application play a major role in this strategy. This study was designed and carried out to analyze the new system's (Z-score's) effects on university qualification from 13 Tamil medium schools in the above-mentioned three educational zones in the Ampara district. The reasons for selecting these three educational zones are the most important Tamil medium schools are located here.

Problem Identification

Although it has been in operation in Sri Lanka for many years, the use of raw marks is not a method that is widely employed in educationally advanced countries for selecting students to universities. Several studies done in Sri Lanka have shown that when selection of students to universities is made on the basis of the aggregate of raw marks, undue competitive advantage may accrue to some students by virtue of the subjects they offer. Why? Because examination papers in all subjects do not have the same level of difficulty in a particular stream.

It has been observed over the years that students consistently score higher marks in some subjects than in others. For example, students can qualify to read for a degree in the biological sciences by offering at the GCE (A/L) examination one of two possible combinations of subjects. One combination is Chemistry, Biology and Physics. The other combination is Chemistry, Biology and Agriculture. There is evidence that more students are able to obtain higher marks in Agriculture than in Physics. Therefore, offering Agriculture instead of Physics improves the chances of gaining entrance to universities. Again, students offering different religions and foreign languages as subjects consistently score high marks in them. This enhances their chances of gaining university entrance. In the year 2000, students had found it harder to score high marks in Biology than in Botany; in Combined Mathematics than in Applied Mathematics. The net result of such differences is that educationally undesirable competitive advantage accrues to some students by virtue of the very subjects they offer at the GCE (A/L) examination.

This is manifestly unfair and undesirable and demands correction.

The universally accepted statistical solution to the above problem of valid comparison across subjects is to convert the raw marks obtained by students in different subjects to 'Z score' using a standard scale called the Z-distribution.

Z-Distribution and Z-score

Basically what is done to convert the raw marks in different subjects to a scale that has a constant mean and standard deviation is called the-Z distribution. The Z-distribution has a constant mean of zero (0) and a standard deviation of one (1).

To convert raw marks to 'Z-score' the mean mark for a given subject is subtracted from the raw mark obtained by each student in that subject. These differences when divided by the standard deviation of marks for a given subject give the Z-score for the specific subject for each student.

$$\text{Z-score} = \frac{\text{Raw marks obtained by a student} - \text{Mean mark for the subject}}{\text{Standard deviation of marks for the subject}}$$

Objective of the Study

Testing and analyzing the effect of Z-Score system on qualification to universities from Tamil medium schools in Kalmunai, Sammanthurai and Akkaraipattu educational zones in Ampara district. Discussing and forwarding the suggestions for the better future performances.

Methodology

Data Collection

4 years have passed after the introduction of Z-Score system by the University Grants Commission of Sri Lanka. The secondary data, the number of the students who were qualified for the university applications, were collected form 13 Tamil medium schools form Kalmunai, Sammanthurai and Akkaraipattu educational zones for overall, Biological science, Physical science, Management & Commerce, and Arts

streams for the past 12 years from 1993 to 2004. It was done by preparing and filling a questionnaire for each school and the overall summary from 13 Tamil medium schools. The raw data ware converted into percentages by dividing the number of students qualified to universities by the number of students who sat the examination, for overall and for all four streams individually.

The schools were: KM/ Zahira College (National School) Kalmunai, KM/ Mahmud Ladies College-Kalmunai, KM/ Carmel Fatima College (National School) Kalmunai, KM/ Wesly High School-Kalmunai, KM/ Vipulananda Central College-Karaitivu, KM/ Al-Manar Central College-Maruthamunai, KM/ Shams Central College-Maruthamunai, KM/Al-Mazhar Girls High School-Nintavur, KM/ Al-Ashraq MMV-Nintavur from Kalmunai educational zone, SMT/ Muslim Central College-Sammanthurai, SMT/ Al-Marjan Muslim Ladies High School-Sammanthurai from Sammanthurai educational zone and AKP/Muslim Central College (National School) Akkaraipattu, AKP/ Ayesha Balika Maha Vidyalaya-Akkaraiapttu from Akkaraipattu educational zone.

Initially the collected data had to be converted into its corresponding percentage value because the number of students who sat the examination varied from year to year. So the number of students those who qualified to universities are divided by the total number of

students who sat the GCE (A/L) examination, in the specific stream and overall data. Then it was multiplied by 100 to get the corresponding percentage value.

