International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 09, September 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

COMPARING STUDENT AND TEACHER NEEDS USING DATA MINING

Archna Bajaj[1], Dr. S.K.Saxena[2]

[1]*PhD Scholar: Dept. of Computer Science and System Studies,*
Mewar University, Chittorgarh (India)
[2]*Senior Faculty: Dept. of Computer Science and Engineering,*
Delhi Technological University, New Delhi (India)

ABSTRACT

The aim of this research paper is to compare the needs of students and teachers using Data Mining Techniques. These two entities form the basis of any educational Institute and meeting their needs is a critical aspect for the success of these institutes. In this study, we will be analyzing the primary data that is collected from a group of students and teachers of Undergraduate institutions. The paper mainly focuses on the academic needs of these two groups and the responses generated help the institutes enhance the overall education experience. The research may lead to more satisfied Students and more pro-active Teachers.

Keywords: Data Mining, Educational Data Mining (EDM), Faculty Needs, Student Needs

I. INTRODUCTION

Education institutes today are focused towards planning, monitoring and responding to the Needs of each individual student in order to promote academic growth. Educators understand that each student in the classroom is unique and a wide range of methods are used nowadays to reach out to each one. However, there are quite a few common needs of students that need to be addressed by these institutions. Teachers also have their own Needs and the institutes are required to work towards understanding and implementing these Needs. The Higher education institutes today are diversified, characterized by a plethora of programs and education technologies with increased emphasis on performance and quality of education. Students have an access to higher education today and push for wider participation in gaining education. A massive number of private Higher Education Institutes (HEIs) have also started to fulfill the growing demands of higher education.

"Need" is defined as the gap between current outcomes or outputs and desired (or required) outcomes or outputs [1]. It is important to understand and identify these gaps in terms of ways of providing education so as to help them achieve their goals.

Educational Data Mining or EDM is one technique, which can help in mining the educational data to get valuable information and improve the performance and quality of the HEIs. Data Mining is used to analyse a large data and summarize the same into usable information. DM helps one find patterns and relationships within the data. Data mining algorithms use techniques that have existed for long, but have only recently been used as mature and reliable tools that are consistently more efficient than the old statistical methods. Beyond the immediate purpose of tracking, accounting for, and archiving the activities of an organization, this data can

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

sometimes be a gold mine for strategic planning, which recent research and new businesses have only started to tap [2].

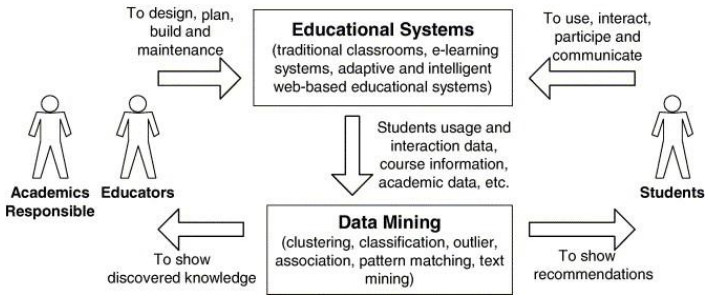

Fig. 1

DM is used across various industries and in many applications. But it finds limited application in the field of Education till date. Institutions can use Data Mining tools to predict Students and Teachers behaviours and Needs along with future trends so as to allow businesses to make proactive, quick and knowledge-driven intelligent decisions. Educational Data Mining is an emerging field that focuses on applying Data Mining tools to Education related Data [3].

II. RESEARCH BACKGROUND

Researches within Educational Data Mining field have focused on topics like finding set of Weak students, Student evaluation, Faculty Evaluation, Student dropout ratio, Understanding students enrollment data, impact of feedback on teachers and students behavior.

Recent literature on Educational Data Mining is presented below:

Romero and Ventura conducted survey on Educational Data Mining between Years 1995 to 2005 and concluded that Educational Data Mining is a promising area of research [4].

Alaa-El-Haleez gave a case study that used Educational Data Mining to analyze student-learning behavior [5].

B.K.Bhardwaj and Saurabh Pal used classification task on student database to predict the students division on the basis of previous database and reduce fail ratio [6].

Chong Ho Yu used Data Mining techniques to study the predictors affecting University student retention [7].

S.Anupama and Vijaylakshmi used Data Mining techniques to study behavior and performance of students [8].

Ajay Kumar Pal and Saurabh Pal used Data Mining techniques in EDM for predicting performance of students [9].

J.Ranjan and K.Malik used data-mining techniques for exploring the effects of probable changes in processes related to admissions, course delivery and recruitments [10].

Dr. Mohd Maqsood Ali, "Role of data mining in education sector", International Journal of Computer Science and Mobile Computing Vol. 2, Issue. 4, April 2013 [11].

