ANALYSIS ON FACTORS AFFECTING STUDENT ACADEMIC PERFORMANCE USING DATA MINING TECHNIQUES

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ABSTRACT

A student's academic performance is influenced by several factors. Studies have been done in the educational data mining area to search out what are all the factors that have an effect on a student's academic performance. There are many factors which may have an effect on a student's scholastic achievement but our study aims to search out the major factors that may have an effect on a student's academic performance. In our study we have taken a normal student, who can be a primary school student or an undergraduate student. Predicting student's performance becomes tougher attributable to the big volume of information in academic databases. More number of students, large amount of data to be stored and more the responsibility of the institutions to shape the student's career creatively. Teacher's responsibility increases, they must be aware of the student's activities and behaviour. To make the jobs of a teacher easy, we have identified few factors/attributes affecting student's academic performance the most. Our study might bring edges and impacts to students, educators/lecturers and tutorial establishments. The factors which we have researched in our study are – student's background, financial status of student's family, college/school surrounding, class environment, faculty support, parent's support, family stress, friends circle.

Keywords: Educational Data Mining, Data Mining, Data Mining Techniques, Educational Data Mining, Data Warehouse, Anomaly Detection, Classification, Regression, Clustering

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1. I NTRODUCTION

[1]Data mining is a computational method of processing data, which is successfully applied in many areas that aims to obtain useful knowledge from the data. It is the method of analyzing the data from completely different view and summarizing into necessary information, therefore determines hidden patterns from an outsized set of information.

[2]The main functions of data mining are applying various methods and algorithms in order to discover and extract patterns of stored data. Education incorporates a long lasting effect on one's life. Educationalists are not happy with easy listing of student's information however additionally they need careful data relating to the student's past educational performance and the prediction of their educational future.Since the amount of academic details stored in traditional computer files and database is increasing at an exponential rate.

[3] Simple structured or query languages are not enough to support these increased demands for information. Therefore data mining these factors lead to a new emerging field, Education data mining

(EDM).One of the biggest challenges is to enhance the standard of the educational system so as to enhance student''s performance.

2. BACKGROUND OF EDUCATIONAL DATA MINING

[4] Data mining functionalities are used to specify the sort of patterns to be found in data mining tasks. In general, we can classify data mining tasks into two categories: descriptive and predictive. Descriptive data mining describes the general properties of the information in the database. Predictive mining tasks consider the current data and perform inference in order to make predictions. [5] In this paper they have analysed or performed research on techniques in educational statistics.

[5] Data mining involves six common classes of tasks:

• Anomaly detection: [5] Identification of unusual data records, data errors that require further investigation.

• Clustering is where records are grouped together into a single unit.

• [5] Classification is the task of generalizing known structure to apply to new data.

• Regression attempts to find a function which models the data with the least error.

• [5] Summarizing is a greater compact representation of the data set, inclusive of visualization and report generation.

3. LITERATURE REVIEW

Several studies have been done in Education data mining for finding particular cases to enhance student''s scholastic performance. [6] In this paper author studied the use of data mining techniques using Apriori algorithm on set of students of Istanbul, to reveal the relation between the courses that the students failed.[6] They have taken the dataset of around 28 understudies for 74 courses for least bolster rate 9 and as least certainty rate 85%.[6]In their study they have revealed that if a student failed in particular subject in class 9th then he will fail in next year as well.

Table 1: Result Accuracy Using Decision Tree Method by Various Authors

Method	Attributes	Result/percent	Author
[7]Decision tree method	[7]Internal assessment	76%	Romero et al. (2008) [7]
	Psychometric factors	65%	Gray et al. (2014)
	cgpa, student demographic, high school background, scholarship, Social network	73%	Osmanbegovic and suljic (2008) [7]
	Internal assessment, cgpa, extra-curricular	66%	Mayilvaganan and kapalnadevi (2014)[7]
	Student demographic, high school backgroun	65%	Ramesh et al. (2013) [7]
	Internal assessment, student demographic, extra-	90%	Elakia et al. (2014)[7]

	Psychometric factors, extra-curricular activities, soft skills	88%	Mishra et al. (2014)[7]