Appropriate Statistical Test

The converted qualified percentage data were used to prepare the simple bar charts for overall and individual streams. These charts were described for easy clarifications and comparisons for each year's outputs. Also the converted qualified percentage data were used to prepare the time series plots for overall to analyze the effectiveness of Z-Score system in course of time. Appropriate models were fitted for overall percentage data. The predicted percentage value for the years 2000, 2001, 2002, 2003, and 2004 were calculated from the model by using the observations of 8 years from 1993 to 1999. These predicted values were compared with the observed values to analyze the effectiveness of Z-Score system. Two sample T-test were also used to test the significance of the effectiveness of Z-Score system on qualification to universities from Tamil medium schools in the Ampara district.

Data Analysis and Discussion

Overall Data Analysis

The year 1993 to 2004 overall summarized data from 13 Tamil medium schools in Ampara district were as below:

Table 3.1: Overall Statistics of the Entrance of Students to Universities from 1993 to 2004.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Sat	800	879	1013	1132	1060	1325	1487	1959	2108	2313	2567	2337	18980
Passed	594	616	742	876	840	1037	1122	1318	1464	1329	1644	1557	13139
Passed(%)	74.25	70.08	73.25	77.39	79.25	78.26	75.45	67.28	69.45	57.46	64.04	66.62	69.23
Failed	206	263	271	256	220	288	365	641	644	984	923	780	5841
Qualified	466	446	584	715	675	759	784	1020	1080	1005	1170	1331	10035
Qualified (%)	58.25	50.74	57.65	63.16	63.68	57.28	52.72	52.07	51.23	43.45	45.58	56.95	54.40

The simple bar chart on qualification to university of 13 Tamil medium schools in the Ampara district from 1993 to 2004 is given below.

Figure 3.1: Qualification to university of 13 Tamil medium schools in Ampara district from 1993 to 2004.
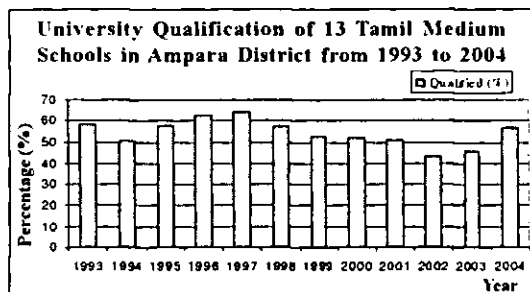
From the above percentage data, the average percentage to qualification to universities from 1993 to 1999 when before Z-score was introduced is 57.64%, this value is higher than on qualification to university from 2000 to 2004, after the Z-score was introduced. But it can not be conformed this decrease is due to the introduction of Z-score system. So it needs powerful statistical analysis.

Time Series Analysis for Overall Data

The overall percentage data were used to fit the model by using the Time Series statistical technique. The model is $Y=60.287 - 0.906*t$ and this model is satisfied with the conditions of model adequacy.

The time series graph is given below.

Time Series Plot of Qualified Percentage Vs Year
The Overall Data

Linear Trend Model
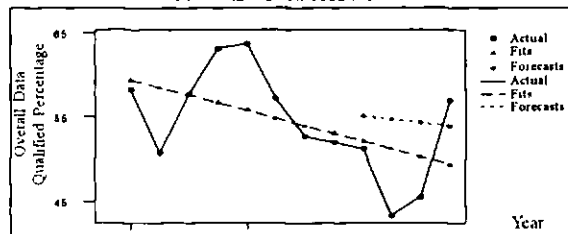$Yt = 60.2871 - 0.906224*t$

Figure 3.2: Time Series Plot of Overall Data from 13 Tamil Medium Schools in Ampara District.

From the above graph higher variation can be seen between observed values and predicted values from 2000 to 2004. But there is no evidence that, this variation is due to the introduction of Z-score system.

Two Sample T-test

An appropriate statistical test is two sample T-test to test whether the Z-score system has effects on qualification to universities from Tamil medium schools in Ampara district. So from 1993 to 1999 qualification to universities converted data and year from 2000 to 2004 data are considered as two separate independent samples. If the Z-score system has no effect on qualification to universities from Tamil medium schools in Ampara district then these two samples population are same. The statistical analysis result is given below.

