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DEGREE OF PREPARATION OF SECONDARY SCHOOL STUDENTS IN ADDIS ABABA FOR THE ETHIOPIAN SCHOOL LEAVING CERTIFICATE EXAMINATION: AN EMPIRICAL STUDY

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ABSTRACT

It has been many years since secondary schools with different streams in their programmes have been formed. These streams were established in order to facilitate different manpower needs at paraprofessional level. In order to see if the schools have kept these streams to a required level, various achievement tests are given. These tests are given as teacher-made tests, either as formative or summative evaluation. This however is not enough to ascertain the students' completion of the secondary school programmes. The Ethiopian School Leaving Certificate examination (ESLCE) is therefore given to serve this purpose.

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The ESLCE as it has been used for many years is given to determine if the candidates have successfully completed the secondary school programme and to see whether or not they are able to proceed to a post-secondary one. Although these streams supposedly prepare students for various careers at different levels, they all take ESLCE. But do they all have opportunities to prepare themselves adequately for this challenge? This paper, with its limited scope, attempts to investigate just that. To that end such variables as the eighth grade percentile rank of candidates, period allocations of subjects commonly offered in secondary schools and qualifications of teachers of these subjects were used. Finally, appropriate statistics was employed for analysis.

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I. INTRODUCTION

The Problem and its Background

It has been a long time since national examinations were introduced in Ethiopian Schools. The first[1] of these was the sixth grade national examination in 1948, followed by that for the eighth grade in 1950. The Ethiopian School Leaving Certificate Examination (ESLCE) was introduced experimentally in 1948.[2] The objectives of each of these examinations were:

1. To ascertain that the students had completed the curriculum set for the grades attended up to the level at which the examination was given.

2. To serve as a measure, for promotion to the next higher level, of the adequacy of the student's achievement in the subjects attended.

Although the levels for sixth and eighth grades are different, the type of subjects at the respective levels are uniform in that the students take national examinations in the same set of subjects in the particular level. The situation for ESLCE, however, is different in that the set of subjects in each stream which the students are expected to take are different. Moreover, there is a belief among school administrators that the ESLCE favours certain streams in comprehensive secondary schools, as pointed out by Asefa Gebregiorgis.[3] This belief

emanates from the fact that the set of subjects in the academic stream is different from that of the agricultural, business or industrial education stream. Which of these streams results in relatively more advantage is a suitable subject for research, to which this paper attempts to contribute.

Definition of Terms

Addis Ababa Administrative Region - the region of Addis Ababa according to the regional boundaries before the zoning of the People's Democratic Republic of Ethiopia came into effect.

Common subjects - subjects taken by all regular students in the Ethiopian School Leaving Certificate Examination.

Comprehensive Secondary School - a secondary school whose instructional programmes are categorized by separate areas.

National examination - the examination given nationwide to students in sixth, eighth or twelfth grade. Recently it has included the 10 + 3 grade as well.

Qualification of teachers - certification of teachers showing their level of education and field of specialization.

Stream - one of the categories of instructional areas in the comprehensive secondary and some vocational schools of 10 + 3 level.

Vocational secondary school - a secondary school in which skill subjects are given up to 10 + 3 (or 12 + 1) level.

The Purpose and Significance of the Study

The programmes in our schools have evolved over many years. The earlier programme was purely academic. Later, schools were established with specialized curricula like the Technical School and the Commercial School of Addis Ababa. Between 1961[4] and about 1984, many schools were converted into comprehensive. Since 1984, some schools have started a polytechnic programme. Thus, there are now four major types of schools in Ethiopia:

1. Schools which offer only academic subjects, like St. Joseph's and Nazareth Secondary Schools in Addis Ababa.

2. Schools which offer only vocational subjects, like St. Mary's Secondary School in Addis Ababa.

3. Schools which offer many streams, like Misrak and Nefas Silk Comprehensive Secondary schools.

4. Schools which raised their programme to 10 + 3 level and which run such streams as academic, business and productive technology. Examples are Entoto Academic and Vocational Secondary school and Wingate Vocational School. The Technical School of Addis Ababa also

belongs to this group, except that it has only one stream of technical subjects.

