Effects of Sex Ratio and No of Primary School on Literacy Rate in District of West Bengal

Effects of District Income and No of Primary School on Female Literacy in District of West Bengal

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Contents:

1. Introduction

"Literacy is…the road to human progress and the means through which

Every man, woman and child can realize his or her full potentials"

-Kofi Annan

Literacy is most commonly defined as the ability to read and write. But it's not as simple as it sounds. Reading and Writing abilities vary across different cultures and contexts, and these too are constantly shifting. Literacy is essential for eradicating, Poverty reduction, Mortality, Curbing Population growth, achieving gender equality and ensuring sustainable development peace and democracy. Our economy is enhanced when learners have higher the literacy levels. Effective literacy skills open the doors to more educational and employment opportunities so that people are able to pull themselves out of poverty and chronic under-employment. In our increasingly complex and rapidly changing technological world, it is essential that individuals continuously expand their knowledge and learn new skills in order to keep up with the pace of change.

Literacy is always considered to be an important key for socio-economic growth. Economic prosperity of a country entirely depends on the economic resources it has and human resource is an important part of economic resource. Human resource includes the population, its growth rate, skills, standard of living and the working capacity of the labour force and all the above factors can be enhanced by increasing the literacy rate of a population. Thus literacy rate plays a key role in economic growth of a country.

With a literacy rate of 76.26 % , above the national average of 74.04%, as per the 2011 census. West Bengal ranks 20th amongst the 36 States and Union Territories in India in terms of literacy rate. As per 2011 Census, Male literacy rate of the Country was 82.14% and the Female literacy rate of the country was 65.46%. As per 2011 census, the Male literacy rate of West Bengal was 81.69% however the Female literacy was 70.54%. By Birth, 952 females were born for every thousand male in West Bengal as per census 2011. As per the sex ratio by population

and literacy, the females lag behind in literacy. Picture of female literacy in West Bengal is said to be worse. Presently it is 70.54%. The difference of male and female literacy is high, 11.15 (2011 census).

Female literacy can considered to be a more sensitive index of social development to overall literacy rates. Female literacy is relatively related with fertility rates, population growth, infant and child mortality rates and shows a positive association with female age at marriage, life expectancy, participation in modern sector of economic activities and above all female enrolment. Female literacy is vital to build a foundation on which their societies can grow .The importance of female literacy from social and economic point of views are-

- Female literacy contributes to Economic Growth
- Literate mothers increase human capital through their influence in the health, education and nutrition for children.
- Improves family's economic prospects by improving female's qualification and skills.
- Improves reproductive health.

The history of women's education witnessed the fight by both men and women who worked together for the betterment of the society. The first woman who spearheaded this change in the society was Savitribai Phule. Social reformer like Jotirao Phule, Rabindranath Tagore, Ishwar Chandra Vidyasagar, Swami Vivekananda, Raja Ram Mohan Roy and others fought tirelessly to improve the condition of women and given their position in the society. Rabindranath Tagore strongly believed in fighting for women's upliftment using his pen as a weapon. Ishwar Chandra Vidyasagar was one of the key figures of India's Renaissance in the nineteenth century who whole-heartedly worked for women's empowerment and prosperity. He laid emphasis on education among women as that would be the key to get them out of the hardships of the social evils and malpractices. Dealing with education and its basic spirit at the root, Vidyasagar started his social movement from Bengal in both the fields-women's education and getting them out of the grip of social oppressions. He initiated the provision of widow remarriage and fought against the evils of child marriage. Swami Vivekananda also believed that freedom and equality of women are important for the better functioning of home and society. He also believed that development of knowledge with intelligence can help women uphold their social disposition.

Literacy plays many vital roles to improve our lives-

- Literacy lifts individuals out of poverty: - Lacking basic reading and writing skills is a tremendous disadvantage. Literacy not only enriches an individual's life, but it creates opportunities for people to develop their skills that will help them provide for themselves and their families.

- Literacy improves the development of the wider community:- The positive knock-on effect of educating girls can be seen in the wider social and economic benefits yielded for their communities. Increasing the emphasis towards women's education positively impacts on each generation through raised expectations and increased self- esteem. Improving literacy facilitates employment whereby both male and females can contribute, helping the wider economy and community to thrive.

- Literacy reduces infant mortality rates: - Illiteracy directly affects an individual's health and wellbeing, so the importance of education on physical health is vital. Infant mortality rates drop significantly for women who have had primary education, and even more for those who complete secondary school. It is estimated that infant mortality decreases 9% for every year of education attained. This is because girls and women are able to educate themselves on health issues, which can help reduce the cycle of poverty and mortality rates in the long term.

- Literacy empowers women and girls: - Breaking the cycle of illiteracy and improving self-esteem is crucial for women and girls in the developing world. By enabling them to become economically productive and independent, they become empowered and can take control of their lives. The importance of education in fostering personal autonomy, and creative and critical thinking skills is central to helping girls contribute to their societies.

- Literacy positively impacts economic growth beyond the local community:- The impact of improving literacy in girls not only has a positive economic impact at a local and community level, but the productivity of the workforce flourishes at country level too by enhancing a country's economic strength.

2. Motivation

Literacy is a huge impact on an individual's ability to participate in society. Literacy can benefit to economic growth, it also reduces poverty and crime. If people are literate, they can be educated and get employed for jobs instead of stealing to survive. Literacy also helps to boost self-esteem, confidence and empowerment. Literacy skills allow students to seek out information, explore subjects in depth and gain a deeper understanding of the world around them. The literacy improves the health, literacy promotes "Lifelong Learning" and builds skill, Literacy improves the economy and creates jobs, literacy promotes gender equality, literacy promotes democracy and peace etc. That means literacy is very important for social development and personal improvement. So, if we literate our women it's becomes more effective and beneficial for our society, as well as economic development. If we literate our women, educate them the upcoming generations will be literate because a mother's contribution in a child's life is greater than any other person. The educated women have been found to experience less domestic violence, regardless of other social status indicator like employment status. Literate and educated women saves live and builds stronger family, communities and as well as economics. A literate and educated girl experience more rapid economic growth and improved quality of life. So, the benefits of an educated and literate society are undeniable and the development of knowledge with intelligence can help women to uphold their social disposition.

