THE MEASUREMENT OF ENGLISH LANGUAGE PROFICIENCY OF HIGH SCHOOL GRADUATES

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ILS / TEFL

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A B S T R A C T

The historical development of the Ethiopian School Leaving Certificate Examination (ESLCE) - the transition from the General Certificate Education Examination (GCE) to the ESLCE and the creation of a new curriculum suitable for the Ethiopian context has been thoroughly discussed. Several attempts have been made to change the form of the ESLCE English examination from a subjective type to an objective one and to simplify the difficult items. Arguments for and against the subjective and the objective tests by various concerned people have been briefed in the review of literature. But the various attempts have not changed the situation any better. As a policy, the purpose of the ESLCE has been stated that the examination, at present, serves as a high school completion as well as college entrance examination. No substantial inquiry has been made regarding the dual nature of the examination. Due to its dual purpose, the writer of this thesis has attempted to make a survey study of the effectiveness of the ESLC English examination as a proficiency test, and if necessary to propose an alternative approach. Discussions are opened on the theories and principles of tests.

Out of 758 freshmen students enrolled for the 1981-2 second semester, 350 students have been selected for the study. Data have been collected for the 1980 ESLCE and the

1981 Freshmen English results by using a table of random sampling. Using the model of linear correlation coefficient attempts have been made to find out whether the 1980 ESLC English results and the 1981 Freshmen English results of the same students correlate or not. Findings show that the relation between the two examinations is very low. Those students who have obtained good grades in the ESLC English examination do not seem to show good English language performance at the University. Findings, therefore, prove that the ESLC English examination is ineffective in predicting the English language performance of twelve grade leavers when they join the University. Conclusions are arrived, based on the results, that the ESLC English examination is ineffective as a proficiency test on the grounds that (a) it cannot serve as a criterion for admission to the University. (b) it cannot be a measure for predicting students' language performance at the University level. To avoid such ineffectivensss, the writer recommends as a possible alternative approach that the Ministry of Education and the University should set two separate examinations - the Ethiopian School Leaving Certificate Examination (ESLCE) and College Entrance Examination (GCE) respectively, specifying the forms, contents and purposes of the two examinations. The writer makes it clear that the conclusion is not final

and perfect and suggests that further research and evaluation on other variables (syllabus, materials, quality of teachers, methodology etc) are urgently needed before moves are taken.

Declaration

I, the undersigned, declare that this thesis is my work and that all sources of material used for the this have been duly acknowledged.

Name TESFAYE GASHAW

Signature

Place and date of submission

Graduate School, June 1982

PREFACE

This thesis attempts to survey the effectiveness of the Ethiopian School Leaving Certificate Examination (ESLCE) as a proficiency test, and if necessary to propose an attentive approach. In October 1965, it has been stated that, at present, the ESLCE serves as grade twelve completion as well as college entrance examination. So far, no substantial inquiry has been made regarding the dual purpose of the examination. Because of the lack of any systematic study on the dual nature of the examination, the writer of the thesis has been forced to rely on secondary sources. The lack of primary sources is one of the limitations of this paper. Despite this limitation, attempts have been made to study the duality of the ESLCE in light of theories and principles of tests.

In principle, material production, teaching and testing are closely linked and interrelated. Weakness in any one of the above areas is reflected in the other areas. The greatest problem comes if we try to see them as separate and independent categories which do not form an integral part of the whole language teaching and learning system.

The scope of the study is limited to the 1981-2 Freshman students of Addis Abeba University. 758 students enrolled for the 1982 second semester are the writer's target population.

This thesis, in its frame work, is complete and can be considered as one step in identifying one single problem and suggesting possible alternatives. But the conclusion and recommendations are not final and perfect and need further research and evaluation. A research on other variables (syllabus, quality of teachers, methodology, etc) is urgently needed.

I owe much to my respected advisor, Dr. Hailu Araya, for his unreserved advice and encouragement to finish my thesis. I own much, again, to my best friend, Ato Mazengia Mekonnen, for his unselfish assistance in providing me with materials and sharing his opinion.

Tesfaye Gashaw

Addis Abeba

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INTRODUCTION

0.1. Historical Perspective

Before the present Ethiopian School Leaving Certificate Examination (ESLCE), grade twelve students sat for the London Matriculation Examination which later became the London General Certificate of Education Examination (GCE). In 1950[1], the ESLCE, administered by the University, was introduced in an experimental form. For some time, these two examinations, the London GCE and the ESLCE, ran parallel. In 1962, the Ministry of Education ceased to sponsor enteries from the government school system for the London GCE. During the same period, the Ministry of Education was active in the establishment of a new curriculum for secondary schools which would reflect more closely the precise requirements of the Ethiopian situation. In short, there was a movement from an external examination to an internal national examination and the creation of a new curriculum.

The creation of the new curriculum around 1955 had involved the Ministry of Education, the Addis Abeba University, the head masters of secondary schools and selected secondary school teachers. In the early years, when most secondary schools were in Addis Abeba, the examination secretary (then Mr. P. Trudeau)[2] had the tradition of calling informal meetings between himself and

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[1]All dates included in the paper are in Gregorian Calendar.

[2]Ministry of Education, "Comments on 12th grade examination", Addis Abeba (n.d) pp. 2 ff

head masters to discuss the previous examination each year. These meetings were not regular and after about 1957 were discontinued and the examination continued for several years without direct contacts between the ESLCE Office, the Ministry of Education and the schools. During this time, contact was maintained only through a series of letters largely consisting of complaints written by secondary school directors to the ESLCE Office. But in 1962, a conference was held to examine closely the ESLCE. An agreement was reached among all parties in the conference on both the content of the curriculum and the content and structure of the examination.

Later on, on the initiative of the Ministry of Education, a conference was called to discuss the 1970 examination results and to consider possible changes in the 1971 examination. The committee agreed on minor changes in the examination format. Again, another conference was held in 1972 to discuss the 1971 examination and the committee considered proposals for modifications of future examinations. It was agreed that a complete review of the 1972 examination results should include:

a. an evaluation of the ESLCE as a General School Leaving Certificate examination.

b. an evaluation of the ESLCE as a College Entrance examination.

The awarding of a pass in the English language at "C" level is accepted as an assurance by the examiners that the student is fit to enter a course of higher studies at institutions where the medium of instruction is English. To what extent is this assurance borne out by the student's performance in the various courses at the University?

Before we go to the problem in detail, we shall have a brief discussion on the theories and principles of language testing. Evaluation is carried out through tests or measurements. The units of measurement are read as "scores" and the scores should be interpreted. Evaluation, therefore, is a concrete concept, i.e. it evaluates something. The things to be evaluated are determined by the objective set by the test designer. It is the purpose of the test that shapes the form and content and not vise-versa. In addition, before a test is constructed, it is important to consider the standards which are being set. What standards, for example, should be demanded of learners of a foreign language? Therefore, evaluation depends on the objective or purpose and level set by the test designer.

0.3. Characteristics of Good Tests

We shall go further and examine the major characteristics of a good test.

Validity - a test has to be valid, i.e. it should measure what is intended to measure and nothing else.

Reliability - a test has to be reliable, i.e. it has to yield consistent readings over a period of time.

Back Wash Effect refers to the effects of a test on teaching. If a test has a good back wash effect, it will exert a good influence on the learning and teaching that takes place before the test.

Scorability - Can the test be scored with ease so that the users may be able to handle it?

Economy - Does the test measure what we want it to test in a reasonable time considering the testing situation? If it does, the test is practical and economical.

Administrability - Can the test be given under the conditions that prevail and by the personnel that is available.

Tests can be designed to serve different purposes. One single test serves one single purpose. There are different types of test, but this study deals only with achievement and proficiency tests. First we shall consider the major features of achievement test.

0.4. Features of an Achievement Test

Generally based on syllabus .

Measures what has been taught and learned.

Designed primarily to measure individual performance rather than to act as a means of motivating the students or re-inforcing learning.

Several achievement tests are standardized and pre-tested.

Norms are established.

Comparison is made between performance of different students and different schools.

0.5. Features of a Proficiency Test

In no way related to any syllabus or teaching program.

Concerned simply with measuring the students' control of the language in the light of what he will be expected to do with it in his future performance of a particular task.

