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An Empirical study on Attainment in Mathematics at High School Leaving Certificate Examination

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Abstract: The paper attempts to analyze the results of high school leaving certificate examination, Sivasagar, India, to find out gender difference if any, in attainment in mathematics, level of achievement in the subject in compared to other subjects. List of schools registered under Secondary Education Board of Assam of Sivasagar district is collected from the official record of Government education department. The classification criteria of schools are done on the basis of management of the schools. According to such criteria the schools are categorized into four distinct groups viz., Government aided and private and again, another criterion for grouping is geographical location of the schools according to urban (U) and rural (R). Two structured questionnaires are prepared to collect data. Interview methods are also applied for collection of the data. t-Test is applied to test the significance of difference as statistical tool. In the present study, HSLC examinations results of each school during three consecutive years viz., 20012-13, 2013-14, 2014-15 are collected and analyzed.

The analysis of data has showed that the majority of students have achieved in the range of 40 -50 marks, only a minor portion attained above the range of 60 and a meager portion scored above 80 out of 100. In 2014 no students achieved in between 30 to 40 and no of students were very little in 2012 and 2015 also. There is no gender difference in achievement for the three consecutive years of study. The mean achievement in mathematics is lowest in the year 2012-13 and was better compared to social-science in the year 2012-13.

Keywords: Attainment, gender, HSLC, mathematics, SEBA, t-test.

I. INTRODUCTION

In the process of civilization progression, the role of mathematics has been pivotal, invaluable and immeasurable. In modern civilization a good knowledge in mathematics is very much necessary. The subject has tremendous role in increasing the potential of other discipline also. In the national policy on education (NPE), 1986, inter disciplinary importance on mathematics is highlighted as follows –“Mathematics should be visualized as the vehicle to train a child to think, analyze, and articulate logically. Apart from being a specific subject it should be treated as a concomitant to any subject involving analysis and meaning.” Mathematical proficiency is a necessary component in preparing for employment and essential in the fields of highly-skilled persons required by industry, science and technology, Zulekha, Aqil, (2015). High school level is a very crucial stage. These are the formative years after which the students choose whether to pursue mathematics for further study or not. Each and every education commission of India emphasizes on importance of mathematics. Secondary education commission, 1952 recommended to make the mathematics compulsory subject. Kothari commission had made mathematics as a compulsory subject up to Xth standard (for ten years of education). NPE further stated “At the secondary stage, a beginning will be made to teach mathematics in a suitable manner. Even then the concepts of essential learning outcomes, minimum level of learning and mastery learning are relevant and valid. Many pupils perform poorly in mathematics and find its understanding very difficult”. The admission into elite, self financing schools are depends on the performance in the secondary examination Joseph, (2014). The board examinations are milestone events for the children, and roads to economic mobility, they represents the attitudes to education. These examinations throw long shadows and have extreme significance for classroom assessment Ramanujam, Subramaniam (2012).

A. Status of Mathematics

Though much thrust has been given to foster the growth of interest for the subject yet due to some reasons, students find the subject tough from their very early school days and try to avoid the subject, which has been reflected in the results of high school leaving certificate (H.S. L.C) examination. The students detained for failing in one or two subjects, maximum numbers failed in mathematics. It follows up to class X board examination. The largest numbers of failure are in mathematics (Teaching of mathematics, 2006). The answer books of Secondary School Examination have shown that the numbers of failure in the subject are very high, Dhyani. V, (2014). The implications of the failure in the Board examination of Class X, a certificate given by the State,



must be considered seriously, Teaching Mathematics, (2006). There were no significant differences in mathematics achievement based on medium and gender among the students Choudhury, Barua, (2012). The research of Zulekha, Aqil, (2015) found no significant difference between male and female students of 9th standard on Mathematics achievement.

Science education in Assam lags behind the rest of the country. Every year less than 10 percent of total high school students opt for science and mathematics in higher secondary level, Bhagowati, (2011). After completion of the Xth standard a very few opt for mathematics at higher secondary level. During the last thirty years, the best students are not attracted to study mathematics and they flock to other branches of science, Verma, Gandhi, (2007). The teaching learning process of mathematics education is grooved with various problems.

The evidence proves that a critical ailment in the system is teachers lack of ability to teach what the current curriculum demands Benarji, (2015). The Annual Status of Education Report (ASER 2012) prepared by NGO Pratham opened up the sorry state of education system. This report shows that the number of Class V students who could not read a Class II level text or solve a simple arithmetic problem has been increasing.