4. THE PROPOSED MODEL

In fig-1 we have proposed a model on how the data mining process could be applied in the educational field. [8] A common source for data is a data warehouse. The data from the source is collected where it undergoes data cleaning and data integration to remove unwanted disturbance or noise and [9] inconsistent data and where multiple data sources could also be combined .Data Selection is where data which is relevant to the analysis task are retrieved from the database. Information Transformation is the place where the information is rebuilt or combined into structures fitting for mining by performing rundown or accumulation operations. Design assessment is done to distinguish the really an interesting example speaking to learning base.
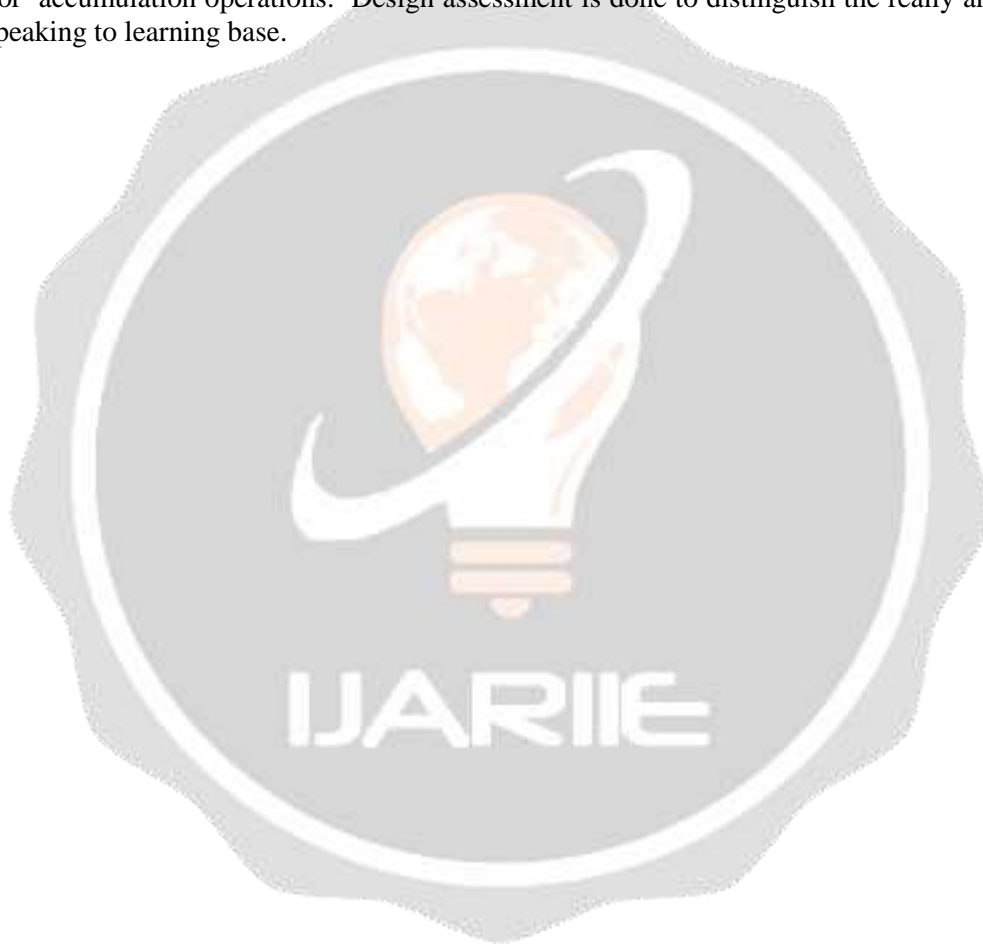
4.1 Knowledge Presentation

It is a method where perception and Knowledge representation strategies are utilized to show the mined data to the user. Warehouse is structured via a process of data cleaning, data integration.
[10]The five components of a data warehouse are:

- Collection of data from different sources
- data extraction and conversion
- the data warehouse or database management system
- data warehouse administration
- business intelligence (BI) tools

After the data is processed in the data warehouse, data mining techniques must be applied to get the exact result.