Although the main objective of these schools invariably is to enable their students to complete their secondary education, there are plans, however little they may vary, set out by the Ministry of Education (MOE) for students to follow once they complete their twelfth grade (or 10 + 3) education. These plans are solely for students who are in academic schools, or in the academic streams of other schools, to proceed to higher educational institutions. For those in vocational schools or in vocational streams of other schools, the purpose is for them to become engaged in the world of work or proceed to higher educational institutions after completing their high school programme. All candidates, however, take the ESLCE as a factor of exit from the schools and as a factor of entry into the higher education institutions.[5] But from my observations the notion that vocational trainees will engage themselves in the world of work after high school completion is impractical and too theoretical. This leads me to believe and observe that all candidates take the ESLCE for the purpose of qualifying for higher education institutions. Have they been adequately prepared for this? This is what the paper attempts to examine with a belief that an answer to the question would help design better ways for:

1. Student selection and placement in the various schools and streams.

2. Equitable subject matter coverage in all schools and streams.

3. Equitable assignment of qualified teachers in schools and streams for all subjects.

4. Equitable use of school facilities among streams.

Basic Assumptions

The nature of our secondary schools is such that they have a uniform programme to the extent that they are all required to pursue curricula designed by MOE. The period allocation for each subject for the various streams is also approved by the Ministry. Apart from this, however, there are aspects which are non-uniform in the streams. These variations are mostly influenced by local conditions. This situation leads me to make the following assumptions:

1. There is significant difference in ESLCE achievement between the various streams in secondary schools;

2. In this particular study the difference indicated in number 1 (above) is assumed to be a function of:

a) the nature of the selection and placement of students in streams;

b) variations in the coverage of subject content caused by unequal allocation of periods;

c) difference between streams in the qualifications of teachers in their area of specialization, which in turn influence their proper use of school facilities for the particular stream.

Delimitation

The two comprehensive secondary schools in Addis Ababa that were selected for the study are:

1. Misrak Comprehensive Secondary School

2. Nefas Silk Comprehensive Secondary School

The following data were gathered:

1. Academic, business and productive technology streams were identified in each of the schools selected.

2. One hundred and eight (36 from each stream), ninety (30 from each stream) and ninety-three (31 from each stream) were selected randomly from among the ESLCE candidates of 1982, 1986 and 1990, respectively.

3. The eighth grade percentile ranks of those selected were obtained from their records in the schools.

4. The period allocations of the common subjects such as Amharic, English and Mathematics while they were students were obtained from the MOE guidelines. This was with the assumption that schools do not change the period allocations recommended for them by the Ministry of Education, and the author did not get any evidence suggesting that such changes were made.

5. The academic qualifications of teachers of the common subjects while the candidates were in their eleventh grade were also obtained. Teachers teaching in grade 11 were selected because they as teachers at this level and up are expected to have BA/BSc in their area of specialization.

6. The candidates' ESLCE grades in the subjects identified were obtained from the schools and were later verified with the ESLCE office.

Limitations

Only two* comprehensive secondary schools were selected. Another major limitation was the fact that only student selection, teacher qualification and the extent of coverage of syllabi were considered as factors which would affect student achievement. Other important factors, such as the extent of availability of teaching materials, students' out-of-school background and the standard that schools use to promote students from lower to higher grades prior to ESLCE, were not used. It is, however, believed that under prevailing circumstances the factors used give an indicative picture which can serve as a basis for further research.

Methodology

After the necessary data were collected, analyses of the variables were made:

1. The eighth grade percentile ranks were compared by using the median and the semi-interquartile range.

2. The period allocations of the common subjects and teacher qualification were compared by using an instruction adequacy index designed for the purpose of the study.

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* The Akaki Comprehensive Secondary School was initially included in the sample with the intention of getting more reliable data. However it was later dropped because adequate data were not available from that school.