In 2010, 46.3% of kids in this category failed to strike the minimum requisite standard mark and it is increasing to 51.8% in 2011 and 53.2% in 2012. In 2010, 29.1% children in Class V could not solve a two-digit subtraction problem without seeking help. This proportion increased to 39% in 2011 and 46.5% in 2012. The annual status of education report (ASER 2014) had shown that basic arithmetic skills among the children are woefully low. One out of every three children in class V cannot do a numerical subtraction problem like 71 minus 21.

The students' knowledge and capacity of learning is estimated mostly through achievement tests. The teachers, parents, and policymakers can assess the student's learning outcomes through test, National mathematics advisory panel final report (2008). HSLC Examination is a common test for 10th standard students conducted by Board of Secondary Education of Assam (India), (SEBA), under the state Government of Assam. Majority of the schools of Assam adopt HSLC examination for evaluation of the 10th standard students.

A uniform pattern is followed for testing and evaluation for all the schools. Hence, the results can be taken as a uniform treatment for all schools for the purpose of analysis. From above discussion we have observed that though the subject has much importance yet in overall findings have shown that teaching the subject at these vital periods of schooling has needed special attention.

B. Objectives Of The Study

- 1) To find out the difference, if any, in attainment in mathematics between male and female students at HSLC examination,
- 2) To analyze level of achievement in the subject
- 3) To compare the performance in mathematics and other subject at HSLC examination,

C. Methodology

The study has been carried out with following steps:

- 1) List of schools registered under SEBA curriculum of Sivasagar district is collected from the official record of Government education department. The classification criteria of schools are done on the basis of management of the schools. According to such criteria the schools are categorized into four distinct groups viz., Government aided and private and again, another criterion for grouping is geographical location of the schools according to urban (U) and rural (R).
- 2) Two structured questioner prepared in different by researcher are used to collect data and the necessary information from the selected schools and administrator of the selected schools. Interview methods are also applied for collection of the data.
- 3) t- Test is applied to test the significance of difference as statistical tool.

In the present study, HSLC examinations results of each school during three consecutive years viz., 2012-13, 2013-14, 2014-15 are collected and analyzed.

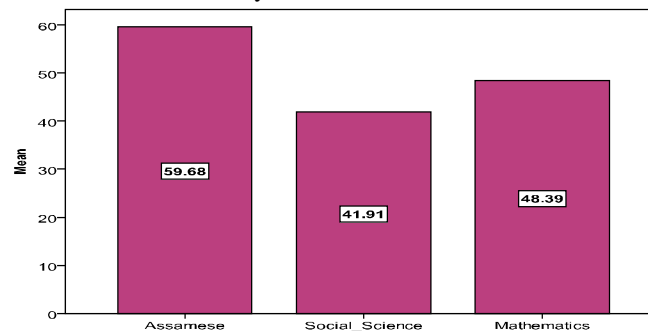
D. Scope And Limitation Of The Study

The scope of the present study covers some of the randomly selected schools of Sivasagar district only. The study is confined only in the results of HSLC examination under SEBA for the period of 2012-13, 2013-14, and 2014-15 not schools under other national boards are considered.

II. RESULT AND DISCUSSION

The student's attainment in examinations is associated with various factors such as class size, geographical location, management of the schools. To study the causes of difference in achievement various factors have to be analyzed. For this purpose data is collected from selected schools situated in different geographical location and manage by different governing body from the three subdivisions of Sivasagar districts of Assam. The detailed information and attainment in the HSLC examinations' result have been analytically presented.

Fig. 2.1 Bar Diagram of the marks for the year 2013 of Assamese, Social Science and Mathematics



There is the difference of attainment in Assamese, Social Science and Mathematics. Lowest mean is for social science which is 41.91 and highest is for Assamese which is 59.61 and for mathematics it is 48.39.

Table 2.1 is for independent sample T- Test to find out the mean difference of the marks achieved by male and female students for the Year 2013.