N	Mean	StDev	SE Mean
7	57.64	4.82	1.8
5	49.86	5.40	2.4

95% Confidence Interval for $\mu_{(Before\ Z\text{-}score\ introduced)} - \mu_{(After\ Z\text{-}score\ introduced)}$: (1.2, 14.4)

T-Test $\mu_{(Before\ Z\text{-}score\ introduced)} = \mu_{(After\ Z\text{-}score\ introduced)}$ (vs not =): T= 2.63   P=0.025
DF= 10
Both use Pooled StDev = 5.06

The null hypothesis is that Z-score system has no effect on qualification to universities of Tamil medium schools in Ampara district. At 5% significance level the calculated value is 2.63 (P value is 0.025<0.05) which is greater than the critical value 2.228. Therefore, null hypothesis is rejected. This means that the Z-score system has effects on qualification to universities of Tamil medium schools in Ampara district.

One-way ANOVA test for significance of the effectiveness of Z-Score system

Another one important statistical test is one-way ANOVA to test whether the aggregate and Z-score systems are same or different to select the students to universities from Tamil medium schools in Ampara district. So from 1993 to 1999 qualification to universities converted data and year from 2000 to 2004 data are considered as two different treatments. If the Z-score system has no effect on qualification to universities from Tamil medium schools in Ampara district then these two treatments are same. The statistical analysis result is given below.

61

One-Way Analysis of Variance

Analysis of Variance for CI

Source	DF	SS	MS	F	P
Levels	1	176.7	176.7	6.91	0.025
Error	10	255.7	25.6		
Total	11	432.4			

Individual 95% CIs For Mean
Based on Pooled StDev

Level	N	Mean	StDev	-+—+—+—+—
Before Z-Score	7	57.640	4.818	(—*—)
After Z-Score	5	49.856	5.395	(—*—)

-+—+—+—+—

Pooled StDev = 5.057   45.0   50.0   55.0   60.0

Since, P=0.025 is smaller than the desired probability (0.05) of rejection of null hypothesis. So these two methods vary to select students to universities.

When the mean comparisons are compared and it is observed that $\mu_{(Before\ Z\text{-}score\ introduced)}$ and $\mu_{(After\ Z\text{-}score\ introduced)}$ are different at 5% significance level.

Therefore, from the above statistical analysis it can be concluded that the Z-score system decreased students on qualification to universities of Tamil medium schools in Ampara district.

Stream wise statistical analyses were also carried out for the data from 1993 to 2004.

Statistical Analysis for Biological Science Stream

Biological science stream statistical analyses were also carried out for the data from 1993 to 2004. The summarized data is given below.

Table 3.2: The Entrance of Students to Universities from Biological Science Stream of 13 Tamil Medium schools in Ampara District from 1993 to 2004.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Sat	220	277	262	292	263	330	370	407	463	444	528	468	4324
Passed	152	182	164	167	188	258	249	243	311	262	307	288	2771
Passed(%)	69.09	65.70	62.60	57.19	71.48	78.18	67.30	59.71	67.17	59.01	58.14	61.54	64.08
Failed	68	95	98	125	75	72	121	164	152	182	221	180	1553
Qualified	114	101	111	108	126	178	173	166	176	156	174	255	1838
Qualified (%)	51.82	36.46	42.37	36.99	47.91	53.94	46.76	40.79	38.01	35.14	32.95	54.49	42.51

The simple bar chart on qualification to universities from biological science stream from 13 Tamil medium schools in Ampara district is given below.

University Qualification from Biological Science Stream of Tamil Medium Schools in Ampara District from 1993 to 2004
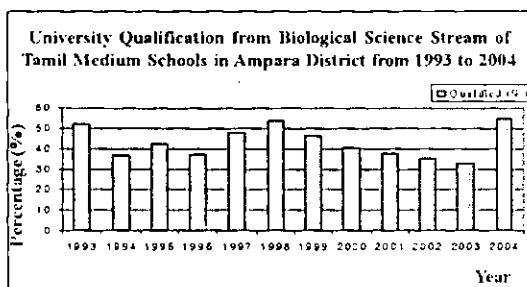
Figure 3.2: Biological Science stream qualification to university of 13 Tamil medium schools in the Ampara district from 1993 to 2004

Two independent sample T-test was tested for the data from 1993 to 1999 and from 2000 to 2004. The result is given below.