3. Literature Review

Javali [1978] in her research "Female Literacy and Fertility" has studied correlation between literacy rate and crude birth rate using 18 states and 4 territories estimates are found that female literacy and crude birth rate are inversely related. Jyothi and Rajaiah [1988] have identified clear discrimination in sex ratio, literacy and employment- some observation. Sharma and Retherford [1990] have pointed out in their study on the "Effects of Female Literacy on Fertility in India" based on Census [1981] data, showed that female literacy rate had a strong effect on total fertility rate. An increase of ten percentage point in female literacy rate reduces the total fertility rate by slightly less than one half children per women, about half of the effect of female literacy rate on total fertility rate is direct and about half is indirect through reduction in child mortality. Bowman's [1992] study on external benefits of education and women, says that "Education enables a women to: a) Acquire the ability to manage her household in a better way within the given budget constraints; b) Ensure that the good nutritional standard and hygiene are maintained;

c) Regulate the fertility behavior in a planned way and d) Contribute to the quality learning in succeeding generations". Joshi [1993] have addressed educational structure of women in his paper titled "Educational Infrastructure for Women". He has discussed that general educational facilities have increased but quality of education has deteriorated. Country is still facing acute problem of massive illiteracy, failure to universalize elementary education, slow progress in education and unemployment among the educated person. The literacy rates of female had improved but still female literacy is lagging behind in comparison to male counter-part. He has pointed out that regional variation, imbalances and disparities in all the sectors of education. His study focuses on Intra-sectored Resources Allocation to Education in the five year plan. Shoma A. Chatterji [1993] stated that education helps the women to gain personal autonomy by virtue of the fact that education helps her to earn an income to take active part in public life and to take decisions regarding her own fertility. Murtha, Guio and Dreze [1995] in their district level study of 14 states in India found that the variables which have a significant impact on fertility are female literacy and female labour force participation. Martin [1995] studied the relationship between women's education and fertility using data from the Demographic and Health Surveys for 26 countries and found that higher education is consistently associated with lower fertility but a considerable diversity exists in the magnitude of the gap between upper and lower educational strata and in the strength of the association. She concluded that education enhances women's ability to make reproductive choice. According to National Literacy Mission 1998, the following factors are responsible for poor female literacy rates: gender-based inequality, social discrimination and economic exploitation, occupation of girl child in domestic chores, low enrolment of girls in schools and low retention rate and high dropout rate. Mishra and Retherford [2000] study estimates levels of child malnutrition and found that more than half of all children under age four are malnourished. Children whose mothers have little or no education tend to have a lower nutritional status than do children of more-educated women, even after controlling for a number of other-potentially confounding-demographic and socioeconomic variables. Further they suggested that women's education and literacy programs could play an important role in improving children's nutritional status. Akmam [2002] reviews all those papers which raise issues on women's education and fertility. Review of eight papers reflects determinants of fertility in Developing Countries. Review of 4 articles discuss the various intervening variables lie income level of households, education level of husband, place of residence etc through which education of women

affects fertility. Buragohain [2003] has study on female literacy in the northeastern region of India. An attempt was made to know relationship between high female literacy rate and Infant Mortality Rate, mean age of marriage, total fertility rate using spearman's correlation coefficient. Female literacy has positive impact on the decline of infant mortality rate and the child mortality rate in all the north-eastern states except Meghalaya. But the same impact was not observed in all the states in case of total fertility rate and mean age of marriage. Rao and Gupta [2006] in their paper entitled "Low Female Literacy: causes and strategies", states that "Literacy is a process, which dispels ignorance and promotes rational thinking. Literacy thus moulds a person to become a responsible citizen." Inchani and Lai [2008] showed that there was a significant association of the child sex ratio and the educational levels of their mothers and this trend occurred in both rural and urban areas. Haldar [2008] has been adopted to assess the literacy development of the districts for the period between 1951 and 2001. Sugana [2011] concluded education of women is the most powerful tool of change of position in society and education brought a reduction in inequalities and functions as a means of improving their status within the family. Singariya [2012] revealed that regression results indicated that the male literacy rate in districts had significant and large negative effect on the juvenile sex ratio at the 0.25. Basak, Roy Mukherji [2012] focuses on the particular state of West Bengal and its districts to understand its educational backwardness. Desai [2012] showed that there exists a high correlation between literacy rate and the GDP and it became an imperative to find some innovative measures to increase the literacy growth rate. Som and Mishra[2012] urbanization is the causes and effect of literacy and education. Thankachan [2012] studied "Empowerment of women for sustainability: An analysis of relationship between literacy rate and women's status in India" and found that female literacy has positive relationship with sex ratio , women's economic status index , women's social status index, women's health status index, gross gender development index and negative relationship with gender disparity index which further indicate that enhancement of literacy is a better way for gender development and promoting the status of women in the society. S. Halder [2012] in his study has some objectives like the status, trend and scenario of women's literacy of South-East Asia, India and specially in West Bengal after 1960's. World Bank [2013] says that educating women is not a charity, it is good economics and if developing nations are to be abolishes poverty, they should educate their women. Sandeep Singh and Dr. Ran Singh [2013] on their paper revealed that there is negative correlation between literacy rate and sex ratio in India. Better family planning, low mortality rates of infants and

children, lower maternal mortality are some of the advantages of educating a girl [Sangeeta and Kumar, 2013].Som and Mishra (2014) on their study they are try to analysis and create a blue print for planning for reduce or vanishing the differential on literacy and education in West Bengal. Giving quality education to girls can eradicate poverty in developing countries education of girls not only benefits women herself but her families, society and the whole world as well. Denying girls their right to education is a detriment for many societies. Education can improve an individual's abilities and bring about social change [Andres and Chavez, 2015]. Chattoraj and S.Chand (2015) this paper investigates the development (changes) of literacy from 2001 to 2011 also differs from district to district. The paper tries to find out the reason and pattern of such diperities. Girl's education is a key factor in India's social and economic growth [sahoo, 2016]. Sanchita Saha and Dr. Gopal Chandra Debnath [2016] on their paper they focuses the literacy condition of West Bengal and its Districts. Kumar, Kumar and Rani [2016] in their paper they clearly highlighted that gender disparity in literacy is not a problem of the single state rather is an issue or drawback faced by majority of the states. Das [2019] in her paper will critically analysis the present status of women education in India, Problems in women education and the role of education to promote education. Kumari Singh and M. Rabindranath [2020] in their paper they are a try to analysis the gender divine in educating girls through the functionalist of education. Subba [2021] in his paper the existence of literacy disparity in the state of West Bengal has been studied. The state stands at 20th position in terms of literacy rates. This paper aims at bringing forth the fact that gender disparity in literacy exist in the state of West Bengal by making analysis of literacy rates of its various districts following the census data and also aims at providing suggestive measures through which the situation can be improved.

4. Objectives:

The study is based on the secondary data from Census. The main purpose of this study is to analyze the present situation of literacy in West Bengal. This paper focuses on the discussion about the economic factors which affect the literacy. We will also discussed about the female literacy rate and the benefits we get to literate our female and this paper also discuss about the fact that how female literacy gave an impact on districts income (district GDP) in West Bengal. The effect of literacy rate on population will also be discussed here.