Concerned with measuring not general attainment but specific skills in light of the language demands made later on the student by his future course of study or job.

Often administered to students from various language-learning background.

If the purpose of a test is to find out how much of a particular lesson, course book or syllabus the students

have learnt, then, we need an achievement test. If our purpose is to find out the students language level, irrespective of which materials, etc., they have been exposed to, then, we need a proficiency test.

As far as the ESLCE is concerned, there is no problem if it is taken as an achievement test. It is a good examination in serving its purpose, i.e., measuring what has already been taught and learned. The problem comes when it is used to serve as college entrance examination. To try to make an achievement test fulfill two functions is mixing two different types of test with different objectives. The dual nature of the ESLC English examination may contribute to its inadequacy and ineffectiveness. It is the dual purpose of the ESLC English examination that initiated the writer of this thesis to survey the effectiveness of the ESLC English examination as a proficiency test.

0.6. Glossary of Terms

Not all disciplines and experts give the same definition to one term. Here, attempts will be made to define terms in relation to language tests. The definitions of the various concepts lend themselves well to the classification of language tests and will be of value in helping us in the preceding and succeeding chapters to differentiate among the principal testing objectives.

Achievement Test - According to Heaton, it is a test designed primarily to measure individual performance rather than to act as a means of motivating the student or re-inforcing learning. Based on a syllabus it measures what has been taught and learned.

Back Wash Effect - Heaton refers it to the effect of a test on teaching. If a test has, a good back wash effect, it will exert a good influence on the learning and teaching that takes place before a test and the vise-versa.

Close Procedure - Oller defines it as a test construction procedure that involves deleting words on systematic basis and replacing the deletions with blanks which the learner must fill in.

Correlation Coefficient - The purpose of correlation coefficient, Borg and Gall say, is to express in mathematical terms the degree of relationship between any two variables.

Discrete-point Test - An analytical language test, defines oller, based on the notion that one and only one point of grammar should be tested at a time, that one and only one skill should be assessed at one time, that one and only one component of grammar should be assessed at a time, and that productive and receptive repertoires, as well as oral and visual repertoires

should be tested separately.

Examinations and Tests - As Common Wealth Educational Liason Committee defines it in "Tests and Examinations in English", Examinations and examination questions can be variously divided into objective or non-objective, written or oral. A further distinction between tests and examinations is often useful, the term "test" being reserved for a carefully constructed and validated instrument for measuring aptitude or achievement either singly or as of a set.

Linguistic Competence - A term, Oller defines, popularized by professor Noam Chomsky, that contrasts with linguistic performance. Essentially, linguistic competence is interpreted as the internalized grammar on which the creative use of the language is used.

Linguistic Proficiency - Oller defines it as a term from the language - testing literature that is used to refer to the type of grammatical skill that linguists talk about.

Population - According to Borg and Gall, the larger group we wish to learn about is called population, where as the smaller group we actually study is called a sample. Sampling involves the selection of a portion of a population as representative of that population.

Random Sampling - Borg and Gall define it as one in which each individual in the defined population has an equal change of being included.

Reliability - According to Oller, it is the degree to which a test produces similar results on different occasions under similar conditions.

Standard Deviation (S.D) - Standard deviation, Borg and Gall define, is a measure of the extent to which scores in a distribution on the average deviate from their mean. The mean is calculated by dividing the sum of the scores by the number of scores.

Standard Test - David P. Harris defines it as a formal, large scale instruments which are prepared by profossional testing services to assist instructions, in the selection, placement and evaluation of students.

Validity - Oller defines it as a degree to which a test actually measures what is supposed to measure.

CHAPTER ONE

1. Review of Literature

Much research has gone into the setting of the Ethiopian School Leaving Certificate English Examination. Considerable attention has been given by different experts at different times. The arguments for and against the examination and the findings of the investigations are easily available to interested readers at the Education Research Centre. There are certain limitations to this part of the thesis. The writer of this thesis could not come across any primary source. However, attempts will be made to summarize on the various comments, suggestions and criticisms made on the ESLC English examination by experts. A brief summary of the works done on problems related to the one hand will here be given.

1.1 Comments, Suggestions and Criticisms on the ESLC English Examination

In a seminar on the English Curriculum, January 1967, Dr. Harold S. Madessen in a "Dialogue on Objective Examination of English Language Skills" advocates that objective tests are capable of revealing even very sophisticated skills in writing. Such tests, he says, have won broad acceptence. For instance, he argues that two years earlier, D.W. Grieve, a British English language specialist, advocated that West Africa abandon its essay-precis, school leaving examination for a more objective test. He goes on further to say that

Paul B. Diederich, a renowned test expert in English assures us that objective tests can provide a very sound measurement of language skills. Former National Council of Teachers of English (N.C.T.E.) presidents Dora V. Smith and John C. Gerber hold similar views. Further, he says, Edith Huddleston is one of many English experts who assert objective questions are superior to essay as test instruments "because they can sample a wider area of subject matter in a given length of time; and inevitably the objective tests can be more reliably scored." To substantiate her claims, she cites several studies, including her own Ph.D. dissertation, a study made at the request of the College Entrance Examination Board.[6] Each of these studies point out the superiority of objective examination to the essay examination in regard to the ESLC English examination.

On the other hand, Mr. Lionel Thompson, English Language Teaching (ELT) adviser to the Ministry of Education in his assessment of the ESLC English examination in connection with its implications for the successful carrying out of the Education Sector Review writes an analysis and evaluation of the examination to Dr. Ayalew G.Selassie on

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[6]Harold S. Madessen. "A Dialogue on Objective Examinations of English Language Skills", Seminar on the English Curriculum, January 1967, PP. 6-7.

the 8th of August 1973. He stresses the dual nature of the examination and the vital role played by the ESLCE in the Ethiopian education system. He raises the following ten points in criticizing the objective test of 1973.

1. It is unbalanced in its internal allocation of testing areas.
2. It is extremely restricted in the areas of the language communication skills which it attempts to assess.
3. It is limited in its failure to test more than one level of grammatical structure.
4. It fails to make any use at all of the numerous objective production techniques.
5. It tests peripheral, para-linguistic skills, but not the basic skills.
6. It does not appear to be based on a corpus of material which has been made available to students.
7. It betrays a lack of basic objective TEFL testing techniques.
8. There is confusion between which areas of language are being tested in the different section.
9. Many of the items lack face validity.

10. There is lack of awareness of basic validation procedure.[7]

The sum total of the defect of the 1973 ESLC English examination, he says, is that it is not a good measure of students' ability to communicate in, or other wise control, spoken and written English. A final serious defect he pointed out in the ESLC English examination as a whole is the fact it is used as a means of entrance to the university. He points out that this dual use of the ESLCE runs contrary to the whole aim of the Education Sector Review as it causes the needs of university entrance to dominate the whole of the Ethiopian education system. He goes on to say that not only is this dual use of the ESLCE unfortunate from an educational and osychological point of view, but it is also inefficient from a professional testing stand point. Mr. Thompson suggests that the examination should include as many areas of language communication (both written and oral) as it is possible to cover, using latest objective techniques.

Another attention was focussed on the ESLCE by the University Testing Centre in November 1971 in a report for Freshmen English staff on "The Interpretation of the Results of the Michigan Test of English Language Proficiency Administered to Freshmen Students at HSIU".

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[7]Lionel Thompson. "The Ethiopian School Leaving Certificate Examination in 1973", Addis Abeba, 1973, P.1.

Scores obtained by university students enrolled in English 111 and English 102 on the Michigan Test of English Language Proficiency were analyzed and test recommendations were given in terms of the success students had experienced in college by the category of their scores on the Michigan Test of English Language Proficiency. The results of the study revealed that in the case of English 111 only 6 percent of the students would be considered able to carry a full-time academic load at a university in which the language of instruction is English. In the case of English 102 students less than one percent would be considered able to carry a full-time course load.[8] But the report warns that the reader must realize that the percentages reported are based upon academic success in universities in the United States and should not be interpreted on 1:1 basis for Addis Abeba University. The report's recommendations were as follows:

> "However, it is incumbent upon the administration as well as the faculty to take cognizance of this information and consider ways of remedying the English deficiencies that exist in the entering of Freshman class. If the manpower needs of Ethiopia are to be met and the university fulfill its commitment to the nation it would seem that careful advising should and must

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[8] University Testing Centre. "The Interpretation of the Results of the Michigan Test of English Language Proficiency Administered to Freshman Students at HSIU", Addis Ababa, November 1971, PP. 1-5.

