77 VALUE $C I=INDIA C=CHINA O=OTHER;

```

FORMAT: \$C

LOW VALUE	HIGH VALUE	LABEL
C	C	CHINA
I	I	INDIA
O	O	OTHER

NOTE: THE PROCEDURE FORMAT USED 0.08 SECONDS AND 184K.

```

78 PROC SORT; BY GPA;

```

NOTE: 4 CYLINDERS DYNAMICALLY ALLOCATED PER SORT WORK DATA SET.
NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 8 VARIABLES. 280 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.24 SECONDS AND 216K.

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STATISTICAL ANALYSIS SYSTEM

13:54 TUESDAY, MARCH 22, 1983

79 PROC PRINT;
80 *PLOT DATA BY SEX AND COUNTRY FOR ALL PAIRS OF VARIABLES;

NOTE: THE PROCEDURE PRINT USED 0.20 SECONDS AND 172K AND PRINTED PAGES 1 TO 3.

81 PROC PLOT DATA = SUBSC ;
82 PLOT (LC SW RV GPA) * TOEFL = SEX;
83 PLOT GPA * (LC SW RV) = SEX;
84 PLOT (LC SW) * RV = SEX;
85 PLOT LC * SW = SEX;
86 PLOT (LC SW RV GPA)*TOEFL=COUNT;
87 PLOT GPA * (LC SW RV)=COUNT;
88 PLOT (LC SW)*RV=COUNT;
89 PLOT LC * SW = COUNT;
90 *RUN REGRESSION EQUATIONS ON SUB SCORES AND GPA BY COUNTRY AND BY SEX;

NOTE: THE PROCEDURE PLOT USED 0.67 SECONDS AND 254K AND PRINTED PAGES 4 TO 23.

91 PROC SORT; BY COUNT;

NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 8 VARIABLES. 280 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.18 SECONDS AND 220K.

92 PROC CORR; VAR LC SW RV TOEFL GPA; BY COUNT;

NOTE: THE PROCEDURE CORR USED 0.16 SECONDS AND 172K AND PRINTED PAGES 24 TO 26.

93 PROC SYSREG; MODEL LC SW RV GPA = TOEFL; BY COUNT;

NOTE: THE PROCEDURE SYSREG USED 0.19 SECONDS AND 180K AND PRINTED PAGES 27 TO 29.

94 PROC SORT; BY SEX;

NOTE: DATA SET WORK.SUBSC HAS 126 OBSERVATIONS AND 8 VARIABLES. 280 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.19 SECONDS AND 220K.

95 PROC CORR; VAR LC SW RV TOEFL GPA; BY SEX;

NOTE: THE PROCEDURE CORR USED 0.15 SECONDS AND 176K AND PRINTED PAGES 30 TO 31.

96 PROC SYSREG; MODEL LC SW RV GPA = TOEFL; BY SEX;
97 *RUN REGRESSION ON BOTH COUNTRY AND SEX WITH INTERACTION;

NOTE: THE PROCEDURE SYSREG USED 0.17 SECONDS AND 184K AND PRINTED PAGES 32 TO 33.

98 PROC GLM DATA=SUBSC; CLASSES SEX COUNT;
99 MODEL GPA = TOEFL SEX COUNT SEX*COUNT;
100 OUTPUT OUT = GLMO PREDICTED = YHAT RESIDUAL = RESID;

NOTE: DATA SET WORK.GLMO HAS 126 OBSERVATIONS AND 10 VARIABLES. 226 OBS/TRK.
NOTE: THE PROCEDURE GLM USED 0.26 SECONDS AND 216K AND PRINTED PAGES 34 TO 35.

101 PROC PLOT; PLOT RESID*YHAT=SEX/VREF=0; PLOT RESID*YHAT=COUNT/VREF=0;
102 *CONSTRUCT A FREQUENCIES TABLE OF SEX BY COUNTRY;

NOTE: THE PROCEDURE PLOT USED 0.17 SECONDS AND 184K AND PRINTED PAGES 36 TO 37.

103 PROC FREQ DATA=SUBSC; TABLES SEX*COUNT/EXPECTED CHISQ;

3

STATISTICAL ANALYSIS SYSTEM

13:54 TUESDAY, MARCH 22, 1983

104 FORMAT SEX \$S. COUNT \$C.;
105 *GET LIST OF MEAN SCORES BY SEX*COUNTRY;

NOTE: THE PROCEDURE FREQ USED 0.15 SECONDS AND 176K AND PRINTED PAGE 38.

106 PROC SUMMARY; CLASS SEX COUNT; VAR GPA TOEFL LC SW RV;
107 OUTPUT OUT=SC
108 MEAN = MGPA MTOEFL MLC MSW MRV STD = SDGPA SDTOEF SDLC SDSW SDRV;

NOTE: DATA SET WORK.SC HAS 12 OBSERVATIONS AND 14 VARIABLES. 164 OBS/TRK.
NOTE: THE PROCEDURE SUMMARY USED 0.12 SECONDS AND 176K.

109 PROC PRINT DATA = SC;

NOTE: THE PROCEDURE PRINT USED 0.11 SECONDS AND 176K AND PRINTED PAGE 39.

NOTE: SAS INSTITUTE INC.
SAS CIRCLE
BOX 8000
CARY, N.C. 27511

VITA ²

Hui-Ming Chang

Candidate for the Degree of

Doctor of Education

Thesis: THE RELATIONSHIP BETWEEN TOEFL SCORES AND GPA SCORES OF
INTERNATIONAL GRADUATE STUDENTS AT OKLAHOMA STATE UNIVERSITY

Major Field: Curriculum and Instruction

Biographical:

Personal Data: Born in Shanghai, China, April 22, 1936, the son of
Pei-Hsin and Kway-Ying Chang.

Education: Received the Bachelor of Arts degree in English from
National Taiwan Normal University in 1967; received Master of
Science degree from Oklahoma State University in 1974; com-
pleted requirements for the Doctor of Education degree at
Oklahoma State University in July, 1983.

Professional Experience: Counselor, English Teacher, National
Taiwan Normal University Experimental High School, 1960-70;
English instructor, China City--Government College, 1970-72;
Graduate Assistant, Department of Curriculum and Instruction,
Oklahoma State University, Stillwater, Oklahoma 1975-78;
Consultant, Summer Institute for Educational Research on Asian
Americans, Boston University, Boston, Mass. Summer, 1980;
Reading Specialist, Olive Public High School, Drumright,
Oklahoma, 1980-82.