N	Mean	StDev	SE Mean
7	45.18	6.85	2.6
5	40.28	8.48	3.8

95% Confidence Interval for $m_{(Before\ Z\text{-}score\ introduced)} - \mu_{(After\ Z\text{-}score\ introduced)}$: (-4.9, 14.7)

T-Test $\mu_{(Before\ Z\text{-}score\ introduced)} = \mu_{(After\ Z\text{-}score\ introduced)}$ (vs not =): T= 1.11 P=0.29 DF= 10

Both use Pooled StDev = 7.55

The null hypothesis is that Z-score system not effect the biological science stream on qualification to universities of Tamil medium

schools in the Ampara district. At 5% significance level the calculated value is 1.11 (P value is 0.29>0.05) which is less than the critical value is 2.228. Therefore, null hypothesis is not rejected. This means that the Z-score system not effect the biological science stream on qualification to universities of Tamil medium schools in the Ampara district.

One-way ANOVA was also tested for the data from 1993 to 1999 and from 2000 to 2004 to test whether these two methods are same or not. The result is given below.

One-Way Analysis of Variance

```
Analysis of Variance for CI
Source          DF      SS      MS      F       P
Levels          1       70.1    70.1    1.23    0.293
Error           10      569.3   56.9
Total           11      639.4

                        Individual 95% CIs For Mean
                        Based on Pooled StDev
Level           N       Mean    StDev  -+—+—+—+—
Before Z-Score  7       45.179  6.853  (—*—)
After Z-Score   5       40.276  8.478  (—*—)
                                       -+—+—+—+—
Pooled StDev =    7.545 36.0    42.0    48.0    54.0
```

Since, P=0.293 which is greater than the rejection (0.05) of null hypothesis. So it can be concluded that the Z-score system has no effect on qualification to universities from Tamil medium Schools in the Ampara district from the biological science stream.

Statistical Analysis for Physical Science Stream

An individual statistical analysis also carried out for Physical Science stream for data from 1993 to 2004. The summarized data is given below.

Table 3.3: The Entrance of Students to Universities from Physical Science Stream of 13 Tamil medium schools in the Ampara District from 1993 to 2004.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Sat	97	108	123	122	143	172	193	287	317	355	396	318	2631
Passed	61	55	54	70	74	83	86	140	187	137	190	144	1281
Passed(%)	62.89	50.93	43.90	57.38	51.75	48.26	44.56	48.78	58.99	38.59	47.98	45.28	48.69
Failed	36	53	69	52	69	89	107	147	130	218	206	174	1350
Qualified	48	34	28	40	37	52	40	82	94	82	90	130	757
Qualified (%)	49.48	31.48	22.76	32.79	25.87	30.23	20.73	28.57	29.65	23.10	22.73	40.88	28.77

The simple bar chart on qualification to universities from biological science stream from 13 Tamil medium schools in the Ampara district is given below.

University Qualification from Physical Science Stream of 13 Tamil Medium Schools in Ampara District from 1993 to 2004
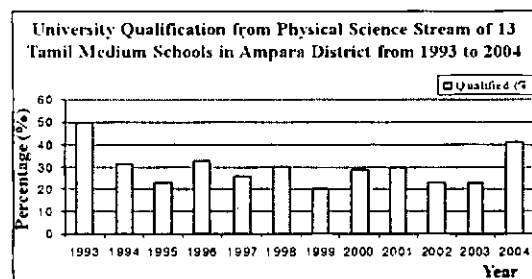
Figure 3.3: Physical Science stream on qualification to university of 13 Tamil medium schools in the Ampara district from 1993 to 2004

The T-test was tested for the data from 1993 to 1999 and from 2000 to 2004 as two independent samples. The result is given below.