> be instituted to prevent the student from being over loaded with course work before he/she is competent in English Language as long as the instruction and reading materials assigned are in English."[9]

Mr. M.G. Andrews, in his article "Testing Comprehension in ESLC Examination", criticizes the Comprehension part of the ESLC English examination on the grounds that it lacks validity and specific purpose. He suggests that the comprehension part of the ESLC English examination might be improved in two ways. First, he suggests that it could be made a more valid test of comprehension by improving the form and objectivity of the questions. Second, he suggests that a thorough investigation should be made of exactly what we would expect twelfth grade students in Ethiopian schools to understand - what vocabulary items, what grammatical structure and more difficult, what degree of complexity of ideas should be found in the passage. He believes that we can make the ESLC English Comprehension Examination a better test by having a more precise knowledge of what we are testing and by excluding from the test as far as possible all other language skills.

Another problem area of the ESLC English examination was also discussed by a committee on the 1981

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[9]Ibid., P.7.

examination. The Committee, after thoroughly assessing the 1981 examination commented that some words like 'pestilence' and 'benevolence' (questions 162 and 163) cannot be expected to be known by the majority of the candidates. Too much time is spent in answering 30 comprehension and vocabulary questions by which a great deal of the candidate's time is wasted. Again, in the assessment, it was found out expressions number 236 (not mentioned) may not be commonly heard by the Ethiopian candidates. After the comment, suggestions were made that the format of the paper be designed in such a way that there will be one comprehension passage of about 500 words, with 15 to 20 comprehension and vocabulary questions, about 20 to 30 questions on sentence meaning, more questions on grammar and usage with few questions on mechanics. It also suggested that the time and number of questions within the range of the candidate's ability should be increased respectively.

The above brief summary of related works reveals the attention given by the concerned people to the problems of the ESLC English examination. Findings of the above summary have been largely supported by a number of comments, suggestions and criticisms that have employed essentially the same approach by concerned people like Lee O'Keeffe, Faculty of Education, Ronald Forrest on

"English in Grade 12" etc,. For our purpose the above brief summary would suffice.

1.2 Trends and Procedures of Tests

At best tests represent no more than refined and systematized process of observation. The increasing use of tests have been accompained by an increasing flow of comments. The reasons are easy to see. Robert C. Ebel in Social Consequences of Educational Testing comments as follows:

> "Test scores are sometimes misused and even if they are flawless and used with the greatest skill, they would probably still be unpopular among those who have reason to fear an impartial assessment of some of their competence."[10]

1.2.1 Teacher-made and Standard Test

In any consideration of educational testing, a distinction must be drawn between teacher-made and standard tests. Classroom tests are generally prepared, administered and scored by one teacher. In this situation test objectives can be based directly on course objectives. In as much as the instructor, the test writer and the evaluator all are the same individual, the students know pretty much what is expected of them - what is likely to

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[10] Perspective in Educational and Psychological Measurement. edited by Glenntt Hracht, Kneeth D.Hopkins, Julian Stanely - Prentice-Hall, Inc., Englewood Cliffs, N, J, 1972, P.4.

be covered by the test questions and what kind of standards are likely to be applied in the scoring and the interpretation of results. Moreover, it is likely that the teacher's ultimate evaluation of his students will be based on a number of tests and other measurements, not just one.

Standard test is designed to be used with thousands and sometimes hundress of thousands of subjects throughout a nation or the world and prepared (and perhaps administered, scored and interpreted) by a team of testing specialists with no personal knowledge of the examinaes and no opportunity to check the consistency of individual performance.

1.2.2 What is a close Procedure?

When one discusses language tests today, one has to mention close procedure which was developed by Taylor.

What is a close test? John Oller in an interview in July 1976 says:

> "A close test is merely a passage with blanks integrated for words that have been deleted. Usually every fifth, sixth or seventh word is deleted. For larger scale proficiency testing for placement purposes, it is generally assumed that a close test should be about fifty items long. Usually the first and last sentences of the text are left intact."[11]

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[11] Forum. (edited by Covell Newton), Volume XIV, Number 6, July 1976, P.24.

Oller believes that there are two reasons for the preference of close tests. The first sort, he says, has to do with theoritical issues. In a nut shell, he feels that integrative tests are more effective device for "eliciting information" concerning the "efficiency of the learners internalized grammar". The second sort of reason, Oller says, has to do with practical considerations. In general, he says, it is much easier to prepare and administer an integrative test than to prepare and administer a discrete-point test. To device an effective and adequate discrete-point test of the multiple choice objective examination, it is sometimes necessary to go through several cycles of pre-testing and revision of items.[12]

It is established by a large and constantly growing body of research that the integrative tests are generally more reliable, more valid and can effectibely measure English language proficiency for students who use English as a foreign language. When close tests are used for testing, we must first decide on the purpose of the test - achievement or proficiency etc,. It is felt that a language test should form an integral part of the instructional process.

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[12] Ibid., P.25.

Carrol says:

> "The four skills of listening, speaking, reading and writing must also be regarded as integrated performance which call upon candidate's mastery of the language as a whole."[13]

Adediby Ojerinde conducted a study on whether or not close test could effectively measure English language proficiency among Nigerian primary-school pupils whose mother tongue is not English. It could be concluded, he says, from the study that the close test can be used to measure the English Language Proficiency of Yoruba-English bilingual children. He goes on to say that various studies assert the importance of the close test in Spanish - English and French - English bilingual settings and this, he says, is true of Yourba-English bilingual setting too.[14]

The writer of this thesis raised the idea of close test not to advocate or propose that the ESLC English examination should follow this format, but to bring to the attention of the reader the recent, popilar trend in language testing which is widely used as an alternative to other kinds of test.

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[13]Harold B. Allen. Teaching English as a Second Language. University of Minnesota, Tate McGraw-Hill Publishing Company, Ltd., 1965, P.4.

[14]English Language Teaching. Journal (ELT) edited by W.R. Lee, Volume XXXV, Number 1, Oct. 1980, P.66.

The method has its critics. The problem when marking is what to count as a correct response. "Should only exact matches be counted as correct or near enough."[15] Despite its short comings, Oller puts the effectiveness of the method as follows:

> "Thes would tend to indicate that the integrative tests are simply better devices on the whole for eliciting information concerning the efficiency of the psychologically real grammar a learner is internalizing when he acquires a language."[16]

To sum up, we have seen the arguments for and against the subjective and objective tests. We have also seen Mr. Thompson's criticism of the dual nature of the ESLCE in connection with Education Sector Reyiew. Other comments, suggestions and criticims were briefly surveyed. Lastly, we have looked at language tests today, considering close procedure as an alternative test principle used else where.

Constructing a test is a task requiring some skills. Among the requisites are - a thorough knowledge of the subject matter, an intimate understanding of the specific teaching objective and an insight into abilities and background of the students.

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[16] Allen. Op.Cit., P.26.

There are advantages and disadvantages inherent in both the subjective and the objective tests. The disadvantages are maximized when an inadequate examination is developed and it is equally possible to construct an inadequate examination of either type. However, it is impossible to generalize about the relative superiority of subjective or objectibe testing without knowing some thing about the situation in which the test is to be administered and the purpose to be served by the test.

CHAPTER TWO

2. Methodology

2.1 Procedure

The primary objective of this thesis is to survey the effectiveness of the ESLC English examination as a proficiency test in terms of its stated purposes. Therefore, the survey specifically considers the ESLCE as a means of selecting students for Addis Abeba University and attempts to see the dual nature of the examination in light of the types and principles of tests.

All students who have joined the University in 1981 through the ESLCE are the writer's population. Figures in the Freshman Program Office indicate that there are 758 students who have registered for second semester in 1982. Out of 758 enrolled students, 350 students are selected by using a random sampling technique. From each section (there are 29 sections), 25 students are selected from the list by using the table of random numbers in Borgand Gall's Educational Research, 3rd edition, 1979. The selected students in the 14 sections are called groups A,B,C,D,E, F,G,H,I,J,K,L,M, and N.

