A PSYCHOMETRIC ANALYSIS AND MEASURES FOR MODELING ACADEMIC PERFORMANCE IN EDUCATION

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ABSTRACT

In this paper we are analyzing on college admission rates and a more important case where increase in number of students is a new challenge for colleges in infrastructure, library, and other facilities. Learners to facilities ratio is increasing constantly and it have an impact on learning ability of learner also. Due to increase in ratio, learner could not achieve their goal. Learners may achieve their goal and use their potential properly if they free to use the facilities which are required to them and available in proper manner and at proper time. This paper is a study on some parameters and their data mining analysis. This study including some parameters used by previous workers in this domain but our domain is quite unique and different. We are putting introduction of parameters and their results by previous workers. Measures used i006Eclude data typically available to colleges at the start of first year as per records and data collected in various parameters such as age, gender and prior academic performance.

Keywords: Academic Performance, Psychometric analysis Motivation, Learning and Personality.

I. INTRODUCTION

Primary education system is back bone of education system of every country and here we are going through an era of educational systems where education system defined not only quality but also market demands. Educational data mining and learning planning or strategies are the major research area of today as we are entering in PPP mode of education system gradually where some part of education systems may get preference over some others as per the demand of education market. In the beginning to answer increasingly critical questions about what a student demands and whether a student is busy. For example, questions may concern what a factors affect the boost in performance in reading a word says about overall learning of that subject. Researchers have experimented with several new techniques for building models and also with new kinds of techniques and models developed by them recently are useful for society. Learning system data that have shown so many critical analysis promise for predicting student outcomes. This section presents broad areas of applications that are found in practice, especially in emerging parameters. These application areas were discerned from the review of the published and brief survey of literature and were used to frame the interviews with students. These areas represent the broad categories in which data mining and analytics can be applied to activity, especially new admissions entered in the institutions as it relates to learning habits also. This concept

of research widely using in various domains and have its direct application in the concept of Big Data. In next section we are explain education data mining in detail.

Educational Data Mining is a research domain that uses the techniques of data mining, statistical analysis and visualization, and so many numerical as well theoretical analysis techniques to analyze data in the domain of education. EDM models are used to study various psychological factors/parameters of learners such as Meta cognition, mental modeling, generation effect, ability to remember etc. It helps in predicting the future learning behavior of the students, provide rewarding directions and recommend how these directions are fitting to the students' needs. The main concern of educational institutions is ensuring quality in education and various measures to examine and enhance student retention, achievement towards success.EDM has emerged in the late 90s' and has contributed much towards educational system till date. EDM models are used to study various psychological factors/parameters of learners such as Meta cognition, mental modeling, generation effect, ability to remember etc. It helps in predicting the future learning behavior of the students, provide rewarding directions and recommend how these directions are fitting to the students' needs. Due to the new challenges in educational systems, this domain emerged as an important and this field has proven to be a growing research domain.

The main concern of educational institutions is ensuring quality in education and various measures to examine and enhance student retention, achievement towards success. We know that, using Data Mining in Education, gap in the knowledge is the key feature responsible for failure in educational processes such as planning, evaluation and counseling. The aim is to identify hidden patterns, association rules and anomalies by using data mining techniques to tide over the knowledge gap in higher educational systems. The main components of the model are: Evaluation, Planning, Registration, Consulting and Marketing. Techniques applied to process these components are Prediction, Clustering, and Classification and Association analysis.

In section II of this paper the literature review or related work has been discussed, Analysis Parameter is discussed in section III, Conclusive Discussion is given in section IV, Future work in section V and at last references are given.