5. STUDY ON FACTORS AFFECTING THE ACADEMIC PERFORMANCE OF STUDENT'S

5.1 Student Background

Students' family income and parent's education are significantly related with student performance and they are highly interconnected with the student academic performance. Student's living location, community, medium of teaching, mothers qualification, fathers qualification, students habits, family's financial status, are very much correlated with the student academic performance. Previously Saiadin et al had conducted a research on analysing the relationship between student's behaviour and their success. They developed the student performance predictor by using Smooth Support Vector Machines (SSVM) classification and kernel k -means clustering techniques. They found out that there is a strong relation between mental condition of student and their final academic performance. Self-confident students (confidence in own abilities and skills): [11] Circumcision (11.1%), beliefs (50%), early marriage (5.6%) and family income (61.1%). Also, cultural constraints negatively impacts on achievement level among students. Students who come from insecure environments caused by socio-cultural practices such as cattle rustling, they lack concentration in class and confidence in whatever task they are given to do (Durojaiye, 1976).

5.2 Financial Status of Student's Family

As tuition fees and debt still rise, several poor [12] students are still beneath extreme pressure to make ends meet and for some, it is at the expense of educational pursuits.[12] The creators of the National Survey of Student Engagement this year asked how finances were affecting students" academic activity.[12] NSSE director Alexander C. McCormick said are "not too surprising, but worrisome. "You have to wonder what the impact is," said McCormick, who is also an associate professor of educational leadership and policy studies at Indiana University at Bloomington. [12]One hope is that students are renting textbooks or borrowing from a friend rather than simply going without, but even then he said, if a student cannot open a book whenever necessary, it"s of no use. Financial status of a student is additionally an element that affects the student"s performance academically.

5.3 College or School surrounding
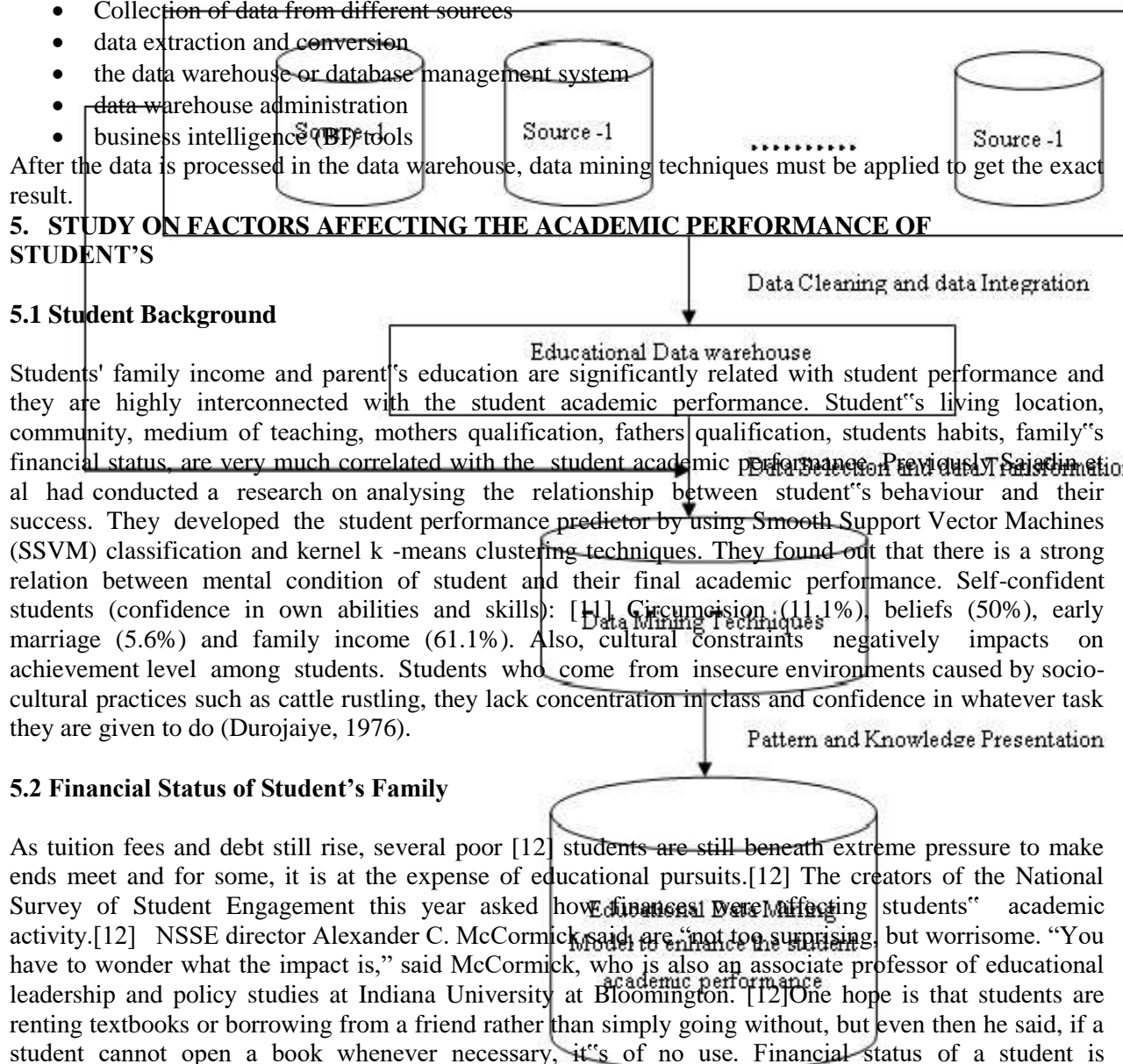
College/school environment plays an important role in students" academic career. Students are the real stake holder"s of the college/school. In return the institution must be able to give full support in order to improve the student"s in academic as well as shape the student"s career in a beautiful way. Early academic achievement of a student is a predictor of future success. In order to increase the success rate of an institution, student"s need to be supported for both academically and socially .Keeping all these things in mind, few schools / colleges have established academic support centres, writing centres and they have also started experimenting with peer tutoring.