The ESLC English results are obtained from the awarded certificates to the students and the 1981 Freshman first semester English results are obtained from the Freshman English coordinator's office through the

help of Freshman English instructors. The sample therefore, represents $\frac{(350 \times 100)}{758}$ 46.2% of the total pupolation.

The grade obtained from students certificates and Freshman students are letter grades. The letter grades are given numerical values, which correspond to the equivalence normally considered at the Addis Abeba University for statistical analysis. In both cases, however, the letter grades have equal numerical values.

1980 ESLC English Letter Grades	1981 Freshman English Letter Grades
A = 4	A = 4
B = 3	B = 3
C = 2	C = 2
D = 1	D = 1
F = 0	F = 0

After collecting the data and giving the letter grades numerical values a statistical model is used for testing the hypothesis in this study. (Survey of the effectiveness of the ESLC English examination as a proficiency test). The model employed to test the hypothesis is a linear correlation coefficient technique. This technique is utilized to find out whether or not the 1980 ESLC English results associated with the 1981 Freshman English results. Relationships can be positive or negative.

Linear corrections range between -1 to 1. (-1 ——— 0 ——— 1)

The range for negative correlation is between -1 and 0, while the range for positive correlation is between 0 and 1. Both the positive and the negative values show relationships. When the correlation is negative it is interpreted as one of the variable's increasing while the other decreasing. In the case of positive correlation, generally, the values of one of the variables increase while those of the other variables also increases. When there is no relationship between the variables then it is interpreted that the relationship between the variables is zero. Specifically speaking about my hypothesis, if findings show negative correlation, it means that the relationship between the 1980 ESCL English results and the 1981 Freshman English results is an inverse relationship and the vise versa. On the other hand, if findings show that the relationship is neither positive nor negative (0), it means that there is no relationship between the two examinations. Do the 1980 ESLC English results positively correlate with the 1981 Freshman English results? The following formula is used to find out the correlation of the two examinations.

2.2 Formula for correlation coefficient[17]

$$r = 1/N \quad \sum \frac{(x - \bar{x}}{SX} \cdot \sum \frac{(y - \bar{y})}{SY}$$

[17] Koosis J.Donald, Business Statistics (2nd edition) New York, August 1977.

where r denotes correlation coefficient

N represents the number of sample

x denotes the value for variable x

y represents the value for variable y

SX represents standard deviation of variable X.

SY denotes standard deviation of variable Y.

$\bar{X}$ represents mean of variable X

$\bar{y}$ denotes mean of variable y.

x = 1980 ESLC English examination results.

y = 1981 Freshman English results

(the variables for standard deviation are the same)

CHAPTER THREE

3. Findings and Discussions

Using the formula for the linear correlation attempts will be made to analyse the correlation of the two English examinations. The statistical analysis for each group will be as follows:

3.1 Computation of Statistics of Group A (see appendix A)

From the preceding statistical analysis, it is now possible to see the underlying assumption for collecting data and utilizing correlation coefficient to test the hypothesis. Results from each groups is indicated in the following table.

Groups	x	y	$\bar{x}$	$\bar{y}$	Sx	Sy	r
A	70	36	2.8	1.44	0.94	0.90	-0.09
B	69	46	2.76	1.84	0.73	0.79	-0.008
C	67	39	2.68	1.56	0.83	0.63	-0.008
D	64	41	2.56	1.64	0.90	0.82	0.07
E	63	40	2.52	1.6	0.80	0.74	-0.07
F	61	40	2.4	1.6	0.75	0.69	0.06
G	68	34	2.72	1.36	0.92	0.86	-0.08
H	64	42	2.48	1.68	0.81	0.65	-0.01
I	66	42	2.64	1.68	0.75	0.73	-0.06
J	63	41	2.52	1.64	0.70	0.63	-0.03
K	62	48	2.48	1.92	0.86	0.80	-0.04
L	62	42	2.48	1.68	0.85	0.79	-0.01
M	63	42	2.52	1.68	0.85	0.79	0.03
N	63	40	2.52	1.6	0.90	0.75	-0.008

3.2 Interpretation

According to the correlation coefficient results groups A,B,C,E,G,H,I,J,K,L and N show very low negative correlation where as Groups D,F,M show very low positive correlation. In.11 out of 14 cases the relationship is negative and is negligible. The result indicates that there is very low relationship between the two examinations. From these results, it is possible to assume that the relationship between the 1980 ESLC English results and the 1981 Freshman English results is extremely low. This implies that the Freshman English results do not necessarily depend upon achievements on the ESLC English examination. From the findings, then, it is possible to infer that those students who have obtained good grades on the ESLC English examination do not seem to show good English language performance at the University. Therefore, comparing the hypothesis with the results, it proves that the relationship between the two examinations is extremely low. In general, findings indicate that the ESLC English examination is ineffective in predicting the English language performance of grade twelve leavers when they join the University. One of the disparities between the two examinations could be explained by the difference in purpose between the Ethiopian School Leaving Certificate examination and College Entrance examination. Therefore,

the duality of purpose of the ESLCE (with other variables) could be the main source of the problem. This does not mean that the ineffectiveness of the ESLCE is only due to the dual nature of the examination. Eventhough investigating other variables (syllabus, teaching materials, quality of teachers, methodology, etc.) is not within the scope of this paper, further research into educational problems is urgently needed.

From the theoritical point of view, however, one can safely say that an achievement test can not serve as a proficiency test. An achievement test can be an effective test in measuring what has already been taught and learnt; but to use it as a measure of specific skills in light of the language demands to be made on students by their future course would be mixing two different types of tests with different objectives. The purposes of different tests are different. It is, therefore, important for the test designer to know what tests are made and how they differ from each other.

If the English language remains as a medium of instruction in the high schools and the University, the ineffectiveness of the ESLC English examination as a proficiency test has far reaching implications. Testing is closely linked with syllabus design and material

production. The three affect each other. If tests are ineffective, they show bad back-wash effect on the instruction and material. Due to the ineffectiveness of a test students can be handicapped for other subjects too. Syllabus design is important, but it concerns how we organize what we decide to teach our students. Unless we have correctly identified what we are to teach and thought about how we are to teach it, we cannot succeed what ever syllabus design we have. Syllabus design, teaching materials and testing should be closely interrelated to make foreign language learning a meaningful activity throughout.

CHAPTER FOUR

4. Conclusion and Recommendations

4.1 Conclusion

In the previous discussion, we have seen that correlation coefficient results of groups A, B, C, E, G, H I,J,K,L and N shown very low negative correlation (-0.01 to -0.09) where as groups D,F, and M show very low positive correlation (0.03 to 0.07). In 11 out of 14 cases the relationship is negative and is negligible. Therefore, findings of the correlation coefficient between the 1980 ESLC English examination results and the 1981 Freshman English examination results show that the relationship between the two examinations is extremely low. From the results, then, it is possible to conclude that the ESLC English examination is ineffective as a proficiency test and consequently should not be a measure for predicting student's language performance at the university level and should not serve as a criterion for admission to the university.

However, it must be clear that the findings of the study are not perfect and final. Further research and evaluation should be carried out before any concrete move is taken. To arrive at a satisfactory conclusion, results of other variables (syllabus, teaching materials, quality of teachers, methodology, etc.) are urgently needed.

If the findings of other variables turn out to be similar with the findings of this study, it will be of great help for the Ministry of Education and the University to reconsider the present examination system. It will also be of great assistance for test constructors and syllabus designers to reconsider and improve their tests and syllabus respectively.

4.2 Recommendations

From the statistical analysis and the conclusions drawn, one can obviously see the ineffectiveness of the ESLCE as College entrance examination. The duality of the examination could be avoided by the following possible recommendations.

1. The Ministry of Education and the University should design their own testing systems for grade twelve leavers and for those who would like to join the University, respectively. The two different examinations could be called The Ethiopian School Leaving Certificate Examination (ESLCE) and College Entrance Examination (CEE).

   The ESLCE should be syllabus based and students should be examined on what they have learnt. The form of the ESLC English examination should be a combination of objective

and subjective tests. The content of the examination should reflect language content areas of the high school syllabus as well as the language skills required at the university level. The ESLCE should serve as grade twelve completion examination. The certificates awarded to students who pass this examination should qualify them to obtain jobs. This, of course, could be a guarantee and an incentive to students who do not want to pursue further education.