II. SURVEY OF LITERATURE

Psychological dynamics and its application play an important role in the life of students and their behavior to. It is found that students in crowd as college room, Bergner, et al. studied agent based modeling of collaborative problem solving, while [1b] Seunghoonhong et al presented an online tracking by learning discriminative saliency map with convolutional neural network. A mathematical model proposed by Bergey et al [1] based on Crowd in class room and control theory also given by them. A study of popular minds given by Bon[2]. Xiaome et al [3] presented a theoretical algorithm for special type agents based on computational psychological parameters while Clark and Mayer[4] investigated e-learning and its applications in psychological parameters. Nikolaos et al [5] given a prototype system for educational data mining domain. Romero [6] has written a review on educational data mining systems and given a brief study in this review on its application on human beings and cybernetics. Baker [7] written similar views on educational data mining taking some different parameters. Barnes et al [8] presented his research work in the domain of educational data mining, Baker and Yacef [9] also presented future scope of educational data mining in his work and it was a path finder work at that time. Schmitt et al [10] Predicted four-year college student performance using cognitive and non-cognitive

predictors and its impact on demographic status of students in the model. Baker and Yacef [11] presented the state of educational data mining in in particular time and its future predictions and results. Bidjerano and Dai[12] the relationship between the a model of personality and self-regulated learning strategies, they also put difference between learnings and individuals. Biggs et al [13] presented revised two-factor study process questionnaire. Calders and Pechenizkiy[14] introduce the special section on educational data mining. Cassidy[15]. Studied individual differences as determining factors in academic achievement in higher education studies. Chamorro-Premuzic and Furnham [16]presented his work on personality, intelligence and approaches to learning as predictors of academic performance. Dollinger et al [17] debated in his work for factors best account for academic success, those which college students can control or those they cannot while Flanagan and McGrew[18] interpreted intelligence tests from contemporary theory by taking various parameters Goldberg[19] developed markers for the big five factor structure. Kappe and Flier using multiple and specific criteria to assess the predictive validity of the big five personality factors on academic performance [20]. Kaufman et al [21] proposed the role of personality and motivation in predicting early college academic success in non-traditional students at a panic-serving institution. [22]Mooney et al given a study of progression in higher education, in his study a report was submitted to higher education authority for reforms. Ning and Downing [23] presented reciprocal relationship between motivation and self-regulation in a longitudinal study on academic performance. Pardos et al [24] presented his work entitled the sum is greater than the parts and his work he presented a models of student knowledge in educational software. Pintrich et al [25] presented a manual for the use of the motivated strategies for learning questionnaire. [Robbins et al [26] given psychosocial and study skill factors for predictions college outcomes using meta-analysis. Romero and Ventura [27] presented a survey on educational data mining during 1995 to 2005. Schmitt et al [28] predicted four-year college student performance using cognitive and non-cognitive predictors and the impact on demographic status of admitted students. Sternberg [29] reported on intelligence as developing expertise. Swanbergand and Martinsen [30] combining personality, approaches to learning and achievement. Volet[31]. Cognitive and affective variables in academic learning: the significance or direction and effort in students' goals.

III. ANALYSIS PARAMETERS

We are taking four parameters to analyze our model are, motivation, aptitude, learning planning and individuality. We shall try to put our model best fit in these parameters and analysis the results. These were selected because various research scholars shown importance of these parameters separately in various studies, but very limited work have done in this field and because these factors can be seen beginning of degree classes of students where a student on analysis can change his/ her planning/ strategies as well. We will show the relevance of these parameters in coming sections and also relation between individual factors and academic achievement, and also look at regression models of combinations of measures. We are also analyzing some data of previous workers all research work cited below by various research workers is treated as reference for our work.

3.1 Motivational factors

Motivation can be explained by different theories proposed by various scientists, which can also explained by a number of factors, some of which we are explained here in our model have direct or indirect relation to academic performance of students [16]. Parameters relevant to academic performance in college include target,

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self determined motivation, achievement motivation and self-efficacy. In Robbins et al 2004 Meta analysis of 109 studies, self-efficacy and achievement motivation were found to be the best predictors of academic performance [16]. Correlations with self-efficacy averaged at 0.49 to 0.05 (CI: 90%) and correlations with achievement motivation averaged at 0.303 to 0.04 (CI: 90%).Self-determined motivation is not as strong as a predictor of academic performance [11].