3. The candidate's GPA's in the common subjects were compared by using mean, standard deviation, coefficient of variation and correlation.

4. A summary of relationships between the ESLCE GPA's in the three subjects and the other variables was presented.

II. The Validity of the ESLCE

Examinations attempt to measure whether the objectives of a subject or course have been met in the teaching-learning process. This is especially true in a classroom situation where a teacher-made test is used to evaluate student's achievement. A variation occurs when subjects are taught in classes, and national examinations are prepared based on the contents of the subjects assumed to have been covered. Examples of this in Ethiopia are the sixth, eighth and the twelfth grade national examinations. In the way these are prepared they are very close to teacher-made tests. The criterion missing is the fact that they are not prepared by the actual teachers who taught the particular students.

Teacher made tests are achievement tests. An achievement test, like any other test, should measure what it purports to measure. It should have content validity, where the content of the test is closely related to the subject matter covered in class. With regard to this, Ebel and Frisbie state:[6]

> Without question, test content (what the items or test tasks require the examinee to know) is the most important factor to assess. How well the tests or subtests match the curriculum in terms of content coverage and emphasis must be determined in selecting achievement tests.

While content validity might not be a problem if a test is prepared by a teacher for his class, it is very difficult to achieve it in a standardized test for students in many schools and different streams which might not have the same coverage of syllabus. In connection with this Schwarz and Krug[7] have the following to say:

> The rationale for achievement tests as scholastic predictors is based on three major assumptions. The test constructor reasons that:

1. if the educational experience that the applicants were provided by their past schooling have been approximately the same;

2. if the differences in the applicants' relative achievement, given these equivalent experiences, were the result of certain differences in their individual abilities and characteristics; and

3. if the advanced courses for which they are applying will require the same abilities and characteristics; then the applicants should continue to achieve at different levels, just as before. Having through these assumptions established a link between their past performance and their future potential, he can logically select the highest achievers for admission to the advanced course.

This by implication would mean that if examinees' experiences in their past schooling were not the same and if the differences in the applicants' relative achievements were not due to their individual differences, standardized achievement tests should not be given. On the other hand such tests must be given for the following purposes:[8]

> Standardized tests of achievement (not to be confused with aptitude tests) should be administered at major transition point from one level of schooling to another and particularly from high school to college or work. The purposes of these tests would be to: (a) certify the students' credentials; (b) identify the need for remedial intervention; and (c) identify the opportunity for advanced or accelerated work. The test should be administered as part of a nationwide system.

The ESLCE is an examination which manifestly has two objectives: to serve as a measure of completion of the students' secondary school education and to serve as a selection criterion for post-secondary school institutions. It is given at a transitional point, that is, at the end of twelfth grade (or at the 10 + 3 grade level). Whether the contents of the tests for the various subjects are based on items adequately covered in class is a subject for thorough study.

Another variable with a bearing on student achievement is teacher qualification. It is common knowledge that, even under the best of circumstances with regard to other resources availed of by students, contacts with qualified teachers in a teaching-learning situation greatly helps students acquire the necessary knowledge and skill. Of course, teachers in and by themselves are not enough unless the student also puts a serious effort into his school work. But, as Justman and Mais[9] say:

> A correspondence exists between student achievement in learning and teaching effectiveness. Although the prime responsibility for learning is the student's, the teacher has a share in affecting the outcome. Every measure of student attainment, formal or informal, is to some extent an indirect measure of teaching competence. While in any specific instance quality of learning may not be a

> true indication of quality of teaching, over a period of time and with different student groups it gains in validity as an index.

Ebel and Frisbie[10] have a similar opinion:

> The students of good teachers learn more important things, and learn them better, than do the students of poor teachers. Hence standardized test scores do provide one kind of evidence of teacher effectiveness. They never tell the whole story. They should never be used exclusively or blindly.

In the Ethiopian case, the sixth and eighth grade national examinations are administered after the students in the respective levels have gone through a uniform set of subjects. With the twelfth grade examination, however, students in most schools are categorized into streams: academic, agriculture, business, home economics or productive technology. Some subjects are offered to all streams in common while others are offered only to specific streams specially in the eleventh and twelfth grades.