Those students wishing to continue their education beyond high school should score a "C" and above in each subject they take in the ESLCE. Those students who get a "B" and above in each subject they take in the College Entrance Examination could be admitted to the University. Or the University should make its own admission policy. The form of College Entrance Examination should be a combination of objective and subjective tests. The content of the examination should reflect language content areas of the university syllabus as well as language skills offered at the high school level. The purpose of

the examination should be to predict language performance at the University.

A Committee or a board should be set up for the two different examinations under the Ministry of Education and the University to excute the work.

Students need writing skills at the University for essay writing, note taking and term paper writing etc,. If the writing skill is expected of high school students when they join the University, subjective type of test should be included in the ESLCE and CEE along with the objective tests.

Who should set the examinations? For the ESLCE, the Ministry of Education in consultation with the University should set up the examination. On the other hand, the University in consultation with the Ministry of Education should set the College Entrance Examination.

Who should grade the examinations? Competent and experienced English instructors mobilized by the Ministry of Education should participate in grading the ESLCE. Competent and experienced University English instructors mobilized by the University should participate

in grading CEE.

How would the subjective tests be graded? One of the limitations of a subjective test is the fear that it would be subjectively graded and therefore, would turn out to be invalid and unreliable. Secondly, due to the increasing number of students each year, it would take too much time to grade and there could be shortage of manpower in grading the essays. The writer of this paper is aware of the grading problems of subjective tests. But, if we include writing skill tests in our purpose, subjective tests can be objective as far as scoring is concerned. By giving some guide lines about the making of the essays (organization, logical presentation, facts, spelling, etc.) one single paper could be marked by different people to make the score objective. Given such guide lines, competent and experienced high school and University English instructors should be assigned to grade ESLCE and CEE respectively.

Eventhough each committee or board is autonomous to design the separate examinations, there should be a link between the two

independent bodies. One form of the examination should contribute to the other form, i.e., the body that sets the ESLCE should include items that are required at the university level and the body that sets College Entrance Examination should include items that are expected of students at the high school level. Regular discussions should be carried out between the two bodies to facilitate the effectiveness of the two different types of examinations. The Ministry of Education should check if the ESLCE questions are based on the syllabus and thoroughly study the problems of high schools while the University should check the quality of the examinations. Once the purposes of the two examinations are defined, the forms and contents of the two separate examinations should be designed according to their defined purposes.

The setting of two separate national examinations may involve a high cost. At, present, due to financial problems, it would not be practical to set up two national examinations. But, if money is available, to avoid the ineffectiveness of the ESLCE due to the dual nature (and other variables) of the examination,

it would be highly recommended to set up the two different national examinations. The high cost as compared to the advantage is justifiable. The Ministry of Education and the University should explore all possible means to resolve the financial problems and invest on beneficial examination programmes.

2. Basically, any form of test, be it objective or subjective, can be effective if the purpose is properly defined. What is the test intended to test? Which skills? - listening, speaking, reading or writing? Which component of skill does it test? - the discrimination of sounds, the understanding of the context, oral expression, reading speed, spelling, composition or translation? For example, a subjective test gives adequate basis to evaluate the student and gives opportunity for the student to express himself. If our purpose or interest is to develop the written skill of the student and to know the attitude rather than achievement, then a subjective test is preferable. To give an objective test for such a defined purpose would be meaningless. An objective type on the other hand tends to be reliable and valid due to the objectivity of scoring and representativeness. The examiner is free of value

judgement and the students grade is not affected. Therefore, if our purpose is to test the recognition power of the student rather than recalling or remembering, then an objective test is preferable. The purpose, therefore, defines the type of examinations we set.

We have seen that the ESLC English examination is, at present, purely an objective type. But, what are some of the English language skills that are tested at the University level and that remain untested by the ESLC English examination? Writing skill remains untested. Students need writing skills for lab-report, short papers (essay), dissertation, note-taking, etc, at the University level. If our purpose is to test writing skills, then we should not merely depend on objective tests alone. Thefefore, the second possible recommendation on the type of test is that a combination of objective test (discrete items), subjective tests (continuous writing) and short answers (integrated items) can be employed as a relaible assessment of students' mastery of the English Language.

The grading problem of integrated items will be resolved only by taking the correct responses and not other possiblities or alternatives.

In my discussion above, I have attempted to bring to the attention of the reader that due to financial problems the setting up of two different national examinations may not be feasible immediately. Assuming that such financial problems will be resolved in the near future, I would like to recommend some improvements on the present ESLC English examination.

a. Distractors should genuinely distract; that is, they should serve to discriminate testees. Distractors should be correctly chosen so that they may not create problems to all testees.

b. The vocabulary questions should be within the scope of the students. There should not be vocabulary questions on the examination that sometime create problems even to native speakers.

c. The choice of passage comprehension tests require care: in a proficiency test, they should be representatives of the kind of English students are expected to read; in an achievement test they should be parallel to those on which past teaching has been based. The content of such a test should be closely related to the interests or subject knowledge of students.

APPENDIX A.

GROUP A.

1. A. $\frac{\Sigma X}{N} = \frac{70}{25} = 2.8\ (\bar{x})$

   B. $\frac{\Sigma Y}{N} = \frac{36}{35} = 1.44\ (\bar{y})$

2. A. $x-\bar{x} = 3-2.8 = 0.2$

   B. $y-y = 3-1.44 = 1.56$

3. A. $(x-\bar{x})^2 = 0.2 \times 0.2 = 0.04$

   B. $(y-\bar{y})^2 = 1.56 \times 1.56 = 2.43$

4. A. $SX = \frac{\Sigma(x-\bar{x}^2}{N} = \frac{22}{25} = 0.88 \quad 0.88 = 0.94$

   B. $SY = \frac{\Sigma y-\bar{y})^2}{N} = \frac{20.07}{25} = 0.8028 \quad 0.8028 = 0.90$

5. A. $\frac{x-\bar{x}}{Sx} = \frac{0.2}{0.94} = 0.21$

   B. $\frac{y-\bar{y}}{SY} = \frac{1.56}{90} = 1.73$

6. $\frac{x-\bar{x}}{SX} \cdot \frac{y-\bar{y}}{Sy} = 0.2 \times 1.73 = 0.36$

7. $\frac{\Sigma \frac{x-\bar{x}}{SX} \cdot \frac{y-\bar{y}}{SY}}{N} = \frac{-2.34}{25} = -0.09$

8. r = -0.09 (this procedure applies to the other groups too).

APPENDIX B

GROUP A

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}\cdot\frac{y-\bar{y}}{Sy}$
1	3	3	0.2	1.56	0.04	2.43	0.21	1.73	0.36
2	4	1	1.2	-0.44	1.44	0.19	1.28	-1.11	-1.42
3	2	0	-0.8	-1.44	0.64	2.07	-0.09	-1.6	0.14
4	3	1	0.2	-0.44	0.04	0.19	0.21	-1.11	-0.23
5	3	2	0.2	0.56	0.04	0.31	0.21	0.62	0.13
6	2	2	-0.8	0.56	0.64	0.31	-0.09	0.62	-0.06
7	4	1	1.2	-0.44	1.44	0.19	1.28	-1.11	-1.42
8	3	3	0.2	1.56	0.04	2.43	0.21	1.73	0.36
9	1	1	-1.8	-0.44	3.24	0.19	-1.91	-1.11	2.12
10	3	1	0.2	-0.44	0.04	0.19	0.21	-1.11	-0.23
11	2	0	-0.8	-1.44	0.64	2.07	-0.09	-1.6	0.14
12	4	1	1.2	-0.44	1.44	0.19	1.28	-1.11	-1.42
13	4	3	1.2	1.56	1.44	2.43	1.28	1.73	0.36
14	3	1	0.2	-0.44	0.04	0.19	0.21	-1.11	-0.23
15	1	0	-1.8	-1.44	3.24	2.07	-1.91	-1.6	3.05
16	4	1	1.2	-0.44	1.44	0.19	1.28	-1.11	-1.42
17	3	2	0.2	0.56	0.04	0.31	0.21	0.62	1.13
18	2	2	-0.8	0.56	0.64	0.31	-0.09	0.62	-0.06
19	3	1	0.2	-0.44	0.04	0.19	0.21	-1.11	-0.23
20	3	3	0.2	1.56	0.04	2.43	0.21	1.73	0.36
21	1	1	-1.8	-0.44	3.24	0.19	-1.91	-1.11	2.12
22	4	1	1.2	-0.44	1.44	0.19	1.28	-1.11	-1.42
23	2	2	-0.8	0.56	0.64	0.31	-0.09	0.62	-0.06
24	3	2	0.2	0.56	0.04	0.31	0.21	0.62	1.13
25	3	1	0.2	-0.44	0.04	0.19	0.21	-1.11	-0.23
Σ	70	36			22.0	20.07			-2.34

