

Modeling the Learning Disabilities in Student Population

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Abstract — The paper analyzes many learning disabilities prevalent in male and female sample student population which describes how the significance of the problems can be used to pinpoint the existence of educational problems related to health. A learning problem or disability can be seen as spanning a continuum from mild to severe. We will use the term “learning disability” to define the milder educational problems. The severity of the learning problem depends on the number and severity of processes affected. Statistics show that a large number of students are academically inhibited that they have trouble in holding their professional status also in later years. Many students all over the world suffer from some form of learning disability like arithmetic difficulties, verbal disability, memory retention disorders etc. Personal characteristics like introvert nature, inferiority complex, attention deficiency etc reduce their academic progress. The social factors trigger these problems that they do not fit into their peer groups. They also exhibit learning disabilities due to biological factors like parents to sibling disorders, chromosomal disorders etc. It can also be due to psychological factors like lack of self confidence, lack of motivation, not adaptability etc. To model this problem we use Chi-square variate to find the independence of two attributes male students and female students category which forms two groups with the different number of students affected by the different disability causing factors. We assume the null hypothesis that the disabilities of two categories of students are independent of number of students affected by different factors. The calculated Chi-square value is less than the table value at 5 % level of significance. Hence the null hypothesis can be accepted. We can therefore conclude that male and female categories of students in the sample population taken are independent of the disability causing factors in each level.

Keywords: learning disabilities, null hypothesis, significance level, hereditary factors, Personal traits, Psychological factors, Social factors.

I. INTRODUCTION

This paper analyses many learning disabilities prevalent in adolescent male and female sample student population. It also shows that the significance of the problems can be slowly developing academic problems related to health. A learning problem or disability can most profitably be seen as spanning a continuum from mild to severe. Here “learning disability” refers to more severe problems and the term “learning problem” defines the milder educational problems. The severity of the learning problem depends on the number and severity of processes affected in their academic environment. Statistics show that a large number of students read or write so poorly that they have trouble in every phase of life if left unnoticed. Some of them may suffer from specific learning disorders and many teenagers in schools and colleges all over this world suffer from some form of learning disability like arithmetic disability, verbal disability, memory retention disorder, ADHD etc triggered by social factors. Personal phenotypic characteristics like introvert nature, inferiority complex, attention deficiencies [1] also play a vital role. They also exhibit learning disability due to biological factors like parents to sibling

disorders, chromosome disorders etc. It can also be due to psychological factors like lack of self confidence, lack of motivation, not adapting to social atmosphere in educational places etc. So the paper takes a sample set of male and female student population and applies a statistical technique called “test of significance” or χ^2 test for analysis. We use Chi-square variate to find the independence of two attributes X and Y which are types of students X, classified as male and female and Y the different factors causing learning disabilities. The paper finds if the male and female categories of students are independent of the number of students affected by the disability causing factors in each level.

II. RELATED WORKS

The learning disability is a universal phenomenon. In the survey of research papers related to this topic, Jain et al, “Computational Diagnosis of Learning Disability”, [1], proposes a perceptron based artificial neural network model for diagnosing learning disability using curriculum based test conducted by special educators in medical environment. The model comprises of a single input layer with eleven

units which correspond to different sections of a conventional test and one output unit. The method is not only devoid of typical computational complexity and sophistication associated with other methods but gives comparable experimental results on detection measures like accuracy, sensitivity and specificity. The paper by H. Selvi, M.S. Saravanan on “Diagnosis of Dyslexia Students Using Classification Mining Techniques “ [2], discusses the areas of learning disability on the basis of the clinical information and research . The paper shows that Dyslexia is the most common of the language based learning disabilities in the digital era. Nearly the same percentage of males and females has dyslexia has been found out in this paper. Children suffering from a learning disability might face difficulties with reading, writing or mathematics but they excel in other areas of interests as they are endowed with a special blessing. The paper says that it is in the interest of the society and especially the parents have to identify the problem early in the development of the child and steer him/her towards a preferred field. They should not lose their sense of self-worth and blame themselves for their situation. The model being proposed is a Web-based tool incorporating machine learning techniques (Decision trees) for predicting whether children (8-10 years) are at a risk of having Specific Learning Disability. Generally many [3] adolescent children face this problem in Schools and Colleges. A Survey on ADHD using Data Mining Techniques by M. Lalithambigai, A.Hema, blends the analysis of ADHD modeling with data mining techniques. The paper applies the thriving medical applications of Data mining in the field of medicine and public health leading to the popularity of its use in KDD (Knowledge Discovery in Data Mining.). Data mining tools are established in the successful result in ADHD analysis. This survey paper [4] reveals Attention Deficit Hyper Active Disorder (ADHD) is a pattern of behavior that affects approximately 3 to 5% of school going population. This paper surveys on implementation methods by. The survey mainly predicts ADHD problems using Data Mining techniques like classification, Clustering, AI Neural networks, Bayesian Classifiers and Decision Trees.

III. METHODOLOGY

In this paper study of teenagers in Schools and Colleges both male and female students of about 300 samples are taken for study in Tiruchirapalli area. Each exhibit some form of learning disability from mild to severe symptoms range by practical observation of teachers. Four major factors causing the disability are identified. First the Personal traits like laziness, lack of interest in mathematical skills, lesser reading or writing ability and secondly hereditary features such as parent’s learning disability transferred to siblings, chromosomal anomalies [5] are studied. The third factor encircles around social behavior like introvert nature, inferiority complex, attention deficiency etc. The fourth

psychological factors like lack of self confidence, [6] lack of motivation, lack of self esteem ,lack of adaptability between peers etc are observed by questionnaire circulation and group discussions informally. Two groups are taken for study from the experimental study as male and female category of students. The problem is statistically modeled and the paper finds if the two groups of samples are independent of the number of students affected by in each disability category. The details of statistical modeling techniques adopted are outlined below.