A few private schools/colleges provide the supportive initiatives for students and they are trying to find methods to fill the gap between theory and practical.

5.4 Class Room Environment

Classroom is an important place in the growth of a student academically. Students spend most of their time within the classroom. This is the place where they learn several skills needed to achieve success in future. The classroom is where they begin to understand the world and its issues. It is the place where the student develops

their knowledge. Therefore, it is extremely important to understand the ways in which a teacher will build an environment knowledgeable in order to receive maximum effectiveness in instruction. Colleges really do play an important role in teaching the subsequent generation how to be successful members of society. Then every measure should be taken to make sure that the learning environment is one that helps students to succeed. Researches on classroom atmosphere have unconcealed that physical arrangement plays a significant role in teaching learning process. It can affect the performance of both teachers and pupil. It is also found that students who are academically weak do better when they are grouped with other weak students. These studies showed that student"s performance would improve if they are with the same kind of group.

The solution we give here is – there are three factors that influence a student"s academic performance inside classroom.

The first attribute is the student"s attendance in class: attendance of the student shows his/her interest in studies. It explains student"s attitude towards class. If the student is late to class it shows his/her skills towards time management. A student maybe late to the class or may not be present in the class due to several reasons, which maybe as follows:

- Child may help in household activities.
- Poverty
- Child must be helping parents in their occupational work
- Temporary Migration
- Parents" lack of interest in education
- Child maybe ill/sick

The second attribute is concentration level of the student in the class: This mostly depends on the friends" circle the student is in. If the student is with a group which has no interest in study then it"s more likely that the student is influenced by the group and doesn"t perform well in academics. If the student is in a quality group, even though the student wasn"t interested in learning new things, he/she develops interest in academics naturally.

The third most important attribute is study time of the student: the amount of time the student spends after class

hours on a daily basis is very important for the student to excel in academics.

5.5 Faculty Support

Teachers also have a serious role in the life of a student within the classroom. It is the duty of the teachers to have a private conversation with the students and collect information related to their personal issues. So that the student can concentrate completely on their academics, if the student has any personal problem the teacher should be ready to solve his / her problem as soon as possible. It is the obligation of the educator to make sure that the student is free of any kind of stress so that the student can excel in academics. Institutions must realise the importance of a quality teacher, who is committed to his work, able to convey his knowledge to the students" and also the teacher must be a life-long learner in order to shape a student"s academic career, with a positive effect. The teacher must be aware of all analytical and practical skills. They must be able to help students" achieve their goals in life. If a teacher de-motivates or provides negative thoughts it will directly impact the students in an exceedingly wrong approach. Whereas, if a teacher motivates one student he will probably have a very good impact on his peers. A quality teacher is the one who is aware of different learning styles of student"s.