$\bar{x} = 2.8$ $\quad Sx = 0.94$

$\bar{y} = 1.44$ $\quad Sy = 0.90$ $\quad r = 0.09$

APPENIX C

GROUP B.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}$, $\frac{y-\bar{y}}{Sy}$
1	3	1	-0.16	-0.84	0.03	0.71	-0.22	-1.06	0.23
2	3	2	-0.16	0.16	0.03	0.03	-0.22	0.22	-0.04
3	2	2	-1.16	0.16	0.35	0.03	-1.59	0.20	-0.32
4	4	3	0.84	1.16	0.71	1.35	1.15	1.47	1.69
5	4	1	0.84	-0.84	0.71	0.71	1.15	-1.06	-1.22
6	3	2	-0.16	0.16	0.03	0.03	-0.22	0.20	-0.04
7	3	3	-0.16	1.16	0.03	1.35	-0.22	1.47	-0.32
8	3	1	-0.16	-0.84	0.03	0.71	-0.22	-1.06	0.23
9	2	2	-1.16	0.16	1.35	0.03	-1.59	0.20	-0.32
10	4	1	0.84	-0.84	0.71	0.71	1.15	-1.06	-1.22
11	3	3	-0.16	1.16	0.03	1.35	-0.22	1.47	-0.32
12	2	2	-1.16	0.16	1.35	0.03	-1.59	0.20	-0.32
13	3	1	-0.16	-0.84	0.03	0.71	-0.22	-1.06	0.23
14	4	3	0.84	1.16	0.71	1.35	1.15	1.47	1.69
15	4	1	0.84	-0.84	0.71	0.71	1.15	-1.06	-1.22
16	3	2	-0.16	0.16	0.03	0.03	-0.22	0.20	-0.04
17	2	2	-1.16	0.16	1.35	0.03	-1.59	0.20	-0.32
18	3	1	-0.16	-0.84	0.03	0.71	-0.22	-1.06	0.23
19	4	3	0.84	-1.16	0.71	1.35	1.15	-1.47	1.69
20	4	1	0.84	-0.84	0.71	0.71	1.15	-1.06	-1.22
21	4	3	0.84	1.16	0.71	1.35	1.15	1.47	1.69
22	3	2	-0.16	0.16	0.03	0.03	-0.22	0.20	-0.04
23	2	2	-1.16	0.16	1.35	0.03	-1.59	0.20	-0.32
24	3	1	-0.16	-0.84	0.03	0.71	-0.22	-1.06	0.23
25	4	1	0.84	-0.84	0.71	0.71	1.15	-1.06	-1.22
Σ	69	46			13.47	15.47			-2.11

$\bar{x}$ = 2.76 Sx = 0.73

$\bar{y}$ = 1.84 Sy = 0.79 r= -0.08

APPENDIX D.

GROUP C.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}, y-\bar{y}}{Sx \quad Sy}$
1	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.57
2	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
3	3	3	0.32	1.44	0.102	2.07	0.39	2.29	0.50
4	4	2	1.32	0.44	1.74	0.19	1.59	0.70	1.11
5	4	1	1.32	-0.56	1.74	0.31	1.59	-0.89	-1.42
6	3	1	0,32	-0.56	0.102	0.31	0.39	-0.89	-0.35
7	1	1	-1.68	-0.56	2.82	0.31	-2.03	-0.89	1.80
8	3	2	0.32	0.44	0.102	0.19	0.39	0.70	0.27
9	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
10	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.57
11	3	3	0.32	1.44	0.102	2.07	0.39	2.29	0.50
12	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
13	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	0.57
14	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
15	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.57
16	4	2	1.32	0.44	1.74	0.19	1.59	0.70	1.11
17	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
18	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.57
19	1	1	-1.68	-0.56	2.82	0.31	-2.02	-0.89	1.80
20	3	1	0.32	-0.56	0.102	0.31	0.39	0.39	-0.35
21	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.75
22	2	1	-0.68	-0.56	0.46	0.31	-0.82	0.89	0.73
23	3	1	0.32	-0.56	0.102	0.31	0.39	-0.89	-0.35
24	2	2	-0.68	0.44	0.46	0.19	-0.82	0.70	-0.57
25	4	1	1.32	-0.56	1.74	0.31	1.59	-0.89	-1.42
Σ	67	39			17.40	10.07			-1.99

$\bar{x} = 2.68$ $\quad Sx = 0.83$

$\bar{y} = 1.56$ $\quad Sy = 0.63$ $\quad r = -0.08$

APPENDIX E.

GROUP D.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}\cdot\frac{y-\bar{y}}{Sy}$
1	4	4	1.16	2.28	1.85	5.20	1.51	2.78	4.20
2	4	1	1.36	-0.72	1.85	0.52	1.51	-0.88	-1.33
3	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
4	3	1	0.36	-0.72	0.31	0.52	0.4	-0.88	-0.35
5	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
6	3	1	0.36	-0.72	0.13	0.52	0.4	-0.88	-0.35
7	3	2	0.36	0.28	0.13	0.08	0.4	0.34	0.14
8	1	1	-1.64	-0.72	2.69	0.52	-1.82	-0.88	1.60
9	2	2	-0.64	-0.28	0.41	0.08	-0.41	0.34	-0.24
10	3	0	0.36	-1.72	0.13	2.96	0.4	-2.10	-0.84
11	1	1	-1.64	-0.72	2.69	0.52	-1.82	-0.88	1.60
12	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
13	3	1	0.36	-0.72	2.69	0.52	0.4	-0.88	-0.35
14	2	2	-0.64	0.28	2.41	0.08	-0.71	0.34	-0.24
15	3	3	0.36	1.28	0.13	1.64	0.4	1.56	0.62
16	4	1	1.36	-0.72	1.85	0.52	1.51	-0.88	-1.33
17	3	2	0.36	0.28	0.13	0.08	-0.4	0.34	0.14
18	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
19	3	1	0.36	-0.72	0.13	0.52	0.4	-0.88	-0.35
20	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
21	3	3	0.36	1.28	0.13	1.64	0.4	1.56	0.62
22	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
23	4	2	1.36	0.28	1.85	0.08	1.51	0.34	0.51
24	2	2	-0.64	0.28	0.41	0.08	-0.71	0.34	-0.24
25	3	1	0.36	-0.72	0.13	0.52	0.4	-0.88	-0.35
Σ	64	41			20.33	17.08			1.72

$\bar{x} = 2.56$

$\bar{y} = 1.64$

$Sx = 0.90$

$Sy = 0.82$

$r = 0.07$

APPENDIX G.

GROUP F.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}, \frac{y-\bar{y}}{Sy}$
1	2	0	-0.4	-1.6	0.16	2.56	-0.53	-2.32	1.23
2	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
3	3	1	0.6	-0.6	0.36	0.36	0.8	-0.87	-0.70
4	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
5	3	1	0.6	-0.6	0.36	0.36	0.8	-0.87	-0.70
6	3	2	0.6	0.4	0.36	0.16	0.8	0.58	0.48
7	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
8	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
9	4	1	1.6	-0.6	2.56	0.36	2.13	-0.87	-1.85
10	3	2	0.6	0.4	0.36	0.16	0.8	0.58	0.46
11	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
12	2	0	-0.4	-1.6	0.16	2.56	-0.53	-2.32	1.23
13	3	3	0.6	1.4	0.36	1.96	0.8	2.03	1.62
14	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
15	1	1	-1.4	-0.6	1.96	0.36	-1.87	-0.87	1.63
16	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
17	3	2	0.6	0.4	0.36	0.16	0.8	0.58	0.46
18	3	2	0.6	0.4	0.36	0.16	0.8	0.58	0.46
19	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
20	4	1	1.6	-0.6	2.56	0.36	2.13	-0.87	-1.85
21	1	1	-1.4	-0.6	1.96	0.36	-1.87	-0.87	1.63
22	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
23	2	2	-0.4	0.4	0.16	0.16	-0.53	0.58	-0.31
24	3	1	0.6	-0.6	0.36	0.36	0.8	-0.87	-0.70
25	3	2	0.6	0.4	0.36	0.16	0.8	0.58	0.48
Σ	61	40			14.2	12.0			1.51

$\bar{x} = 2.4$

$\bar{y} = 1.6$

$Sx = 0.75$

$Sy = 0.69$

$r = 0.06$

APPENDIX F.