3.2 Aptitude

Aptitude can be defined as a component of a competence to do a certain kind of work at a certain level and also an outstanding aptitude can be considered "talent" for a particular person. An aptitudes classified in two categories I e physical and mental. Aptitude is inherent and may be considered sometimes as born potential to do certain kinds of work whether developed or undeveloped. Ability may be developed knowledge, understanding, learned or acquired abilities (skills) or attitude. The innate nature of aptitude is in contrast to skills and achievement, which represent knowledge or ability that is gained through learning. Aptitude play a major role in overall development of students. Aptitude may enhance during any time of student life but as per many researchers aptitude is not an individual parameters some time it depends on other parameters as discussed in our paper.

3.3 Individuality

This parameter have immense impact and several research work done by various researchers have shown its importance as well and they used various approaches, has resulted in broad conformity of main personality coordinates, namely openness, agreeableness, extraversion, delicacy and neuroticism. From these coordinates, delicacy is the best predictor of academic performance [20]. Chamorro et al 2008 [6] reported a correlation of 0.21 (p<0.01, n=158) between sincerity and academic performance. However the strength of the correlation is influenced by assessment type, with open personalities doing better where the assessment method is not restricted by rules and deadlines [10]. Studies on the predictive validity of other measures of personality are inconclusive [20]. Chamorro et al 2008 [6] reported a correlation of 0.37 with academic performance (p<0.01, n=158). Sincerity is the second most important personality factor, but results are not as good as should be.

3.4 Learner ability

There is always a broad discussion and various opinions that ability of learning is related to academic performance, although opinions may differ on the range of parameters and sub-parameters that constitute ability [8]. For example, some studies have used specific capability tests to determine ability, for which there is internal strength evidence. However such tests have been criticized and seems not good as per their queries and their answers may not be given properly by objects which are very important for measurement and its resultant magnitude terms. For example Sternberg 1999 [19] asserts that high correlation between cognitive intelligence scores and academic performance is because they measure the same skill set rather than it being a causal relationship. The relationship among various academic performances parameters examined on a student's approach to the learning ability. Such learning strategies include both learning style [6] and learning approach or self-regulation [13]. Analyzing the learning style directly related to academic performance, some studies show higher correlations with a deep learning approach [6], while others cite marginally higher correlations with a strategic learning approach [5].

IV. CONCLUSION

In this paper, we have studied how data mining techniques have contributed to the development of student models for their improvement and, In particular, we have discussed the contribution to student modeling entering in degree level programs from school level studies coming from various sectors of standard as well as various economic groups, regional groups and ethnic groups too. We have given an introduction to some factors and their meaning related psychometric analysis in EDM. We are also discussing some parameters on which our analysis will be done for our data mining models. We came to know from various studies that models of academic performance in tertiary education can achieve good predictive accuracy, if younger students and senior students are studied separately and also that patterns should be different for standard versus non-standard students. The preliminary studies have demonstrated that good accuracy can be achieved based on data already available to colleges. Including additional psychometric measures improves predictive accuracy for mature students, but the evidence so far suggests this is due to missing data regarding prior academic performance rather than the additional added value of the psychometric measures themselves.

V. FUTURE SCOPE

In Indian societies a huge number of parents are uneducated .The main aim of Indian government should be quality education not for quantity. But, unfortunately, models like PPP are producing quantity not quality, the day by day the education systems are changed and these changes should be for better quality in education not for larger quantity of education. In the 21st century a large number of universalities are established by the order of UGC. As the numbers of universities are established side by side, each and every day a large number of students are enrolls across the country. With large number of higher education aspirants, we believe that data mining analysis can help bridging knowledge gap in higher educational systems.

We have several problems in our education system but dropping of studies during schooling and starting years of colleges is a big problem in not only in India but also several developing countries. Our study is to analyze psychometrically this problem with the help of the parameters discussed above and this may be used after sending this not only to government bodies but also concerned authorities to solve discussed problem in some magnitude.

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