N	Mean	StDev	SE Mean
7	30.48	9.52	3.6
5	28.99	7.35	3.3

95% Confidence Interval for $\mu_{(Before\ Z\text{-}score}$
$_{introduced)} - \mu_{(After\ Z\text{-}score\ introduced)}$: (-9.9, 12.9)

T-Test $\mu_{(Before\ Z\text{-}score\ introduced)} = \mu_{(After\ Z\text{-}score}$
$_{introduced)}$ (vs not =): T= 0.29 P=0.78 DF= 10

Both use Pooled StDev = 8.71

The null hypothesis is that Z-score system has no effect the physical science stream on qualification to universities of Tamil medium schools in the Ampara district. At 5% significance level the calculated value is 0.29 (P value is 0.78>0.05) which is less than the critical value is 2.228. Therefore, null hypothesis is not rejected. This means that the Z-score system not effect the physical science stream on qualification to universities of Tamil medium schools in the Ampara district.

Analysis of Variance for C1

Source	*DF*	*SS*	*MS*	*F*	*P*
levels	*1*	*6.5*	*6.5*	*0.09*	*0.776*
Error	*10*	*759.2*	*75.9*		
Total	*11*	*765.7*			

Individual 95% CIs For Mean
Based on Pooled StDev

Level	*N*	*Mean*	*StDev*	*—+—+—+—*
Before Z-Score	*7*	*30.477*	*9.516*	*(—*—)*
After Z-Score	*5*	*28.986*	*7.346*	*(—*—)*
				—+—+—+—

Pooled StDev = 8.713   25.0   30.0   35.0

Since, P=0.776 which is greater than the rejection (0.05) of null hypothesis, do not reject the null hypothesis as the Z-score system has no effect on qualification to universities from Tamil medium Schools in the Ampara district from the physical science stream.

Statistical Analysis for Management and Commerce Stream

Statistical analysis was also carried out for Management and Commerce stream for data from 1993 to 2004. The summarized data is given below.

Table 3.4: The Entrance of Students to Universities from Management and Commerce Stream of 13 Tamil medium schools in the Ampara District from 1993 to 2004.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Sat	204	230	332	316	276	258	346	481	469	604	618	567	4701
Passed	160	176	263	268	236	218	271	322	316	352	426	388	3396
Passed(%)	78.43	76.52	79.22	84.81	85.51	84.50	78.32	66.94	67.38	58.28	68.93	68.43	72.24
Failed	44	54	69	48	40	40	75	159	153	252	192	179	1305
Qualified	129	144	227	242	211	139	187	267	237	280	282	314	2659
Qualified (%)	63.24	62.61	68.37	76.58	76.45	53.88	54.05	55.51	50.53	46.36	45.63	55.38	56.56

The simple bar chart for qualification to universities from management and commerce stream from 13 Tamil medium schools in the Ampara district is given below.

University Qualification from Management and Commerce Stream of 13 Tamil Medium Schools from Ampara District from 1993 to 2004
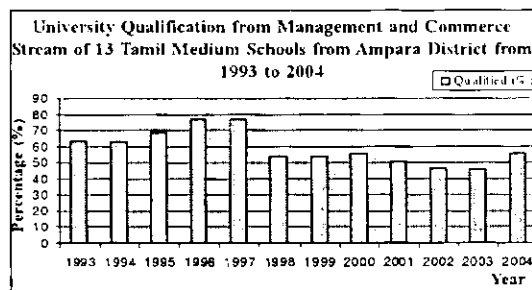
Figure 3.4: Management and Commerce stream qualification to university of 13 Tamil medium schools in the Ampara district from 1993 to 2004

The T-test was tested for the data from 1993 to 1999 and from 2000 to 2004 as two independent samples. The result is given below.

N	Mean	StDev	SE Mean
7	65.03	9.39	3.5
5	50.68	4.73	2.1

95% Confidence Interval for $m_{(Before\ Z-score\ introduced)}$ - $m_{(After\ Z-score\ introduced)}$: (4.1, 24.6)

T-Test $m_{(Before\ Z-score\ introduced)}$ = $m_{(After\ Z-score\ introduced)}$ (vs not =): T= 3.11 P=0.011 DF= 10

Both use Pooled StDev = 7.86

The null hypothesis is that Z-score system has no effect the Management and Commerce stream on qualification to universities of Tamil medium schools in the Ampara district. At 5% significance level the calculated value is 3.11 (P value is 0.011<0.05) which is greater than the critical value is 2.228. Therefore, null hypothesis is rejected. This means that the Z-score system effect the management and commerce stream on qualification to universities of Tamil medium schools in the Ampara district.