The common subjects, like Amharic, English and Mathematics, are taken by all students in preparation for the ESLCE. The subjects which are not commonly attended are those meant for only the specific streams. In most cases, if the subject is

taken by a specific stream other than the academic, it is a subject in which a national examination is not prepared. Exceptions are book-keeping and economics taken by business students and in which national examinations are prepared. This has been the practice even after the comprehensive secondary school programme had been expected to be phased out as of 1984. Since then, about 16 former comprehensive secondary schools have been converted into vocational schools with a level of 10 + 3. Grades 9 and 10, which were formerly the first half of comprehensive secondary schooling, have been converted into either general academic education or general polytechnic education.[11]

III. Data Analysis and Interpretation

After raw data have been collected, they should be statistically analyzed for better interpretation. In this paper such analyses are done with the use of mean, standard deviation, coefficient of variation, Spearman Rank correlation[12] and semi-interquartile range.[13]

In order to see if students in comprehensive secondary schools were placed in the different streams on the basis of their percentile ranks in the eighth grade national examination, statistical tests were made by using their respective results. The three target groups had their eighth grade national examinations four years earlier than their ESLCE. Comparison of the groups was made by using the median and the semi-interquartile range for the three streams as shown in Table 1.

TABLE 1

Median and Semi-Interquartile Range of Eighth Grade Percentile Rank for Selected Years and Streams

Year*	Stream	Median	Semi-Interquartile Range
1978	Academic	66.4	17.5
	Business	82.4	11.1
	Productive Tech.	76.6	9.9
1982	Academic	52.0	17.2
	Business	61.7	14.0
	Productive Tech.	64.2	11.0
1986	Academic	68.3	13.9
	Business	67.4	9.7
	Productive Tech.	68.3	11.1

*The year the candidates took their eighth grade national examination was four (4) years earlier than the year of their ESLCE.

The data in Table 1 are used to check if the students in the various batches were selected and placed on the basis of their percentile ranks. In order to see if the groups in a particular batch were homogeneous or heterogeneous, the semi-interquartile range was used. The homogeneity or heterogeneity of the groups depends on the size of the semi-interquartile range. If it is relatively large, the group is heterogeneous; if it is small the corresponding group is homogeneous. Consequently, if a group is homogenous it is assumed that the members in the group are selected on the basis of similar criteria.

As can be observed from the table, the median range for all groups in the three batches were 16, 12.2 and 0.9 in 1978, 1982 and 1986, respectively. Moreover the data show that there was one group (business) which had the highest median (82.4) in 1978 and another group (academic) which had the lowest (52.0) in 1982. All the rest had medians in the 60's and 70's.

Looking at the streams in each batch, we find business having the highest median (82.4) in 1978 followed by productive technology (76.6). Academic had 66.4. With regard to their semi-interquartile range, academic had the highest (17.5) followed by business (11.1). Productive technology had 9.9.

This indicates that the academic was the most heterogeneous of the groups. Business was relatively heterogeneous compared to the most homogeneous productive technology. In 1982, productive technology had the highest median (64.2). The lowest was the academic (52.0). On the other hand, we see that the academic had the highest semi-interquartile range and productive technology had the lowest. Here again, the academic seems to consist of a heterogeneous group. Conversely, productive technology had homogeneity, judging from the size of the range.

The 1986 batch was unique in that all the streams had almost the same median. There were slight differences, however, in the semi-interquartile range. The academic group had again maintained its consistency in having the highest semi-interquartile range and, as a consequence, in being the most heterogeneous group.

To sum up, although the academic stream was consistent in being the most heterogeneous of the groups, its relative position in terms of the median was not so consistent. Also, consistency in terms of the median is also not manifested by the business group, as shown below.