By analyzing the date, collected in general literacy rate, female literacy rate, district GDP and population. We will show the changes in literacy rate of West Bengal. In this paper we will show the interrelation between general literacy rate, female literacy and district GDP of West Bengal by using Multiple Linear Regression Model.

5. Methodology:

This study is based exclusively on data available from Secondary sources. Due to pandemic situation it is not possible to do proper field survey. Hence, we are not able to use any primary data in our research.

To continue the research we have used different secondary data collected from official website of Census of India. In this paper we have used the district wise data on general literacy rate, female literacy rate, no of primary school and district GDP collect from statistical Handbook of West Bengal, Bureau of Applied Economics and Statistics. We also collect the data on population of West Bengal from Census 2001 and 2011.

By using the collected data, the research study examines the issue in depth. This study is thoroughly analyzed with the help of descriptive statistics, bar diagram. We will use the Multiple Linear Regression Model in this study. To examine the data, used in the research, are statistically significant or not.

6. Result and Discussion:

Literacy in India-

In India, there has been an increase in literacy rate. The literacy rate in the country is 74.04 percent, 82.14 percent for males and 65.46 percent for females. Kerala retained its position by being on top with a 93.91 percent literacy rate, closely followed by Lakshadweep (92.28 percent) and Mizoram (91.58 percent). Bihar with a literacy rate of 63.82 percent ranks last in the country preceded by Arunachal Pradesh (66.95 percent) and Rajasthan (67.06 percent).
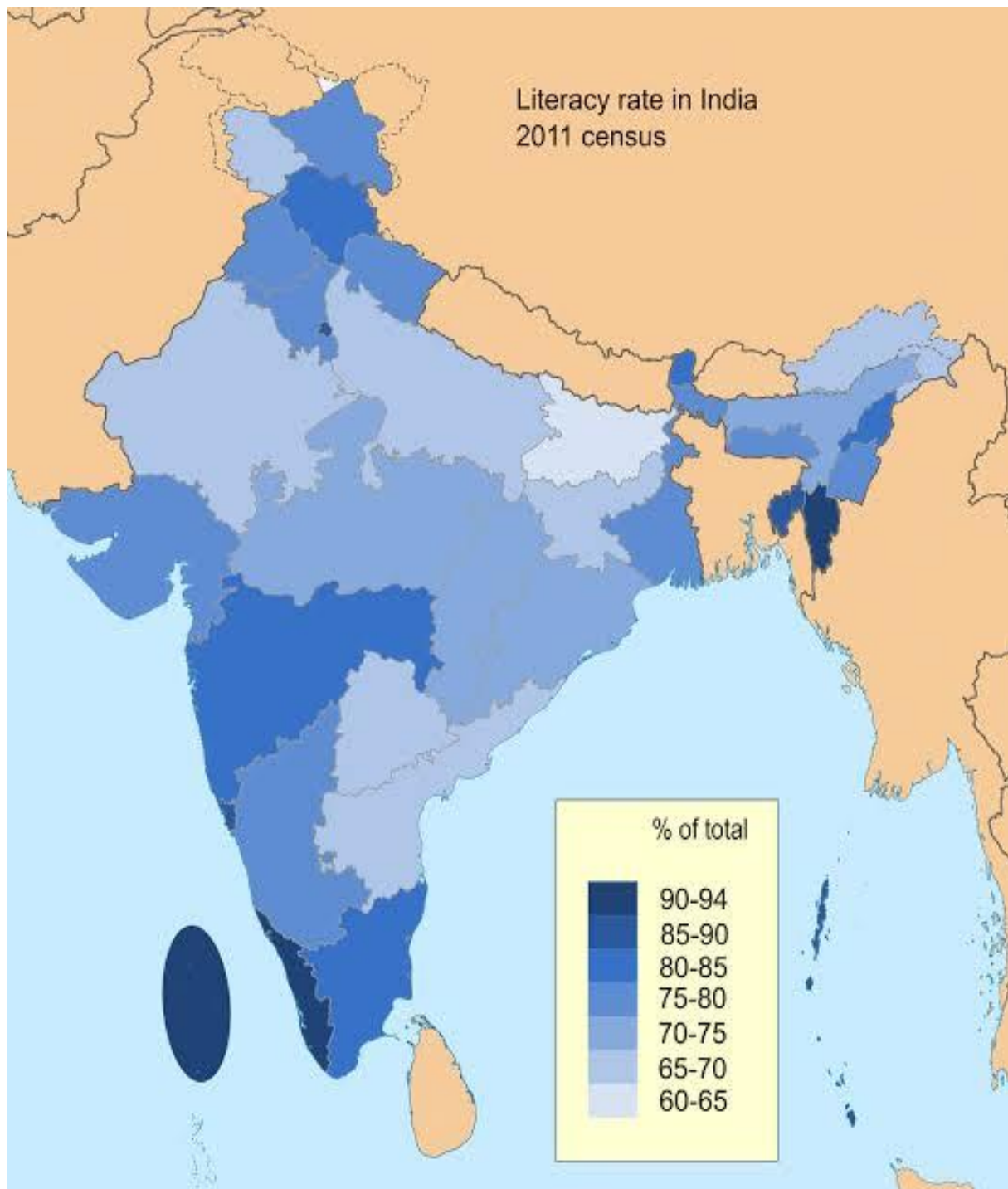
Figure-1

Literacy in West Bengal-

In 2011 the literacy rate of West Bengal is 76.26%. Among the 29 states and 7 union territories the rank of the state is 20th in terms of literacy. In 2001 the literacy rate of West Bengal was 68.64% and then state rank was18th. Only 7.62% literacy development is found during ten years (2001 to 2011). Female literacy in West Bengal is poor, in 2001 it was 59.61% and 2011 it is 70.54%, which is 11.15% lesser than male literacy.

5.1) Changing pattern of total, Male, Female Literacy in West Bengal from 2001-2011-

Literacy Rate in West Bengal by District									
Districts	Literacy rate						Change of total literacy	Change of Male Literacy	Change of Female Literacy
	Person		Male		Female				
	2001	2011	2001	2011	2001	2011			
1	2	3	4	5	6	7	8	9	10
West Bengal	68.64	76.26	77.02	81.69	59.61	70.54	7.62	4.67	10.93
Burdwan	70.18	76.21	78.63	82.42	60.95	69.63	6.03	3.79	8.68
Birbhum	61.48	70.68	70.89	76.92	51.55	64.14	9.2	6.03	12.59
Bankura	63.44	70.26	76.76	80.05	49.43	60.05	6.82	3.29	10.62
Purba Medinipur	74.9	87.02	84.91	92.32	64.42	81.37	12.12	7.41	16.95
Paschim Medinipur	74.9	78.00	84.91	85.26	64.42	70.50	3.1	0.35	6.08
Howrah	77.01	83.31	83.22	86.95	70.11	79.43	6.3	3.73	9.32
Hooghly	75.11	81.80	82.59	87.03	67.21	76.36	6.69	4.44	9.15
24-Parganas(N)	78.07	84.06	83.92	87.60	71.72	80.34	2.99	3.68	8.62
24-Parganas(S)	69.45	77.51	79.19	83.35	59.01	71.40	8.06	4.16	12.39
Kolkata	80.86	86.31	83.79	88.34	77.30	84.06	5.45	4.55	6.76
Nadia	66.14	74.97	72.31	78.75	59.58	70.98	8.83	6.44	11.4
Murshidabad	54.35	66.59	60.71	69.95	47.63	63.09	12.24	9.24	15.46
Uttar Dinajpur	47.89	59.07	58.48	65.52	36.51	52.17	11.18	7.04	15.66
Dakshin Dinajpur	63.59	72.82	72.43	78.37	54.28	67.01	9.23	5.94	12.73
Malda	50.28	61.73	58.80	66.24	41.25	56.96	11.45	7.44	15.71