The faculty should encourage the students to seek knowledge from them. They must create a friendly environment so that the student"s can ask their doubts on the subjects freely. Faculty members not only should welcome the student"s questions but also must be very keen to tell the students about their mistakes and to develop their knowledge and skills. Student teacher connection outside the classroom has been found to relate positive to the scholarly mental self image and profession objectives of students. The way teacher organizes the class room or how teacher controls the class may yield positive or negative consequences for the students. It is important for an educator to understand these causes and effects so that they can learn how to organize or maintain their classroom and create a better knowledgeable environment.

5.6 Parent Support or Home Environment

The following hypotheses were formulated in a recent study by Ukap Akan:

[13]There is no principle distinction between the academic performances of students from parents with high educational background or students whose parents are educated.

[13]Also there is no huge distinction between the academic performances of students who have study facilities at home and students who do not have any sort of study facilities at home.
Parents are students first teachers, second teachers are classroom tutors, and third teacher is the surrounding or environment that the student is living in. Education of a student is a shared responsibility of both parents and teachers. This factor includes: parents education, financial status, occupation etc. Educated parents know the importance of education and they might motivate the student to perform better.[13] Recent survey by European Union Monitoring Report (2013) said that, those students whose parents have a tertiary level of education perform on average significantly better in tests of science, reading and mathematical ability than do those whose parents have only basic schooling. [13]Parents who know the importance of education, they may go through their children"s exercise books after school/college or even employ a private teacher to teach them after school.[13] In this way ,their academic performance will be improved; whereas in case of an illiterate family, the need to check the children"s exercise books is not there, hence their children"s low academic performance in school/college[13]. Educated parents may also have library at home, stocked with novels, encyclopaedia and other educational books and educational audio visual tapes. When the students make use of all these facilities at home they become more intellectual rather than becoming a book worm. But this does not mean that students whose parents are uneducated do not excel in their study. The only thing that matters is Parents Attitudes toward education, perceptions of the value and relevance of education or perceptions of the quality of education. Home is the place where the student can be well groomed.

5.7 Family Stress or Pressure

[12] The Child Line National Exam Stress Survey revealed that 96% of the 1300 students who completed the survey felt anxious about exams and revision, with 59% feeling pressure from their parents to do well and 64% saying they have never received any support in dealing with exams.

Not mentoring kid/ward leads to bad habits and friendship.

[12]The Child Line website has given a statement that, „worryingly in the survey results, some of the students said they coped with anxiety by smoking, taking drugs and self-harming. They might have felt that this is the only way they can cope with these negative emotions but it doesn‟t have to be.‟

[12]The statistics reveals that almost half of students say they have skipped meals, two thirds of those surveyed said that they had difficulty in sleeping.

5.8 Friends Circle or Community where the student often Stays

[14] Recent studies have shown that 90% of students have confessed that a friend or a companion is influential factor for their academic performances. As the students grow up, their independent strength increases, interaction with a friend increases and the emotional talk between friends play a vital role to low their pressure, relieve worries and improve positive emotion. Therefore, there is a decrease in communication with their families. Friendships have positive effects on other measures of well-being, including social and happiness in college life. Research results suggest that the presence of equal friends and followers in class has a positive on studies. However, the number of friends in the social network beyond the first circle of reciprocal friends has no effect at all on students. In addition, the presence of non-reciprocal friends in class has a negative effect on a student's learning outcomes. [14]The influence of friend is much lower than the influence of family and only

1.4% of students consider friend is the most influential factor. We take into account the [14] social support provided by friends, which mainly include spiritual encouragement, emotional comforts and spiritual aspects but less material or economic aid. When the student becomes mentally unstable, family is the one that supports him/her strongly. Family relationship has been relatively stable and firm. Friendship changes relative to new environment or studying at new school, maybe that is one reason why the influences of friend is lower than the influence of family on happiness in high school students. Therefore, if the student is in a good circle of friends academically the student becomes strong. Good friends support, motivate and help each other and come up in life. Bad circle of friends is a bad influence on the students.