TABLE 2

Relative Position of the Streams in Terms of Median and Semi-Interquartile Range of Their Eighth Grade Percentile Rank

Basis of Comparison	Year	High	Middle	Low
Median	1978	Business	Productive Tech.	Academic
	1982	Productive Tech.	Business	Academic
	1986	Academic Productive Tech.	None	Business
Semi-interquartile range	1978	Academic	Business	Productive Tech.
	1982	Academic	Business	Productive Tech.
	1986	Academic	Productive Tech.	Business

The position of the other streams was also not consistent. Thus, the assumption that students in various streams were placed on the basis of their percentile ranks in eighth grade national examinations does not seem to be true. Perhaps the idea that seems to give some sense is what an expert in the Ministry of Education said: "Prospective candidates for the various streams are given the opportunity to indicate their choice of streams and, on the basis of their eighth grade percentile rank and on the availability of space, they would be placed according to their choices."[14] This seems the reason why business and productive technology groups seem to be homogeneous because those interested and able are allowed to join the streams. On the other hand, it might be safe to assume that all others who were not interested in vocational streams or those who were interested in them but could not succeed in entering were grouped in the academic stream, in spite of their heterogeneity in their percentile ranks.

TABLE 3

Mean, standard Deviation and Coefficient of Variation of ESLCE GPA's in Three Common Subjects by Calendar year and Stream.

Year	Stream	Mean	Standard Deviation	Coefficient of Variation in Percent
1982	Academic	1.07	0.59	55.1
	Business	0.94	0.72	76.6
	Productive Technology	1.17	0.86	73.5
1986	Academic	1.45	0.81	55.9
	Business	0.99	0.26	26.3
	Productive Technology	1.25	0.52	41.6
1990	Academic	1.46	0.56	38.4
	Business	0.98	0.46	46.9
	Productive Technology	1.42	0.48	33.8

Table 3 uses the mean, the standard deviation and the coefficient of variation in order to see if any or all of the streams in the three batches have GPA's corresponding the level of the percentile rank in Table 1. In order to see if any of the groups was homogeneous or heterogeneous the coefficient of variation was used. If individuals in a particular group have similar achievements, the group would be observed to have a relatively low coefficient.

Judging from the mean GPA in Table 3 it appears that productive technology (1.17) was better-off in the first batch. But in the other two batches the academic (1.45 in 1986 and 1.46 in 1990) led. With regard to the coefficient of variation, there was no definite pattern. Those which had the highest mean seem to be fairly heterogeneous.

TABLE 4

Correlation of Ranks of Eighth Grade Percentile and Grade Point averages in Common Subjects in ESLCE by Year and Stream.

Year*	Stream	Spearmen Rho Rank correlation	Critical Value at 0.05 level of significance	Computed value of t
1978 (1982)	Academic	+0.14	1.95996	0.82445
	Business	+0.63	1.95996	4.73004
	Productive Technology	+0.15	1.95996	0.88466
1982 (1986)	Academic	+0.07	2.048	0.37130
	Business	-0.27	2.048	-1.48380
	Productive Technology	+0.10	2.048	0.58182
1986 (1990)	Academic	+0.52	2.045	3.27840
	Business	+0.34	2.045	0.19468
	Productive Technology	-0.21	2.045	-1.15568

*The first year of each batch denotes the year the group took the eighth grade national examination, while that in parenthesis is their ESLCE year.

Table 4 shows the extent of the relationship between the eighth grade percentile rank of the target group and their ESLCE GPA in the common subjects. In order to do this, the following arrangements were made:

1. The percentiles and the ESLCE GPA's for each batch and for each stream were ranked.

2. The difference between the two ranks were found and the correlation of the percentile and the ESLCE GPA was calculated by using Spearman Rho Rank correlation.

3. To test the significance of correlation the distribution was computed and compared with the critical value at 0.05 level of significance.

4. If the comparison shows the computed value of 't' to be greater than that shown on a table indicating the critical value at 0.05 level of significance, we take the correlation to be significant.[15]

Looking at Table 4 we find that in the batch of 1982 one stream, business, had significant correlation. No stream in the 1986 batch had significant correlation. Among the streams of the 1990 batch, only the academic showed a significant correlation.