Table 2.1: Independent Sample T- Test for the Year 2013 based on Gender

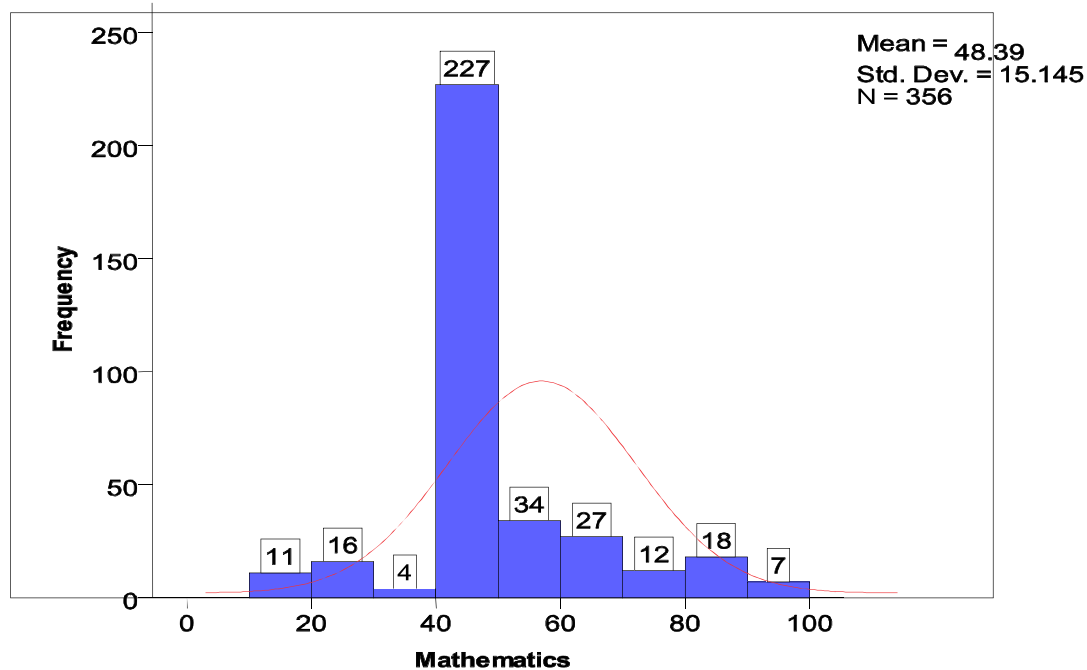
Group Statistics					
Gender		N	Mean	Std. Deviation	Std. Error Mean
Mathematics	Male	223	47.77	14.891	.997
	Female	133	49.44	15.562	1.349

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mathematics	Equal variances assumed	.436	.510	-1.003	354	.316	-1.665	1.659	-4.928	1.598
	Equal variances not assumed			-.992	268.008	.322	-1.665	1.678	-4.968	1.639

For the year 2013 since the value under significance is greater than 0.005 we go along the first row .Here the sample t –value is - 1.003 with a two tailed significance of 0.316. Again the lower and upper limit of 95 % confidence interval for the difference in sample means is -4.928 and 1.598 respectively. Since this interval includes zero, we accept the hypothesis population means are equal i.e. there is no significance difference between the achievements of male and female students.

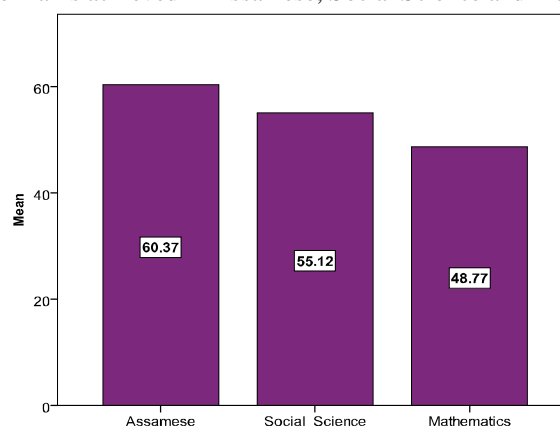
Fig. 2.2 Histogram for the attainment in mathematics in the year 2013



From the above graph it has been observed that there is slight positive skew i.e. mean and median value are in the right side of model value. Histogram has showed 227(63.37%) numbers of students which is maximum, have attained the marks in the range 40-50 , only 98(27.53%) have attained above 60 and only 25(7.02%) students out of 356 have scored above 80.

The figure 2.3 represents the bar diagram of the marks for the year 2014 in the subjects Assamese, Social Science and Mathematics.

Fig.2.3 Bar Diagram of the marks achieved in Assamese, Social Science and Mathematics in the year 2014



The above histogram shows the difference of attainment in Assamese, Social Science and Mathematics. Lowest mean is for mathematics which is 48.77 and highest is for Assamese which is 60.37.