5.9 Health Factor

[15] Inability to adapt, helplessness, mental strain and an excessive amount of workload are 'stress components' for students. Majority students think that they have been stressed at one time or another. Excessive burden of information for a student leaves less time to recreate and relax This may lead to impaired judgment, less concentration, loss of self-esteem, increase in anxiety and depression. Sleep has a vital role in student‟s health. Sleep loss not solely makes people feel sleepy during the daytime, it's conjointly a potential risk issue for Alzheimer‟s malady.Most sleep specialists have indicated that adults need approximately 8 hours of sleep per day. Researchers have scrutinized the link between sleep deprivation and 2 attributes, task performance and individual productivity. Inadequate sleep would make students unable to actively participate in school activities. Wakefulness makes one unable to remain targeted on a task. Sleep-deprived students

performed bad on attention, memory, and problem-solving tasks and this in turn affected their academic performance. Most of the university students slept between 5 and 6 hours every night during weekdays and 6 and 7 hours per night over weekends and therefore had irregular sleep wake patterns. Therefore it is shown that lack of proper sleep negatively affected the academic performance of students.
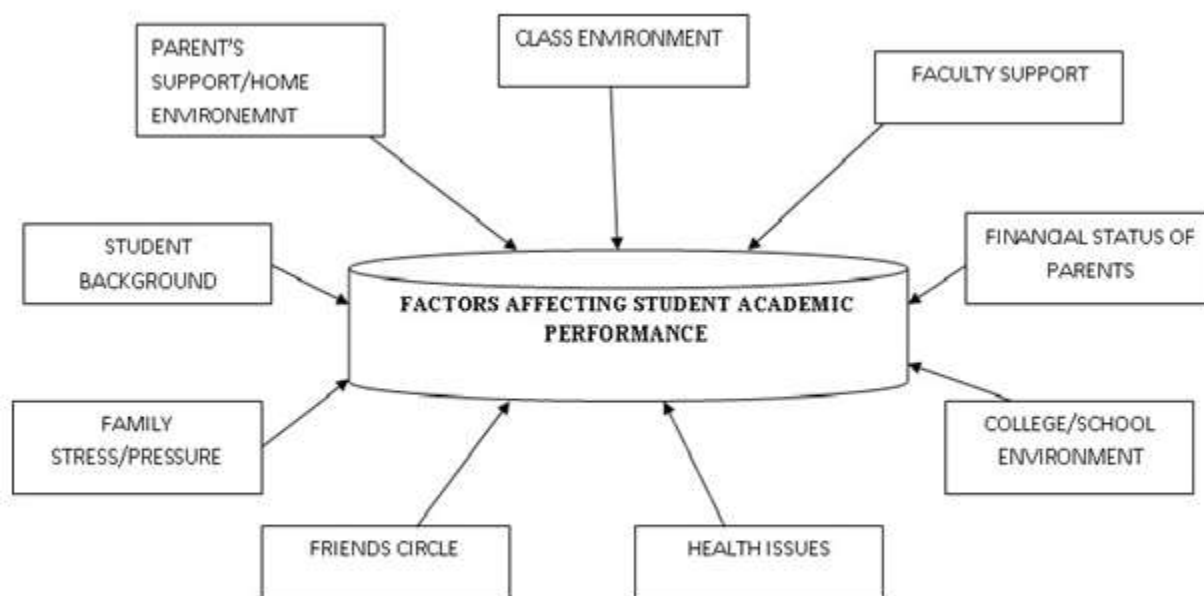
Fig-2: Factors Affecting the Student Academic Performance

6. CONCLUSION

There are numerous factors within and outside school (both academic and non academic factors) that contribute for the quality of academic performance of student. Our study is centred on academic or non academic factors that influence the student"s academic performance. The main objective for the academicians is to educate students efficiently, so that they would be able to achieve an excellent result in their academics. To achieve this objective it is necessary for the educators to be aware of the factors that may contribute in the academic success of students. Therefore, the outcome of this paper gives an important insight into the factors that might affect student"s academic performance. Predicting the factors which may have an effect in students" performance is very helpful in assisting the academicians and novices in their learning and teaching methods. Further works: Using data mining techniques we are going to provide the precise portion of every attribute affecting the educational performance of a student.

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