In the three batches studied, two streams, business and academic, had significant correlation only once each. This is about 22% of the time. It is therefore fair to conclude that the candidates' ESLCE results were not consistent with their eighth grade national examination percentile ranks.

TABLE 5

Relationship of the Average Instruction Adequacy Index (AIAI)* to Achievement in Common Subjects in ESLCE.

Year	Stream	Amharic		English		Mathematics	
		AIAI	AVERAGE GPA	AIAI	AVERAGE GPA	AIAI	AVERAGE GPA
1981/82	Academic	0.45	1.60	0.51	0.61	0.42	1.06
	Business	0.41	1.42	0.48	0.86	0.40	0.61
	Productive Technology	0.41	1.36	0.48	1.06	0.40	1.08
1985/86	Academic	0.42	2.00	0.51	1.33	0.53	1.00
	Business	0.42	1.93	0.46	0.53	0.47	0.30
	Productive Technology	0.42	1.70	0.46	0.97	0.47	1.57
1989/90	Academic	0.46	1.77	0.44	1.26	0.40	1.39
	Business	0.46	1.52	0.40	0.68	0.40	0.90
	Productive Technology	0.46	1.74	0.40	1.35	0.40	1.16

*AIAI was calculated for the candidates' 11th grade year which was a year earlier than their ESLCE.

The concept of Average Instruction Adequacy Index (AIAI) was derived by using the square root of the product of the partitive ratios of a weekly period allocation of a subject and of the number of teachers of a subject with BA and above. If, for example, the partitive ratios of period allocation and staff profile were 0.37 and 0.55, respectively, AIAI would be $\sqrt{0.37 \times 0.55} = 0.45$.

Refering to Table 5, in 1982 when AIAI was relatively high for the academic stream for Amharic (0.45), the average GPA was 1.60, which was the highest, too. Although AIAI was equal for the three streams in each of the other years, the GPA for Amharic was the highest for the academic stream, that is, 2.00 in 1986 and 1.77 in 1990. This situation was not however true for the other subjects. As can be observed from the table, the highest AIAI for English in the years selected were 0.51, 0.51 and 0.44, all for the academic. But the corresponding GPA's were the medium or the least, two out of three times. It is also worth noting that none of the streams which had the highest AIAI in mathematics had a corresponding highest GPA.

IV. Concluding Remarks

As shown in Table 1, among the 1978 batch the business education stream had the highest median (82.4) in its percentile rank and its semi-interquartile range was a little more than the minimum. This picture was repeated in 1982 for productive technology with the highest median (64.2) and with least semi-interquartile range (11.0). This indicates that the two groups,

business and productive technology were better achievers in the eighth grade examination in 1978 and 1982, respectively. Judging from their semi-interquartile range, these were also homogeneous groups. Among the 1986 group none of the streams had a significantly high median in its eighth grade percentile rank. For all practical purposes, the streams in this batch were homogeneous.

As can be observed in all the three batches, different streams had the highest medians at different times, with the exception of a repeat for productive technology, and all of those which had the highest median had about equal semi-interquartile range. This shows that students in a particular stream were not selected for any of the streams because of their high percentile rank. Had this been the case the same stream would have had the highest median repeatedly.

As shown in Table 3, in 1982, the productive technology group was better off in its achievement in the three subjects. However, its variation was medium. In 1986 and 1990 academic had the highest means. Nevertheless, the coefficient of its variation was the highest in 1986 and medium in 1990. So, in 1986 it was the most heterogeneous, and in 1990 a similar group had a medium variation. A close look at the means and coefficients of variation should convince us that the grades of the academic stream were considerably higher in 1986 and 1990. Furthermore we find that the coefficients of variation in these streams were high and medium, respectively, and in such a case the tendency is for the relevant means to be low. In spite of this, however, the groups have high means. This is a clear indication that the grades were relatively high.