Table 2.2 is for independent sample T- Test to find out the mean difference of the marks achieved by male and female students for the Year 2014.

Table 2.2: Independent Sample T- Test for the Year 2014 based on Gender

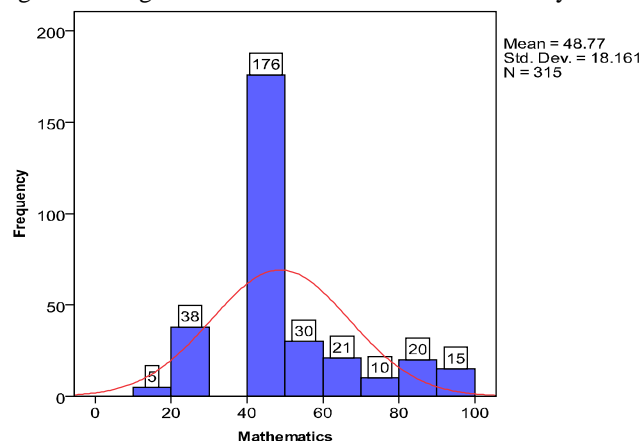
Group Statistics					
	Gender	N	Mean	Std. Deviation	Std. Error Mean
Mathematics	Male	205	49.65	18.562	1.296
	Female	110	47.14	17.354	1.655

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mathematics	Equal variances assumed	.919	.339	1.171	313	.242	2.512	2.145	-1.708	6.733
	Equal variances not assumed			1.195	236.314	.233	2.512	2.102	-1.629	6.654

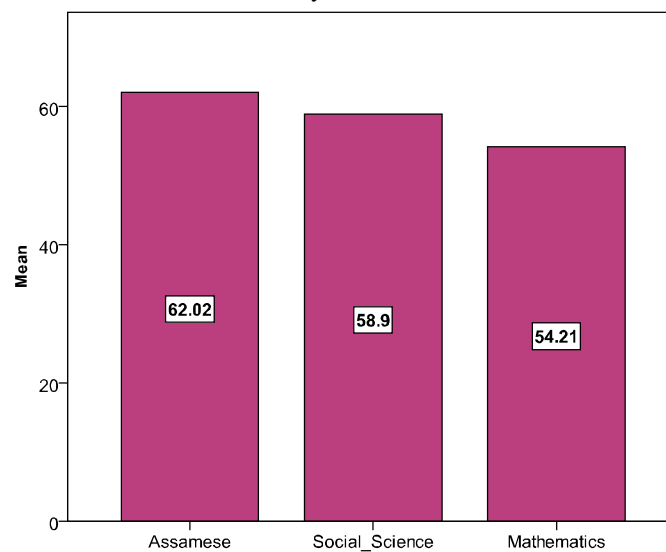
Again for the year 2014 since the value under significance is greater than 0.005 we go along the first row. Here the sample t –value is 1.171 with a two tailed significance of 0.242. Again the lower and upper limit of 95 % confidence interval for the difference in sample means are -1.708 and 6.733 respectively. Since this interval includes zero we accept the hypothesis population means are equal i.e., there is no significance difference between the achievements of male and female students.

Fig. 2.4 Histogram for mathematics attainment in the year 2014



The above graph shows slight positive skew .Mean and median values are in the right side of model value. Histogram has showed 176(55.87%) numbers of students which is maximum in number, attained the marks in the range 40-50,66 (20.95%) students scored above 60 out of total 100 and only 35(11.11%) students out of 315 had scored above 80.No students achieved in the range 30-40. The figure 2.5 represents the bar diagram of the marks achieved in the year 2015 in the subjects assamese, Social Science and mathematics.

Fig.2.5 Bar Diagram of the marks achieved in the year 2015 in Assamese, Social Science and Mathematics



The bar diagram shows the difference of attainment in Assamese, Social Science and Mathematics. Lowest mean is for Mathematics which is 54.21 and highest is for Assamese which is 62.02. There is 7.81 points of difference in mean for the subjects Assamese and Mathematics. Table 2.3 is for independent sample t-Test to find out the mean difference of the marks achieved by male and female students for the Year 2015.