Jalpaiguri	62.85	73.25	72.83	79.95	52.21	66.23	10.4	7.12	14.02
Darjeeling	71.79	79.56	80.05	85.61	62.94	73.33	7.77	5.56	10.39
Cooch Behar	66.30	74.78	75.93	80.71	56.12	68.49	8.48	4.78	12.37
Purulia	55.57	64.48	73.72	77.86	36.50	50.52	8.91	4.14	14.02

[Table-1]

Source: Directorate of Census Operation, West Bengal [2001, 2011]

Table- 5.1 Shows the district wise distribution of literacy rate of total population by sex and their changing pattern from the census year of 2001 to 2011. In this table we can see that North 24 Parganas is the district with highest literacy rate at 78.07% in 2001 and 84.06% in 2011 excluding the metropolitan district Kolkata, at the literacy rate of 80.86% in 2001 and 86.31% in 2011 respectively. Uttar Dinajpur is the lowest literacy rate at just 47.89% in 2001 and 59.07% in 2011. Therefore, the district level literacy differs from district to district. From the above table, East Medinipur, West Medinipur, Howrah, Hooghly, North 24 Parganas and Kolkata has the high literacy. Due to lack of educational infrastructure Burdwan, Bankura, Birbhum, South 24 Parganas, Nadia, Dakshin Dinajpur,Jalpaiguri, Darjeeling and Cooch Behar district has moderate literacy. Due to lack of educational institution, poverty, and low student teacher ratio Murshidabad, Malda, Uttar Dinajpur and Purulia has the lowest literacy.From the above table we see that from 2001 to 2011 Murshidabad (12.24%) and Purba Medinipur (12.12%) has the highest changes of total literacy. North 24 Parganas (2.99%) and Paschim Medinipur (3.1%) has the lowest changes in total literacy. We also see that from 2001 to 2011 Murshidabad (9.24%) and Malda (7.44%) has the highest changes of male literacy and Paschim Medinipur (0.35%) and Bankura (3.29%) has the lowest changes of male literacy. From 2001 to 2011 we see that Purba Medinipur (16.95%) and Malda (15.71%) has the highest changes of female literacy and Paschim Medinipur (6.08%) has the lowest changes of female literacy. From the above table we can also see that in the case of total literacy the mean is 8.171, median is 8.48, mode is 9.098, standard deviation is 2.712, kurtosis is -0.389, skewness is -0.33, ranges is 9.25. For the case of male literacy the mean is 5.217, median is 4.78, mode is 3.906, standard deviation is 2.0167, kurtosis is 0.7875, skewness is -0.2517, range is 8.89. For the case of female literacy mean is 11.7326, median is 12.37, mode is 14.02, standard deviation is 3.134, kurtosis is -0.855, skewness is -0.10875, range is 10.87.

5.1.1- Changing Pattern of General Literacy in West Bengal

Changing Pattern of general Literacy in West Bengal

Literacy Rate (%)
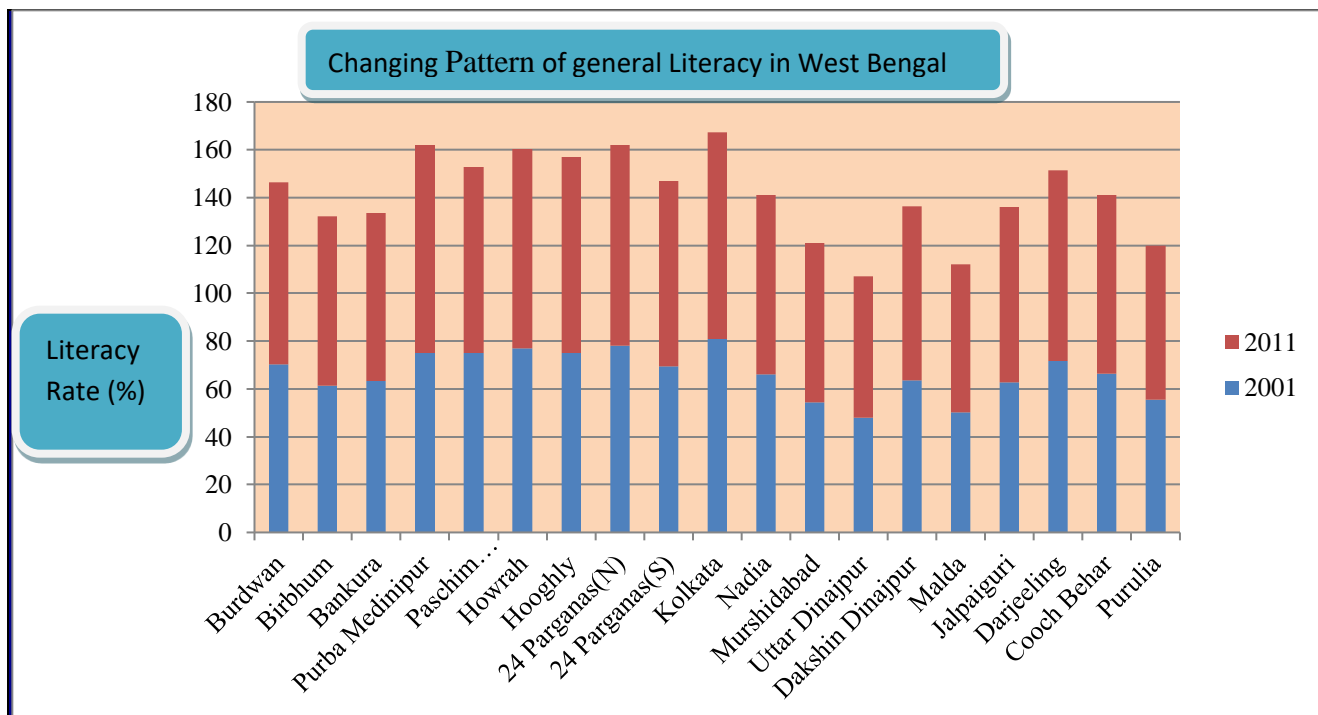
[Diagram-1]

In this 5.1.1 [Diagram-1] here we used a column diagram to see the changing pattern of general literacy of all the districts of West Bengal. The data are used in this diagram are taken from the table 5.1. In this Diagram we measured the districts along horizontal axis and the percentage of literacy rate along the vertical axis.