One-Way Analysis of Variance

Analysis of Variance for CI

Source	DF	SS	MS	F	P
Levels	1	600.1	600.1	9.70	0.011
Error	10	618.5	61.9		
Total	11	1218.6			

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	—+—+—+—
Before Z-Score	7	65.026	9.389	(—*—)
After Z-Score	5	50.682	4.733	(—*—)

—+—+—+—

Pooled StDev = 7.865 48.0   56.0   64.0

Since, P=0.011 which is smaller than the rejection (0.05) of null hypothesis. So it can be concluded that the Z-score system effect on qualification to universities from Tamil medium Schools in the Ampara district from the Management and Commerce stream.

Statistical Analysis for Arts Stream

Statistical analysis also carried out for Arts stream for data from 1993 to 2004. The summarized data is given below.

Table 3.5: The Entrance of Students to Universities from Arts stream of 13 Tamil medium schools in the Ampara district from 1993 to 2004.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Sat	279	264	296	402	378	565	578	784	859	910	1025	984	7324
Passed	221	203	261	371	342	478	516	613	650	578	721	737	5691
Passed(%)	79.21	76.89	88.18	92.29	90.48	84.60	89.27	78.19	75.67	63.52	70.34	74.90	77.70
Failed	58	61	35	31	36	87	62	171	209	332	304	247	1633
Qualified	175	167	218	325	301	390	384	505	573	487	624	632	4781
Qualified (%)	62.72	63.26	73.65	80.85	79.63	69.03	66.44	64.41	66.71	53.52	60.88	64.23	65.28

The simple bar chart on qualification to universities from Arts stream from 13 Tamil medium schools in the Ampara district is given below.
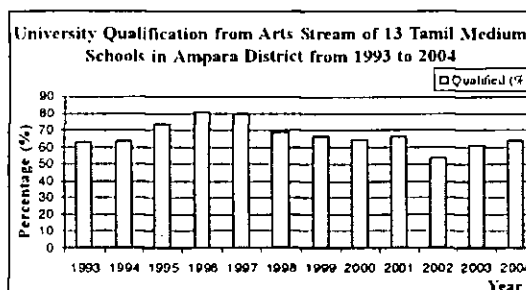
Figure 3.5: Arts stream qualification to university of 13 Tamil medium schools in the Ampara district from 1993 to 2004

University Qualification from Arts Stream of 13 Tamil Medium Schools in Ampara District from 1993 to 2004

N	Mean	StDev	SE Mean
7	70.80	7.43	2.8
5	61.95	5.15	2.3

95% Confidence Interval for $\mu_{(Before\ Z-score\ introduced)} - \mu_{(After\ Z-score\ introduced)}$: (0.2, 17.5)

T-Test $\mu_{(Before\ Z-score\ introduced)} = \mu_{(After\ Z-score\ introduced)}$ (vs not =): T= 2.28 P=0.045 DF= 10

Both use Pooled StDev = 6.61

The null hypothesis is that Z-score system not effect the Arts stream on qualification to universities of Tamil medium schools in Ampara district. At 5% significance level the calculated value is 2.28 (P value is 0.045<0.05) which is greater than the critical value is 2.228. Therefore, null hypothesis is rejected. This means that the Z-score system has effected the Arts stream on qualification to universities of Tamil medium schools in Ampara district.

One-Way Analysis of Variance

Analysis of Variance for CI

Source	DF	SS	MS	F	P
Levels	1	228.3	228.3	5.22	0.045
Error	10	437.5	43.7		
Total	11	665.8			

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	—+—+—+—
Before Z-Score	7	70.797	7.432	(—*—)
After Z-Score	5	61.950	5.151	(—*—)
				—+—+—+—

Pooled StDev = 6.614   60.0   66.0   72.0

Since, P=0.045 which is smaller than the rejection (0.05) of null hypothesis. So it can be concluded that the Z-score system effect qualification to universities from Tamil medium Schools in the Ampara district from the Arts stream.