GROUP E.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}\cdot\frac{y-\bar{y}}{Sy}$
1	3	3	0.48	1.4	0.23	1.96	0.6	1.89	1.13
2	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
3	4	1	1.48	-0.6	2.19	0.36	1.85	-0.81	-1.50
4	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
5	3	1	0.48	-0.6	0.23	0.36	0.6	-0.81	-0.49
6	3	2	0.48	0.4	0.23	0.16	0.6	0.54	0.32
7	3	1	0.48	-0.6	0.23	0.36	0.6	-0.81	-0.49
8	1	1	-1.52	-0.6	2.31	0.36	-1.9	-0.81	1.54
9	3	0	0.48	-1.6	0.23	2.56	0.6	-2.16	-1.30
10	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
11	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
12	1	1	-1.52	-0.6	2.31	0.36	-1.9	-0.81	1.54
13	3	1	0.48	-0.6	0.23	0.36	0.6	-0.81	-0.49
14	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
15	3	3	0.48	1.4	0.23	1.96	0.6	1.89	1.13
16	4	1	1.48	-0.6	2.19	0.36	1.85	-0.81	-1.50
17	3	2	0.48	0.4	0.23	0.16	0.6	0.54	0.32
18	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
19	3	1	0.48	-0.6	0.23	0.36	0.6	-0.81	-0.49
20	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
21	3	3	0.48	1.4	0.23	1.96	0.6	1.89	1.13
22	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
23	4	2	1.48	0.4	2.19	0.16	1.85	0.54	0.98
24	3	1	0.48	-0.6	0.23	0.36	0.6	-0.81	-0.49
25	2	2	-0.52	0.4	0.27	0.16	-0.65	0.54	-0.35
	40				16.15	13.6			-1.81

$\bar{x} = 2.52$ $Sx = 0.80$

$\bar{y} = 1.6$ $Sy = 0.74$ $r = 0.07$

APPENDIX H.

GROUP G.

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}, \frac{y-\bar{y}}{Sy}$
1	1	1	-1.72	-0.36	2.96	0.13	-1.87	-0.42	0.79
2	3	3	0.28	1.64	0.08	2.69	0.30	1.91	0.57
3	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
4	3	2	0.28	0.64	0.08	0.41	0.30	0.74	0.22
5	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
6	3	1	0.28	-0.36	0.08	0.13	0.30	-0.42	-0.13
7	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
8	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
9	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
10	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
11	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
12	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
13	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
14	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
15	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
16	2	1	-0.72	-0.36	0.52	0.13	-0.78	0.42	0.33
17	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
18	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
19	4	4	1.28	2.64	1.64	6.97	1.39	3.07	4.27
20	2	2	-0.72	0.64	0.52	0.41	0.78	0.74	-0.58
21	3	3	0.28	1.64	0.08	2.69	0.30	1.91	0.57
22	4	1	1.28	-0.36	1.64	0.13	1.39	-0.42	-0.58
23	3	2	0.28	0.64	0.08	0.41	0.30	0.74	0.22
24	2	2	-0.72	0.64	0.52	0.41	-0.78	0.74	-0.58
25	2	1	-0.72	-0.36	0.52	0.13	-0.78	-0.42	0.33
Σ	68	34			21.03	18.6			-2.1

$\bar{x} = 2.72$

$\bar{y} = 1.36$

$Sx = 0.92$

$Sy = 0.86$

$r = -0.08$

Appendix I

GROUP H

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})$	$(y-\bar{y})$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}, \frac{y-\bar{y}}{Sy}$
1	3	0	0.52	-1.68	0.27	2.82	0.64	-2.58	-1.65
	2	2	-0.48	0.32	0.23	0.102	-0.59	0.59	-0.29
3	4	1	1.52	-0.68	2.31	0.46	1.88	-1.05	-1.97
4	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
5	3	1	0.52	-0.68	0.27	0.46	0.64	-1.05	-0.67
6	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
7	3	1	0.52	-0.68	0.27	0.46	0.64	-1.05	-0.67
8	3	2	0.52	0.32	0.27	0.102	0.64	0.49	0.31
9	1	1	-1.48	-0.68	2.19	0.46	-1.83	-1.05	1.92
10	2	2	-0.52	0.32	0.27	0.102	0.64	0.49	0.31
11	1	1	-1.48	-0.68	2.19	0.46	-1.83	-1.05	1.92
12	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
13	3	2	0.52	0.32	0.27	0.102	0.64	0.49	0.31
14	2	2	-0.48	0.32	0.23	0.102	0.59	0.49	-0.29
15	3	3	0.52	1.32	0.27	1.74	0.64	2.03	1.30
16	4	1	1.52	-0.68	2.31	0.46	1.88	-1.05	-1.97
17	3	2	0.52	0.32	0.27	0.102	0.64	0.49	0.31
18	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
19	3	2	0.52	0.32	0.27	0.102	0.64	0.49	0.31
20	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
21	3	3	-0.52	1.32	0.27	1.74	-0.64	2.03	-1.30
22	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
23	4	2	1.52	0.32	2.31	0.102	1.88	0.49	0.92
24	2	2	-0.48	0.32	0.23	0.102	-0.59	0.49	-0.29
25	3	2	0.52	0.32	0.27	0.102	0.64	0.49	0.31
Σ	64	42			16.35	10.69			-0.32

$\bar{x} = 2.48$

$\bar{y} = 1.68$

$Sx = 0.81$

$Sy = 0.65$

$r = -0.01$

GROUP I

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-x}{Sx}$	$\frac{y-y}{Sy}$	$\frac{x-x}{Sx}, \frac{y-y}{Sy}$
1	4	1	1.36	-0.68	1.85	0.46	1.81	-0.93	-1.68
2	3	1	0.36	-0.68	0.13	0.46	0.48	-0.93	-0.45
3	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
4	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
5	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
6	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
7	4	1	1.36	-0.68	1.85	0.46	1.81	-0.93	-1.68
8	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
9	2	0	-0.64	-1.68	0.41	2.82	-0.85	-2.30	1.96
10	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
11	3	3	0.36	1.32	0.13	1.74	0.48	1.81	0.87
12	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
13	4	1	1.36	-0.68	1.85	0.46	1.41	-0.93	-1.68
14	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
15	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
16	3	3	0.36	1.32	0.13	1.74	0.48	1.81	0.87
17	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
18	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
19	4	1	1.36	-0.68	1.85	0.64	1.81	-0.93	-1.68
20	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
21	2	2	-0.64	0.32	0.41	0.102	-0.85	0.44	-0.37
22	2	0	-0.64	-1.68	0.41	2.82	-0.85	-2.30	1.96
23	1	1	-0.64	-0.68	1.05	0.64	-2.19	-0.93	2.04
24	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
25	3	2	0.36	0.32	0.13	0.102	0.48	0.44	0.21
	66	42			14.13	13.41			-1.54

$\bar{x}$ = 2.64

$\bar{y}$ = 1.68

Sx = 0.75

Sy = 0.73

r = -0.06

GROUP J

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}, \frac{y-\bar{y}}{Sy}$
1	2	1	-0.52	-0.64	0.27	0.41	-0.74	-1.02	0.75
2	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
3	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
4	3	1	0.48	-0.64	0.23	0.41	0.69	-1.02	-0.70
5	2	2	-0.52	0.36	0.27	0.13	-0.74	0.52	-0.42
6	3	1	0.48	-0.64	0.23	0.41	0.69	-1.02	-0.70
7	4	1	.48	-0.64	2.19	0.41	2.11	-0.02	-2.15
8	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
9	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
10	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
11	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
12	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
13	2	0	-0.52	-1.64	0.27	2.69	-0.74	-2.60	1.92
14	4	1	1.48	-0.64	2.19	0.41	2.11	-1.02	-2.15
15	3	3	0.48	1.36	0.23	1.85	0.69	2.16	1.49
16	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
17	2	1	-0.52	-0.64	0.27	0.41	-0.74	-1.02	0.75
18	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
19	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
20	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
21	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
22	1	1	-1.52	-0.64	2.31	0.41	-2.17	-1.02	2.21
23	2	2	-0.52	0.36	0.27	0.13	-0.74	0.57	-0.42
24	3	1	0.48	-0.64	0.23	0.41	0.69	-1.02	-0.70
25	3	2	0.48	0.36	0.23	0.13	0.69	0.57	0.39
Σ	63	41			12.23	9.77			-0.72