5.1.2- Changing Pattern of Male Literacy in West Bengal

Changing Pattern of Male Literacy Rate in West Bengal

Literacy Rate (%)
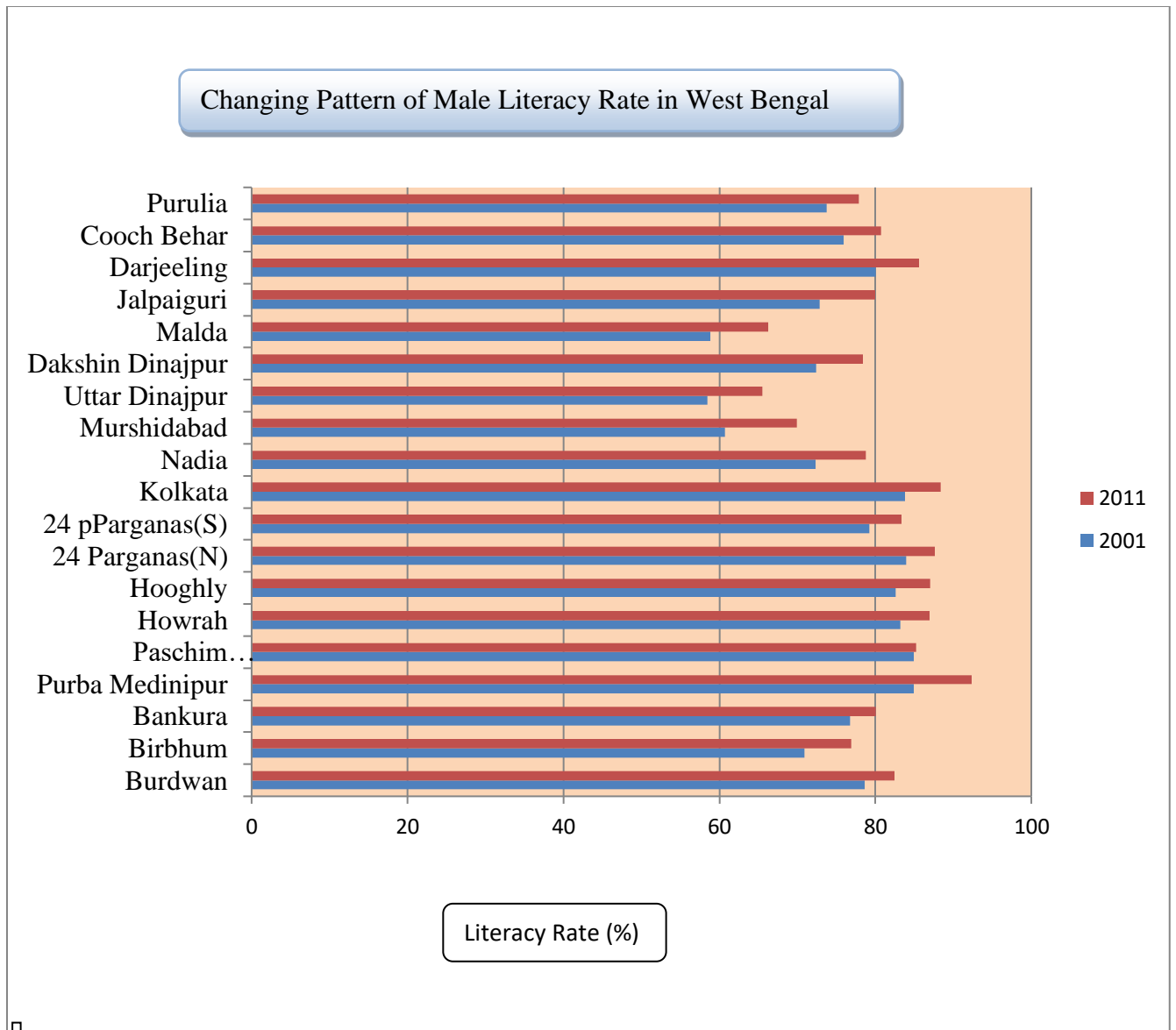
[Diagram-2]

In this diagram 5.1.2[Diagram-2], here we use the bar diagram to measure the changing pattern of male literacy of all the district of West Bengal. To create this bar diagram the input data are taken from the table 5.1. Here all the districts are measured along the vertical axis and the percentage of literacy in horizontal axis.

5.2) Literacy Rate and Gender Gap (India and West Bengal)-

Literacy Rate and Gender Gap (India &West Bengal)				
	India		West Bengal	
Year	Female Literacy Rate (%)	Gender Gap	Female Literacy Rate (%)	Gender Gap
1961	15.35	25.05	16.97	23.11
1971	21.97	23.98	22.41	20.40
1981	29.76	26.62	30.25	20.42
1991	39.29	24.84	38.44	18.14
2001	54.16	21.70	51.00	15.20
2011	65.46	16.68	63.27	10.27

[Table-2]

Source: census of India [1961-2011]

In this Table-2, we can see that in India from 1961 to 2011 the female literacy rate increased and the gender gap are gradually decreased. Similarly we also see that in West Bengal female literacy also increased from 1961 to 2011 and gender gap are decreased.

5.3) District GDP of West Bengal

(In Percent)

District	2010-11	2011-2012(P)
Burdwan	10.2	11.08
Birbhum	2.75	2.87
Bankura	3.21	3.40
Midnapore East	7.98	7.61
Midnapore West	5.64	5.41
Howrah	6.01	5.79
Hooghly	6.69	6.44
24 Parganas (N)	12.03	12.04
24-Parganas(S)	7.89	7.86
Kolkata	8.42	8.38
Nadia	5.1	5.07
Murshidabad	6.11	5.87
Uttar Dinajpur	2.06	2.02
Dakshin Dinajpur	1.48	1.47

Malda	3.3	3.36
Jalpaiguri	3.82	3.83
Darjeeling	2.79	2.82
Cooch Behar	2.34	2.30
Purulia	2.18	2.36
West Bengal	100	100
Mean	5.26	5.26
Median	5.1	5.07
Mode	4.78	4.69
Standard Deviation	3.01	3.043
Skewness	0.71	0.853

[Table- 3]

Source: Bureau of Applied Economic and Statistics

P= provisional

Q= Quick

In this table- 3 we see all the changes of District GDP of 2010-2011 and 2011-2012 data only. In 2010-2011 data we see that North 24 Parganas has the highest percentage of district GDP which is 12.03% of West Bengal's total GDP and Dakshin Dinajpur has the lowest percentage 1.48% of West Bengal's total GDP. Here we see that the Mean is same in both the period i.e, 2010-2011 and 2011-2012 and the Median is higher in 2010-2011 period over 2011-2012 period, the Mode is higher in 2010-2011 over 2011-2012 data, the Standard Deviation is higher in 2011-2012 period, the Skewness is also higher in 2011-2012 period over 2010-2011 data.