Table 2.3: Independent Sample T Test for the Year 2015 based on Gender

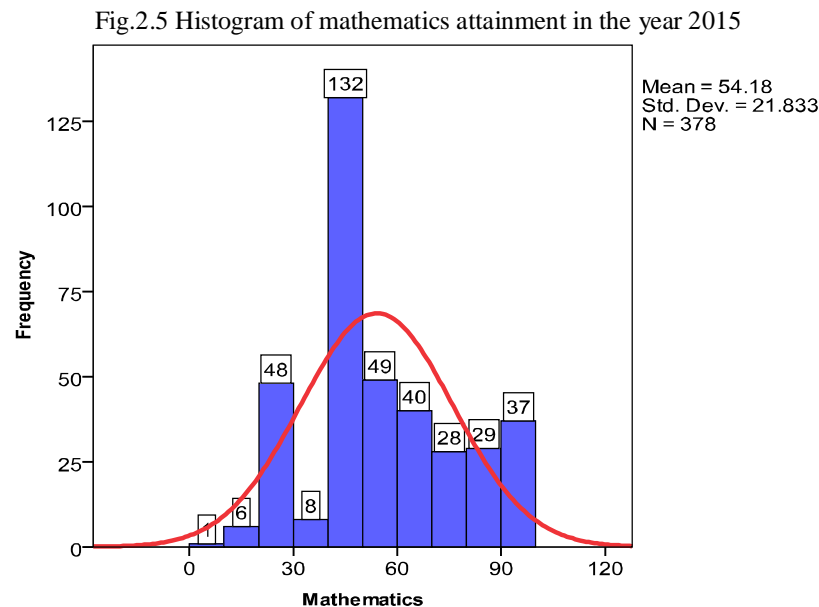
Group Statistics

Gender		N	Mean	Std. Deviation	Std. Error Mean
Mathematics	Male	238	55.60	20.632	1.337
	Female	140	51.85	23.777	2.010

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mathematics	Equal variances assumed	3.755	.053	1.612	376	.108	3.751	2.327	-.825	8.326
	Equal variances not assumed			1.554	259.538	.121	3.751	2.414	-1.002	8.504

Since the value under significance is greater than 0.005 we go along the first row. Here the sample t -value is 1.612 with a two tailed significance of 0.108. Again the lower and upper limit of 95 % confidence interval for the difference in sample means is -0.825 and 8.326 respectively. Since this interval includes zero we accept the hypothesis population means are equal i.e. there is no significance difference between the male and female students.

The figure 2.5 represents the histogram for the marks in mathematics in the year 2015.



The above graph shows slight positive skew. Mean and median values are in the right side of model value. Histogram has showed that 132(34.92%) numbers of students which is maximum in number, attained the marks in the range 40-50, 134 (35.44%) scored above 60 and only 55(14.55%) students out of 378 had scored above 80 out of 100.

The analysis of data has showed that the majority of students have achieved in the range of 40 -50 marks, only a minor portion attained above the range of 60 and a meager portion scored above 80 out of 100. In 2014 no students achieved in between 30 to 40 and number of students were very little in 2012 and 2015. There is no gender difference in achievement for the three consecutive years of study. The mean achievement in mathematics is lowest in the year 2012-13 and was better compared to social-science in the year 2012-13.

III. ANALYSIS OF QUESTIONNAIRE

80 percent teachers has said that there is difference in attitude towards mathematics between boys and girls. 86 percent teachers have found no difference in achievement between boys and girls, 92 percent teachers thought that there is close relationship in mathematics achievement and economic status of parents. 84 percent teachers have thought that there is a positive impact of parent's education level on mathematics achievement of students. 98 percent teachers have said the school authority does not provide ample modern scientific apparatus to make teaching learning process enjoyable. 83 percent teachers said they have not got in- service training to enhance their career.

IV. CONCLUSION

In an education system achievement is the measuring tool of learning outcome and plays an important role in analyzing the suitability of a curriculum and effectiveness of teaching learning process. The study reveals that the curriculum of mathematics is designed to teach a lot but practically majority of students learn a little. The twenty first century is marked with rapid growth of information and communication technology and its advent in every sphere of life has revolutionized the teaching learning process. But it has been observed during the study the schools are lack of infrastructure and trained man power to access these modern pedagogical tools. The current education system does not help the students to sprout inquisitiveness to ask questions. The results of this study have implications for pedagogic and curriculum planning. This research may opens up doors for broad research in this field.



V. ACKNOWLEDGEMENT

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VI. ABBREVIATIONS

- 1) ASER Annual Status of Education Report
- 2) HSLC High School Leaving Certificate
- 3) NGO Non Governmental Organization
- 4) NPE National Policy on Education
- 5) SEBA Secondary Education Board of Assam

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