Conclusions and Suggestions

Conclusions

This research study has given very important results. When the overall analysis of all 13 Tamil medium schools' progresses were statistically performed from the percentage data for the past 12 years, it was clearly found that the overall progress of qualifying to universities from these schools shows a downward trend over the analyzed time period. From the statistical analysis it is observed that the Z-score system significantly has effect on the qualification to universities of Tamil medium schools in Ampara district.

Apart from its effect, the number of students qualifying to universities from all these schools showed a downward trend before Z-Score system's implementation. This showed the poor status of these schools' education in the past. The educational progresses of these schools are going down.

The biological and physical science streams GCE(A/L) Z-score system on qualification to universities of Tamil medium schools in Ampara district does not have significantly effect, because the subject combinations for these two streams are very few compared to the other two streams.

The Management & Commerce and Arts streams are significantly affected by the GCE.(A/L) Z-score system on qualification to universities of Tamil medium schools in Ampara district, because there are many number of subject combinations available at these two streams.

Suggestions

➤ Insufficiency of qualified teachers for advanced level streams is a cause for the decreasing trend of these schools and it can be overcome by appointing qualified graduate teachers for the schools where insufficiency prevails.

➤ Facilities for learning are not sufficient or effective to the students. Insufficient number of books are available at the school library, seminars are not often conducted for the students. Library facility can be sophisticated by providing learning tools.

➤ The teaching quality of these schools is very poor. Students mostly depend on the private classes. So the interest of teachers on teaching is very much essential.

➤ The entertainments have grown to certain extend, so the interest shown by students on study declines.

➤ The interests on each subject differ and it would show its effect on overall Z-score because it relies upon individual Z-scores. Students must give equal priority to each subject that they offer.

➢ The time remains for home study is very less due to overload of home work, assignments and private institution studies.

References

Prem S. Mann., (1998). Introductory Statistics. John Wiley and Sons Inc. United States of America.

Sher Muhammad Chaudhry and Shahid Kamal., (1996). Introduction to Statistical theory 6th Edition. Markazi Kutub Khana, Lahore, Pakistan.

George Simpson and Fritz Kafka., (1965), Basic Statistics. Oxford and IBH Publishing Co. New Delhi, India.

David S. Moore., (2000). The Basic Practice of Statistics. 2nd Edition. W.H. Freeman and Company, United States of America.

Frank Owen and Ron Jones. (1994). Statistics. 4th Edition. Longman Group UK Limited, The Great Britain.

R.S.N. Pillai and V. Bagavathi., (2001). Statistics. S.Chand and Company Ltd, New Delhi, India.

Tim Hannagan., (1986). Mastering Statistics. 2nd Edition. The MACMILLAN Press Ltd, London, the Great Britain.

John E. Freund., (1994). Mathematical Statistics 5th Edition. Prentice-Hall of India private limited, India.

Norman R. Draper and Hanry Smith, (1998). Applied Regression Analysis 3rd Edition. John Wiley and sons. Inc. The United States of America.

Agarwal B.L., (1998). Basic Statistics. New Age (Pvt) Limited Publishers, New Delhi, India.

Douglas C. Montgomery and Elizabeth A. Peck (1992). Introduction to Linear Regression Analysis. 2nd Edition. A wiley-Interscience publication, John Wiley and sons, Inc, New York.

William Mendenhall, Robert J. Beaver and Barbara M. Beaver. (1999). Introduction to Probability and Statistics. 10th Edition, Duxbury Press, An imprint of brooks/Cole Publishing Company.

www.ugc.ac.lk/ugc_Announcements/Admission_release2002_03.html

G.C.E.(A/L) results sheets from KM/ Zahira College National School-Kalmunai, KM/ Mahmud Ladies College-Kalmunai, KM/ Carmel Fatima College National School-Kalmunai, KM/ Wesly High School-Kalmunai, KM/ Vipulananda Central College-Karaitivu, KM/ Al-Manar Central College-Maruthamunai, KM/ Shams Central College-Maruthamunai, KM/Al-Mazhar Girls High School-Nintavur, KM/ Al-Ashraq MMV-Nintavur, SMT/ Muslim Central College-Sammanthurai, SMT/ Al-Marjan Muslim Ladies High School-Sammanthurai, AKP/Muslim Central College (National School)- Akkaraipattu, and AKP/ Ayesha Balika Maha Vidyalaya-Akkaraiapttu.