5.4) No of Primary School in West Bengal-

Number of Primary School in West Bengal(2007-2012)					
District	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**
	Primary	**Primary**	**Primary**	**Primary**	**Primary**
West Bengal					
Bankura	3475	3478	3475	3533	3556
Birbhum	2382	2372	2372	2379	2395
Burdwan	4057	4055	4071	4083	4082
Kolkata	1569	1570	1555	1562	1554

Cooch Behar	1826	1826	1826	1826	1826
Darjeeling	1843	1843	1843	1843	1846
Dakshin Dinajpur	1214	1191	1175	1175	1175
Uttar Dinajpur	1439	1439	1476	1476	1839
Howrah	2113	2205	2185	2209	2209
Hooghly	3023	3025	3026	3028	3053
Jalpaiguri	2037	2044	2042	2035	2035
Malda	1892	1892	1894	1894	1895
Purba Medinipur	3253	3253	3253	3253	3253
Paschim Medinipur	4673	4674	4681	4691	4691
Murshidabad	3178	3172	3175	3179	3163
Nadia	2601	2608	2607	2613	2624
24-Parganas(N)	3743	3700	3594	3594	3622
South 24 Parganas	3666	3683	3689	3699	3722
Purulia	2981	2995	2999	2998	2999
Total	50965	51025	50938	51070	51539

[Table-4]

Source: Bureau of Applied Economics and Statistics [Statistical handbook]

Overall West Bengal has seen an increase in the number of 132 primary schools from 2009-2010 to 2010-2011. In Bankura has the highest number of new primary school which is 58. Also in Jalpaiguri and Purulia, seven and one primary schools were closed, respectively.

Regression Analysis-

Here, we have shown the Regression of Literacy rate on sex ratio and no of primary school in West Bengal.

5.5) Regression of literacy rate on sex ratio and no of primary school in West Bengal-

Regress the literacy on Sex Ratio and no of Primary School			
Districts	Literacy(2011)	Sex Ratio(2011)	No of Primary School(2010-2011)
Burdwan	76.21	945	4083
Birbhum	70.68	956	2379
Bankura	70.26	957	3533
Purba Medinipur	87.02	938	3253
Paschim Medinipur	78.00	966	4691
Howrah	83.31	939	2209
Hooghly	81.8	961	3028
24 Parganas(N)	84.06	955	3594
24 Parganas(S)	77.51	956	3699
Kolkata	86.31	908	1562
Nadia	74.97	947	2613
Murshidabad	66.59	958	3179
Uttar Dinajpur	59.07	939	1476
Dakshin Dinajpur	72.82	956	1175
Malda	61.73	944	1894
Jalpaiguri	73.25	953	2035
Darjeeling	79.56	970	1843
Cooch Behar	74.78	942	1826
Purulia	64.48	957	2998

[Table-5]

Regression of Literacy rate on sex ratio and no of primary school-

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.38							
R Square	0.15							
Adjusted R Square	0.04							
Standard Error	7.89							
Observations	19							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	2	172	86.2	1.387	0.278			
Residual	16	995	62.2					
Total	18	1167						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	257	138	1.87	0.08	-35.01	550	-35	550
X1	-0.2	0.15	-1.4	0.193	-0.513	0.11	-0.5	0.11
X2	0	0	1.41	0.177	-0.002	0.01	-0	0.01

Regression Statistics		Explanation
Multiple R	0.384341461	$R=$ Square Root of R^2
R Square	0.147718358	R^2
Adjusted R Square	0.041183153	Adjusted R^2 used if more than one X variable
Standard Error	7.885151907	This is the sample estimate of the standard deviation of the error u
Observations	19	Number of observation used in the Regression(n)

The above gives the overall goodness-of-fit measures:

$R^2= 0.1477$

Correlation between Y and Y-hat is 0.38434 (when squared gives 0.1477)

Adjusted $R^2= R^2 - (1-R^2)*(k-1)/ (n-k)$

$= (0.1477-0.8523)*2/2$

$= -0.7046$

The Standard Error here refers to the estimated standard deviation of the error term u. It is sometimes called the standard error of the regression. It equals sqrt(SSE/n-k). It is not to be confused with the standard error of Y itself (from descriptive statistics) or with the standard errors of the regression co-efficient given below-

$R^2=0.1477$ means that 14.77% of the variation of Y around Y bar (its mean) is explained by the regresssors X_2 and X_3.

Interpret the ANOVA Table-

ANOVA					
	df	SS	MS	F	Significance F
Regression	2	172.4215125	86.21075624	1.386568	0.278397333
Residual	16	994.8099296	62.1756206		
Total	18	1167.231442			

The ANOVA (analysis of variance) table splits the sum of square into its components. Total Sum of Squares= Residual (or error) Sum of Squares+ Regression (or explained) Sum of Squares. Thus, $\sum(Y\text{-}Y \text{ bar})^2 = \sum(Y\text{-}Y \text{ hat})^2 + \sum(Y \text{ hat-}Y \text{ bar})^2$

Where, Y hat is the value of Yi predicted from the regression line and Y bar is the sample mean of Y. For example,

R^2 =1-Residual SS/Total SS (general formula for R^2)

=1-994.8099/172.4215 (from data in the ANOVA table)

= 86.2107 (which equals R^2 given in the regression statistics table).

The column labeled F gives the overall F-test of H_0:β_2=0 and β_3=0 verses H_a: at least one of β_2 and β_3 does not equal to zero.