IV. STATISTICAL ANALYSIS

Data samples are collected from the student population in and around Tiruchirapalli area in Tamilnadu by circulating a questionnaire about their disabilities and Frequency tables are used to present the distribution of nominal values by the experimental study. Results are expressed in numbers as percentages of respondents to each of the question are presented in the table. Non parametric Chi-Square test is used [7] in this sample, the Null hypothesis H_0 assumes that the male and female categories of students are independent of the number of students affected by the different disability causing factors (%) in each level. A p value less than 0.05 was considered to be statistically significant [8]. Data was collected from the student sample nearly 300 sample population and the various problems observed among the student population was discussed by group discussions and Informal conversation with them. The various number of students affected by learning disability causing factors which inhibit their academic progress and symptoms of long term health related problems are carefully tabulated Table[1]. Initially let our model form the two categories of study as male (X) and female students (Y) and the Null hypothesis H_0 assumes that the male and female categories of students are independent of the number of students affected by the different disability causing factors (%) in each of the level are which are tabulated in Table [1].The observed and expected frequencies are displayed in the Table [2].

Table [1] STUDENT CATEGORIES AND NUMBER OF STUDENTS AFFECTED BY THE CAUSES OF LEARNING DISABILITIES IN SAMPLE POPULATION

CAUSES OF LEARNING DISABILITY STUDENT TYPE	CAUSES OF LEARNING DISABILITIES OBSERVED IN THE SAMPLE POPULATION				Total
	PERSONAL TRAITS	HEREDITARY FACTORS	SOCIAL FACTORS	PSYCHO LOGICAL FACTORS	
X:Female students	86	60	44	10	200
Y:Male students	40	33	25	2	100
	126	93	69	12	300

Table [2] STUDENT CATEGORIES AND CAUSES OF LEARNING DISABILITIES IN SAMPLE POPULATION OI -E₁ VALUES.

CAUSES OF LEARNING DISABILITY STUDENT TYPE	CAUSES OF LEARNING DISABILITIES OBSERVED IN THE SAMPLE POPULATION				Total
	PERSONAL TRAITS FACTORS	HEREDITARY FACTORS	SOCIAL FACTORS	PSYCHOLOGICAL FACTORS	
X:Female students	86(84)	60(62)	44(46)	10(8)	200
Y: Male students	40(42)	33(31)	25(23)	2(4)	100

The validation for above table with df=3 is given as another Table [3]. Here some of the observed or expected frequencies are less than 5; thus the Central Limit Theorem may not apply in this sample population to the full extent .So more samples are to be taken for absolute conclusions.

Table [3] χ^2 calculations: two-way contingency table from: urner.faculty.swau.edu/

	STUDENT CATEGORIES AND FACTORS CAUSING LEARNING DISABILITIES				Total
	PERSONAL TRAITS	HEREDITARY FACTOR	SOCIAL FACTOR	PSYCHOLOGICAL	
Female students	86 84.00 (0.05)	60 62.00 (0.06)	44 46.00 (0.09)	10 8.00 (0.50)	200
Male students	40 42.00 (0.10)	33 31.00 (0.13)	25 23.00 (0.17)	2 4.00 (1.00)	100
	126	93	69	12	300

$$\chi^2 = 2.097, \quad df = 3, \quad \chi^2/df = 0.70$$

$$P(\chi^2 > 2.097) = 0.5525$$

V. RESULTS AND DISCUSSIONS

The Null hypothesis H₀ assumes that the disabilities of two categories of students are independent of the number of students affected by the different disability causing factors in each level as tabulated in Table [1]. Let X represents Female student sample population and (Y) represents the male students sample population. From Table [1] the sample indicates maximum disabilities from personal traits. Beyond the avenues of this analysis a fact must be highlighted that current day students [9] are addicted to social networks, Internet usage, television and other technological gadgets for amusement and their personal

habits creates disorders and disabilities in learning process. The test of significance infers valuable conclusions [8]. The expected frequencies are calculated and tabulated with the observed frequencies in Table [2]. Since the expected frequency in the last cell is <5 it can be pooled with previous one so that observed frequency is 27 and expected frequency is 27. Here in calculation $\chi^2 = \sum (O_i - E_i)^2 / E_i = 0.924$. Since one degree of freedom is lost in pooling the last cell the d.f = (2-1) X (4-1) = 2. The table value of χ^2 for two degrees of freedom at 5% significant level = 5.991. The calculated $\chi^2 <$ the table value of χ^2 at 5% level of significance. Hence the null hypothesis is accepted which proves that the male and female categories of students are independent of the number of students affected by the different disability causing factors in each level. The validation of the above conclusion is given by automatic calculator values given in Table [3] where df=3 is taken and pooling of the values <5 is not considered and this also leads to the same conclusion as $P(\chi^2 > 2.097) = 0.5525$

VI. CONCLUSIONS

The Null hypothesis H₀ assumes that the disabilities of two categories of students are independent of the number of students with different disability causing factors in each level .since the null hypothesis is not accepted as χ^2 is not significant at 5% level. We can therefore conclude that the two categories of students are independent of the disability causing factors in each level. The result implies that the students may have many disabilities but still in the current sample it does not affect the male as well as female student population. But causes of disabilities particularly due to Psychological factors cannot be easily left unnoticed by teachers or parents. Though in the sample of data taken it does not cause much disability it may not be true for larger samples. The paper mainly focuses on student generation because these youngsters decide the destiny of any nation in future. The idea can be extended on larger samples and significant conclusions can be derived to create better healthy student population.

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