In Table 4 the correlation of the respective groups of their percentile rank and the average GPA of the three common subjects in the ESLCE was tested by using the Spearman Rho Rank correlation. The relationship was found to be significant. Out of nine comparisons, there were only two which were found to be significant: business in 1982 and academic in 1990. The rest had a very low correlation and their relationship was negligible. It is therefore safe to conclude that candidates' achievements in the eighth grade national examination and the ESLCE do not reflect high consistency with their abilities.

With regard to instructional adequacy (Table 5) the variables used were the proportion of qualified staff for a subject and the weekly period allocation in the particular subject. In all the three batches the academic groups did best in Amharic followed by business in 1982 and 1986. In 1982 and 1990, and in 1982 and 1986 the productive technology group did better than the rest in English and Mathematics, respectively. The other group which did well in 1986 and in 1990 in English and Mathematics, in that order, was the academic. The groups that achieved least in Amharic, English and Mathematics were Productive Technology in 1982, Business in 1986 and 1990 and Business in 1982, 1986 and 1990. From this we observe that the only definite pattern is that of the academic for Amharic and of business for Mathematics.

From the foregoing discussion we observe the following:

1. There is a limited correlation between the eighth grade percentile and ESLCE GPA's of the sample group (Table 4).

2. There are some indications that high average instruction adequacy index (AIAI) positively corresponds with a relatively high average ESLCE GPA in the subject GPA's (Table 5).

Perhaps there could have been even more correlation between eighth grade percentile rank and ESLCE GPA's and between average instruction adequacy index and the ESLCE GPA's had there been better and appropriate inputs for preparing candidates for ESLCE. After having said this, however, it is still safe to say that it is almost impossible to be exhaustive on the issue at hand in a study of this scope. It is therefore necessary to continue the research with more variables. For this I believe such factors as content of the curriculum and its relevance to the ESLCE, the candidates' age, sex and family background, teachers' qualification, work experience and salary, student/teacher ratios, school facilities and the nature of the school community should be among the many areas that must be thoroughly examined, using a larger sample.

NOTE

1. $$\text{Median} = L - i\left(\frac{\frac{N}{2} - CF}{f}\right)$$

Where:

L = highest limit of the median class

N = number of cases in the whole group

CF = cumulative frequency above the median class

f = frequency of the median class

i = class interval

2. $$\text{Coefficient of Variation} = \frac{S}{\bar{x}}$$

Where:

S = standard deviation of the group

$\bar{x}$ = mean of the group

3.

$$\text{Semi-Interquartile Range} = \frac{Q_3 - Q_1}{2}$$

$$\text{Any quartile } (Q_x) = L_x + \left(\frac{\frac{Xn}{4} - CF_x}{f} \right) i$$

Where:

Q_x = the given quartile

L_x = lower limit of quartile Q_x

n = total of the frequencies

CF_x = cumulative frequency below the class of Q_x

f = frequency of the class containing Q_x

i = class interval

4.

$$\text{Spearman Rho Rank Correlation} = 1 - \frac{6(\Sigma d^2)}{n\left[(n-1)(n+1)\right]}$$

Where:

d^2 = square of the deviations of the ranks of the two variables

n = number of pairs

5. $t = p\sqrt{\frac{n-2}{1-p^2}}$

Where:

n = number of ranked pairs

p = Spearman Rho Rank Correlation

6. Average Instruction Adequacy Index (AIAI) $= \sqrt{\frac{p}{q} \times \frac{r}{s}}$

Where:

P = Number of staff with BA and above for the given stream

q = Total number of staff for the stream

r = Number of weekly class meetings for a subject for the stream

s = Total number of weekly class meetings for the subject for all the streams.

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12. Robert D. Mason, Statistical Techniques in Business and Economics, (Nomewood: Richard D. Irwing Inc., 1979), P. 306.

13. Mason, ibid., p. 194.

14. Comment by Ato Tibebu Kidane, Chief Expert of Technical Vocational Education, Ministry of Education, Addis Ababa, Ethiopia.

15. Mason, op. cit. p. 306.