Aside: Excel computes F this as:

F = [Regression SS/ (k-1)]/[Residual SS/(n-k)]

 =[172.4215/2]/[994.8099/16]

 =1.386568

The column labeled significance F has the associated P-value. Since, 0.2784 > 0.05, we do not reject H_0 at significance level 0.05.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	257.3418745	137.9086098	1.86603197	0.080477	-35.0113	549.695	-35.011	549.7
X1	-0.200352838	0.147329449	-1.3598967	0.192718	-0.51268	0.11197	-0.5127	0.112
X2	0.002911338	0.002063122	1.41113256	0.177354	-0.00146	0.00728	-0.0015	0.0073

Let βj denote the population co-efficient of the j-th regressor (intercept, X1 and X2). Then, column "coefficient" gives the least sqares estimates of βj. Column "standard error" gives the standard errors (i.e, the estimated standard deviation) of the least squares estimates bj of βj. Column "t stat" gives computed t-statistics for H0:$\beta j = 0$ against Ha:$\beta j \neq 0$. This is the coefficient divided by the standard error. It is compared to a t with (n-k) degree of freedom where here n= 19 and k= 3. Column "P-value" gives the P value for test of H0:$\beta j \neq 0$. This equals the $\Pr\{|t|>t \text{ stat}\}$ where t is a t distributed random variable with n-k degree of freedom and t stat is the computed value of the t statistic given in the previous column. Columns "Lower 95%" and "Upper 95%" values define a 95% confidence interval for βj.

Multiple-Regression Model is –

$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + u$

Where, β_1 = Intercept

      β_2, β_3 = coefficients

      u = disturbance term

Testing of Hypothesis-

H0: $\beta_2 = \beta_3 = 0$ i.e, $R^2 = 0$

H1:β_2 and $\beta_3 \neq 0$ i.e, $R^2 > 0$

For testing H0: $\beta_2 = 0$; X_2 is constant

For testing H0: $\beta_3 = 0$; X_3 is non constant

For testing H0: $\beta_2 = \beta_3 = 0$; i.e, $R^2 = 0$ and X_2, X_3 are constant.

Testing Hypothesis for individual Slope coefficient-

[For β_2]

$$H_0: \beta_2 = 0$$

$$H_a: \beta_2 < 0$$

t observation= -1.3599

t critical (0.05, 16) = 1.746

Here t observed < t critical

So, here I accept the null hypothesis and here β_2 is statistically insignificant and it has a negative sign.

[For β_3]

$$H_0: \beta_3 = 0$$

$$H_a: \beta_3 > 0$$

$t_{observation} = 1.4111$

$t_{critical(0.05, 16)} = 1.746$

Here, $t_{observed} < t_{critical}$

So, here I accept the null hypothesis and here β_3 is statistically insignificant and it has a positive sign.

Here, we can drop the X_1.

Overall Significant Testing-

Here $R^2 = 0.1477$ i.e, 14.77%.

Total no of observation (n) = 19 and total parameter (k) = 3.

$H_0: R^2 = 0$

H_a: $R^2 > 0$

$F_{observation} = 1.3866$

$F_{critical(2,16)} = 5.14$

Here we get, $F_{observed} < F_{critical}$

So, we accept the null and the overall model is statistically insignificant

Descriptive Statistics of Literacy rate on sex ratio and no of primary school-

Y		X1		X2	
Mean	74.8637	Mean	949.8421	Mean	2687.89474
Standard Error	1.84742	Standard Error	3.136526	Standard Error	223.982245
Median	74.97	Median	955	Median	2613
Mode	75.19	Mode	956	Mode	2463.22
Standard Deviation	8.05271	Standard Deviation	13.6718	Standard Deviation	976.315972
Sample Variance	64.8462	Sample Variance	186.9181	Sample Variance	953192.877
Kurtosis	-0.5601	Kurtosis	3.938587	Kurtosis	-0.75412576
Skewness	-0.3459	Skewness	-1.51466	Skewness	0.31159947
Range	27.95	Range	62	Range	3516
Minimum	59.07	Minimum	908	Minimum	1175
Maximum	87.02	Maximum	970	Maximum	4691
Sum	1422.41	Sum	18047	Sum	51070

Count	19	Count	19	Count	19

5.6) Regression of Female Literacy on District Income and no of Primary School-

Regress the Female Literacy on District income and no of Primary School			
Districts	Female Literacy(2011)	District GDP (2010-2011) (%)	N0 of Primary School(2010-2011)
Burdwan	69.63	10.88	4083
Birbhum	64.14	2.64	2379
Bankura	60.05	3.04	3533
Purba Medinipur	81.37	7.81	3253
Paschim Medinipur	70.5	5.06	4691
Howrah	79.43	6.29	2209
Hooghly	76.36	6.72	3028
24 Parganas(N)	80.34	12.63	3594

24 Parganas(S)	71.4	7.92	3699
Kolkata	84.06	9.19	1562
Nadia	70.98	4.84	2613
Murshidabad	63.09	5.66	3179
Uttar Dinajpur	52.17	1.86	1476
Dakshin Dinajpur	67.01	1.39	1175
Malda	56.96	3.18	1894
Jalpaiguri	66.23	3.76	2035
Darjeeling	73.33	2.77	1843
Cooch Behar	68.49	2.19	1826
Purulia	50.52	2.17	2998

[Table -6]

Regression Analysis of Female Literacy on District income and no of Primary School in West Bengal-

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.731335							
R Square	0.534851							
Adjusted R Square	0.476707							
Standard Error	6.865701							
Observations	19							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	2	867.221	433.6105	9.198775	0.002191			
Residual	16	754.2056	47.13785					
Total	18	1621.427						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	63.84755	4.741139	13.46671	3.81E-10	53.79678	73.89831	53.79678	73.89831
X1	2.467802	0.583932	4.226179	0.000642	1.229921	3.705683	1.229921	3.705683
X2	-0.00301	0.001936	-1.5559	0.139288	-0.00712	0.001092	-0.00712	0.001092

Regression Statistics		Explanation
Multiple R	0.731335	R= Square root of R^2
R Square	0.534851	R^2
Adjusted R Square	0.476707	Adjusted R^2 used if more than one X variable
Standard Error	6.865701	This is the sample estimate of the standard deviation of the error u
Observations	19	Number of observation used in the regression (n)

The above gives the overall goodness-of-fit measures:

$R^2 = 0.5349$

Correlation between Y and Y-hat is 0.7313 (when square gives 0.5349)

Adjusted $R^2 = R^2 - (1-R^2)*(k-1) / (n-k)$

$= (0.5349-0.4651)*2/2$

$= 0.0698$

The standard error here refers to the estimated standard deviation of the error term u. It is sometimes called the standard error of the regression. It equals sqrt(SSE/n-k). It is not to be confused with the standard error of Y itself (from descriptive statistics) or with the standard error of the regression co-efficient given below-

$R^2 = 0.5349$ means that 53.49% of the variation of Y and Y-bar (its mean) is explained by the regressors X_2 and X_3.

Interpret the ANOVA Table-

ANOVA					
	df	SS	MS	F	Significance F
Regression	2	867.221	433.6105	9.198775	0.002191

Residual	16	754.2056	47.13785		
Total	18	1621.427			

The ANOVA (analysis of variance) table splits the sum of square into its components. Total Sum of Square = Residual (or error) Sum of Square+ Regression (or explained) Sum of Squares. Thus, $\sum(Y- Y\text{ bar})^2 = \sum(Y- Y\text{ hat})^2 + \sum(Y\text{ hat} - Y\text{ bar})^2$

where, Y hat is the value of Y_i predicted from the regression line and Y bar is the sample mean of Y.