$\bar{x} = 2.52$

$\bar{y} = 1.64$

$Sx = 0.70$

$Sy = 0.63$

$r = -0.03$

GROUP

No.	x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}, \frac{y-\bar{y}}{Sy}$
1	4	1	1.52	-0.92	2	0.85	1.77	-1.15	-2.04
2	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
3	2	1	-0.48	-0.92	0	0.85	-0.56	-1.15	0.64
4	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
5	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
6	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
7	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
8	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
9	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
10	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
11	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
12	4	1	1.52	-0.92	2	0.85	1.77	-1.15	-2.04
13	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
14	3	3	0.52	1.08	0	1.17	0.60	1.35	0.81
15	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
16	4	1	1.52	-0.92	2	0.85	1.77	-1.15	-2.04
17	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
18	3	2	0.52	0.08	0	0.006	0.60	0.1	0.06
19	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
20	3	2	0.52	0.08	0	0.006	0.60	0.1	0.06
21	4	1	1.52	-0.92	2	0.85	1.77	-1.15	-2.04
22	2	2	-0.48	0.08	0	0.006	-0.56	0.1	-0.056
23	3	2	0.52	0.08	0	0.006	0.60	0.1	0.06
24	4	1	1.52	-0.92	2	0.85	1.77	-1.15	-2.04
25	1	0	-1.48	-1.92	2	3.69	-1.72	-2.4	4.13
Σ	62	48			18.7	15.88			-0.89

$\bar{x}$ = 2.48 Sx = 0.86 r = -0.04

$\bar{y}$ = 1.92 Sy = 0.86

APPENDIX M.

GROUP L

No.	'x'	'y'	$'x-\bar{x}'$	$'y-\bar{y}'$	$'(x-\bar{x})^2'$	$(y-\bar{y})^2$	$\frac{'x-\bar{x}'}{Sx}$	$\frac{'y-\bar{y}'}{Sy}$	$\frac{'X-\bar{x},y-\bar{y}'}{Sx\ Sy}$
1	1	0	-1.48	-1.68	2.19	2.82	-1.74	-2.13	3.70
2	3	2	0.52	0.32	0.27	0.102	0.61	0.41	0.25
3	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
4	4	1	1.52	-0.68	2.31	0.46	1.79	-0.86	-1.54
5	3	1	0.52	-0.68	0.27	0.46	0.61	-0.86	-0.52
6	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
7	1	1	-1.48	-0.68	2.19	0.46	-1.74	-0.86	1.50
8	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
9	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
10	4	1	1.52	-0.68	2.31	0.46	1.79	-0.86	-1.54
11	3	3	0.52	1.32	0.27	1.74	0.61	1.67	1.02
12	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
13	3	1	0.52	-0.68	0.27	0.46	0.61	-0.86	-0.52
14	2	0	-0.48	-1.68	0.23	2.82	-0.56	-2.13	1.19
15	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
16	4	1	1.52	-0.68	2.31	0.46	1.79	-0.86	-1.54
17	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
18	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
19	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
20	3	3	0.52	1.32	0.27	1.74	0.61	1.67	1.02
21	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
22	4	1	1.52	-0.68	2.31	0.46	1.79	-0.86	-1.54
23	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
24	2	2	-0.48	0.32	0.23	0.102	-0.56	0.41	-0.23
25	3	3	0.52	1.32	0.27	1.74	0.61	1.67	1.02
Σ	62	42			18.23	15.41			-0.26

$\bar{x}$ = 2.48 Sx = 0.85

$\bar{y}$ = 1.68 Sy = 0.79 r = -0.01

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APPENDIX N.
GROUP M.

NO.	'x'	'y'	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sy}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}}{Sx}\cdot\frac{y-\bar{y}}{Sy}$
1	3	3	0.48	1.32	0.32	1.74	0.56	1.67	0.94
2	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
3	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
4	4	1	1.48	-0.68	2.19	0.46	1.74	-0.86	-1.50
5	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
6	3	3	0.48	1.32	0.23	1.74	0.56	1.67	0.94
7	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
8	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
9	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
10	4	1	1.48	-0.68	2.19	0.46	1.74	-0.86	-1.50
11	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
12	2	0	-0.52	-1.68	0.27	2.82	-0.61	-2.13	1.30
13	3	1	0.48	-0.68	0.23	0.46	0.56	-0.86	-0.27
14	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
15	3	3	0.48	1.32	0.23	1.74	0.56	1.67	0.94
16	4	1	1.48	-0.68	2.19	0.46	1.74	-0.86	-1.50
17	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
18	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
19	1	1	-1.52	-0.68	2.31	0.46	-1.79	-0.86	1.54
20	2	2	-0.52	0.32	0.27	0.102	-0.61	0.41	-0.25
21	3	1	0.48	-0.68	0.23	0.46	0.56	-0.86	-0.27
22	4	1	1.48	-0.68	2.19	0.46	1.74	-0.86	-1.50
23	3	2	0.48	0.32	0.23	0.102	0.56	0.41	0.23
24	1	0	-1.52	-1.68	2.31	2.82	-1.79	-2.13	3.81
25	3	2	0.48	0.32	0.23	0.102	0.56	0.41	0.23
Σ	63	42			18.23	15.41			0.64

$\bar{x}$ = 2.52 Sx = 0.85

$\bar{y}$ = 1.68 Sy = 0.79 r = 0.03

APPENDIX O

GROUP N

No.	'x'	'y'	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$\frac{x-\bar{x}}{Sx}$	$\frac{y-\bar{y}}{Sy}$	$\frac{x-\bar{x}, y-\bar{y}}{Sx\ Sy}$
1	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
2	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
3	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
4	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
5	4	1	1.48	-0.6	2.19	0.36	1.64	-0.8	-0.31
6	3	2	0.48	0.4	0.23	0.16	0.53	0.53	0.281
7	3	2	0.48	0.4	0.23	0.16	0.53	0.53	0.281
8	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
9	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
10	2	1	-0.52	-0.6	0.27	0.36	-0.58	-0.8	0.464
11	3	3	0.48	1.4	0.23	1.96	0.53	1.87	0.99
12	1	1	-1.52	-0.6	2.31	0.36	-1.69	-0.8	1.35
13	1	1	-1.52	-0.6	2.31	0.36	-1.69	-0.8	1.35
14	4	1	1.48	-0.6	2.19	0.36	1.64	-0.8	-1.31
15	3	2	0.48	0.4	0.23	0.16	0.53	0.53	0.281
16	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
17	4	1	1.48	-0.6	2.19	0.36	1.64	-0.8	-1.31
18	2	0	-0.52	-1.6	0.27	2.56	-0.58	-2.13	1.24
19	2	0	-0.52	-1.6	0.27	2.56	-0.58	-2.13	1.24
20	4	1	1.48	-0.6	2.19	0.36	1.64	-0.8	-1.31
21	3	3	0.48	1.4	0.23	1.96	0.53	1.87	0.99
22	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
23	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
24	2	2	-0.52	0.4	0.27	0.16	-0.58	0.53	-0.31
25	4	1	1.48	-0.6	2.19	0.36	1.64	-0.8	-1.31
Σ	63	40			20.23	14.00			-0.19

$\bar{x} = 2.52$ $\quad Sx = 0.90$

$\bar{y} = 1.6$ $\quad Sy = 0.75$ $\quad r = -0.008$

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D E C L A R A T I O N

I, the undersigned declare that this thesis is my work and that all sources of material used for the thesis have been duly acknowledged.

Name_____

Signature_____

Place and date of submission_____

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