For example:

R^2= 1- Residual SS/ Total SS (general formula for R^2)

= 1-754.2056/ 1621.427 (from data in the ANOVA table)

= 0.53485 (which equals R^2 given in the regression statistics table)

The column labeled F gives the overall F test of H_0: $\beta_2 = 0$ and $\beta_3 = 0$ versus H_a: at least one of β_2 and β_3 does not equal to zero.

Asides: Excel Computes F this as:

F= [Regression SS/ (k-1)]/[Residual SS/ (n-k)]

= [867.221/ 2] / [754.2056/16]

= 9.1988

The column labeled significance F has the associated p value.

Since, 0.00219 < 0.05, we reject the H_0 at significance level 0.05.

Interpret Regression Coefficient Table-

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	63.848	4.74114	13.46671	3.81E-10	53.7968	73.89831	53.79678	73.8983

X1	2.4678	0.58393	4.226179	0.000642	1.22992	3.705683	1.229921	3.70568
X2	-0.003	0.00194	-1.5559	0.139288	-0.0071	0.001092	-0.00712	0.00109

Let β_j denotes the population coefficient of the jth regressor (Intercept, X_1 and X_2) then column "coefficient" gives the least square estimates of β_j. Column "standard error" gives the standard error (i.e, the estimated standard deviation) of the least squares estimates b_j of β_j. Column "t stat" gives the computed t statistics for H_0: $\beta_j = 0$ against H_a: $\beta_j \neq 0$. This is the coefficient divided by the standard error. It is computed to a t with (n-k) degree of freedom where here n=19 and k= 3. Column "p value" gives the p value for test of H_0:β_j =0 against H_a: $\beta_j \neq 0$. This equals the $Pr\{|t| > t\ stat\}$ where t is a t distributed random variable with n-k degree of freedom and t stat is the computed value of the t statistic given in the previous column. Column "Lower 95%" AND "Upper 95%" values define a 95% confidence interval for β_j.

Multiple Regression Model-

$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + u$

where,

β_1 = Intercept

β_2, β_3 = coefficients

u = disturbance term

Testing of Hypothesis-

H_0: β_2 =0 i.e, R_2 =0

H_1: β_2 and $\beta_3 \neq 0$ i.e, $R^2 > 0$

For testing H_0: $\beta_2 = 0$: X_2 is constant

For testing H_0: $\beta_3 = 0$; X_3 is constant

For testing H_0: $\beta_2 = \beta_3 = 0$; i.e, R^2 =0 and X_2, X_3 are constant.

Testing Hypothesis for individual slope coefficient-

[For β_2]

$$H_0: \beta_2 = 0$$

$$H_a: \beta_2 < 0$$

$t_{observation} = 4.22618$

$t_{critical(0.05,16)} = 1.746$

Here, $t_{observed} > t_{critical}$

So, here I reject the null hypothesis and here β_2 is statistically significant and it has positive sign.

[For β_3]

$$H_0: \beta_3 = 0$$

$$H_a: \beta_3 > 0$$

$t_{observation} = -1.5559$

$t_{critical(0.05,16)} = 1.746$

Here, $t_{observed} < t_{critical}$

So, here I accept the null hypothesis and β_3 is statistically insignificant and it has a negative sign.

Here, we can drop the X_2.

Overall Significant Testing-

Here $R^2 = 0.5349$ i.e, 53.49%.

Total no of observation (n) = 19 and no of Parameter (k) = 3.

$H_0: R^2 = 0$

$H_a: R^2 > 0$

$F_{observation} = 9.198775$

$F_{critical(2,16)} = 5.14$

Here we get, $F_{observed} > F_{critical}$

So, I reject the null and the overall model is statistically significant.

Descriptive Statistics of female literacy rate on district income and no of primary School in West Bengal-

Y		X1		X2	
Mean	68.74	Mean	5.263158	Mean	2687.895
Standard Error	2.177387	Standard Error	0.74255	Standard Error	223.9822
Median	69.63	Median	4.84	Median	2613
Mode	71.41	Mode	3.99	Mode	2463.21
Standard Deviation	9.491009	Standard Deviation	3.236701	Standard Deviation	976.316
Sample Variance	90.07926	Sample Variance	10.47623	Sample Variance	953192.9
Kurtosis	-0.4394	Kurtosis	-0.07282	Kurtosis	-0.75413
Skewness	-0.30644	Skewness	0.849436	Skewness	0.311599
Range	33.54	Range	11.24	Range	3516
Minimum	50.52	Minimum	1.39	Minimum	1175
Maximum	84.06	Maximum	12.63	Maximum	4691

Sum	1306.06	Sum	100	Sum	51070
Count	19	Count	19	Count	19

We can see in our first regression that it is not doing light through but in our second regression we can clearly see that if our GDP increases then the female literacy will also increased. The reason why this is happening is that the income effect is not a negative income effect it is a positive income effect. In other words, the income of household is increasing and the income of the district is also increasing, so the need for women or girl to work in the field is also decreasing that is why the people of the household are sending them to school. Another reason for sending them to school is that they are going to school and being literate.

7. Policy Suggestion-

Income is a favourable effect for female literacy although not in total literacy because may be GDP grow or not grow boys will do something or other and it is overpowering females maybe that's why we can't see it in total literacy. In other words in the total literacy one component is male literacy and the other component s female literacy. There is one component male income and other is female income, if we could see it divided, we might get interesting results but we can't do it so overall we see that the first regression is not significant and the second regression is overall significant. That's why it is obvious that increase in GDP there is increase in female literacy. Then our policy will be to give income support scheme to the government to increase GDP, that is, to increase people's income, that is, to increase household income, that is, to increase GDP, that will be when the government increase investment.

A Policy implication is that the Govt. can speed up the process by promoting the value of gender equality and by enhancing the status of women by increasing educational levels, improved health care facilities, media exposure, and opportunities to work outside the home for women. In addition, a strong political will showed by all concerned parties for the enactment and implementation of legislation against discrimination on the grounds of gender should be given the first priority.

8. Conclusion-

Education is most powerful tool for change the position in society. Education also brings a reduction in inequalities which mean it improving the status within the family. The literacy picture of West Bengal is not satisfactory in 2011. Female literacy in West Bengal is poor 70.54 percent which is 11.15 percent lesser than male literacy. To encourage the education of women at all levels and sending them to schools government of West Bengal is providing a package of concessions I the form of providing free books, uniform, bicycles, midday meals, scholarships, and so on. 'Kannyashree' project is highly successful to reduce drop out of females from the schools. Not only Government each and every section of the society should be involved in such programs.

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