Agrewal, S., G. Pandey, and M. Tiwari. "Data mining in education: data classification and decision tree approach." International Journal of e-Education, e-Business, e-management and e-learning, 2 (2) (2012) [12].

In 2012, M. Sukanya, S. Biruntha, Dr. S. Karthik and T. Kalaikumaran analyzed and assisted the low academic achievers in higher education using Bayesian Classification Method of Data Mining [13].

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Pandey, Umesh Kumar, and Saurabh Pal. "A Data mining view on class room teaching language".International Journal of Computer Science Issues (2011) [14].

III. OBJECTIVES

1. The proposed work uses Data Mining to find similarities and differences between Students and Teachers' Needs.
2. To analyze Need patterns and identify the focus areas with respect to academic needs so as to help in raising the quality standards and effectiveness of Education.
3. Needs and preferences of students towards appropriate course ware, teaching methodologies, faculty competency & approach and ways of assessment will be analyzed.

Student No / Teacher No	1. Appropriate & Updated Course Material	2. Career Oriented Course Material	3. Practical approach towards Understanding of concepts	4. Availability of Books/Journals etc.	5. Number of lectures allocated to the course	6. Lectures	7. Usage of Technology (Smart classes / Electronic text books etc.)
Student1	4	5	4	5	4	4	4
Teacher1	1	2	3	2	1	2	3
Student2	5	4	1	4	5	4	4
Teacher2	1	1	1	2	1	2	2
Student3	5	4	4	5	5	5	5
Teacher3	1	1	1	2	1	2	2
Student4	2	1	2	3	3	3	2
Teacher4	2	2	1	2	2	2	2
Student5	2	1	1	3	4	4	1
Teacher5	1	1	2	2	3	2	2

IV. DATA MINING TECHNIQUES

Algorithms and techniques used for finding out patterns from data constitute Data Mining Techniques. These Techniques are majorly classified into two categories: Predictive and Descriptive techniques:

A. Predictive Data Mining: It uses some variables or fields to predict unknown or future values of variables of that interest. It includes Classification, Regression and Prediction techniques.

B. Descriptive Data Mining: It focuses on finding patterns describing the data that can be interpreted by humans. It includes Clustering, Summarization and Association techniques.

V. RESEARCH METHODOLOGIES

A. Data Collection Strategy:

The data for this study has been collected from students and faculty of undergraduate courses of various colleges. A sample size of 350 students and 66 teachers has been used in the study. The closed-ended Likert scale based questionnaire pertaining to academic needs and comprising of various attributes has been formulated. Participants responded to 23 questions on the scale of 1 to 5 basis as below:

1. Very Important
2. Fairly Important
3. Neutral

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

4. Not Important

5. Not at all Important.

B. Cleaning and preparing data:

Data cleaning means finding and eliminating errors in the data. The collected data needs to be pre-processed and cleaned before Data Mining Techniques can be applied on the same to extract meaningful information. Only the fields required for Data Mining are selected. The pre-processing was done in terms of filling up missing values, rectifying inconsistent data and removing duplicate data. The final data for further analysis has been collated from an Excel dataset collected from various sources.

Partial Data Set (sample raw data):

A sample of the comparative raw data for our study is presented in the Table 1 below:

TABLE 1. (Sample of 5 respondents of each group)

RELIABILITY TEST::

Cronbach's alpha test is a measure of internal consistency that is, how closely related sets of items are as a group. It is a co-efficient of reliability (or consistency) [15].

TABLE 2. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Students: 0.940	0.940	23
Teacher: 0.948	0.950	23

The Alpha co-efficients for students is 0.940 and for teachers is 0.948, suggesting that the items have relatively high internal consistency in both the groups.

C. Data mining exploration:

A popular DM tool, IBM SPSS has been used for initial statistical analysis of the data. The Excel dataset is imported into SPSS.

Response to each question has been analyzed separately. The tables 3 & 4 below show the frequency and percentage of responses to individual questions (sample).

Refer Table 3 for Teachers and Table 4 for Students below:

TABLE 3. (Q2: Career Oriented Course material)

Teachers		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Important	42	63.6	63.6	63.6
	Fairly Important	17	25.8	25.8	89.4
	Neutral	4	6.1	6.1	95.5
	Not Important	2	3.0	3.0	98.5
	Not At All Important	1	1.5	1.5	100.0
	Total	66	100.0	100.0	

International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 09, September 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

TABLE 4. (Q2: Career Oriented Course material)

Students		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Important	120	34.3	34.4	34.4
	Fairly Important	107	30.6	30.7	65.0
	Neutral	68	19.4	19.5	84.5
	Not Important	39	11.1	11.2	95.7
	Not At All Important	15	4.3	4.3	100.0
	Total	349	99.7	100.0	
Missing	9999	1	.3		
Total		350	100.0		

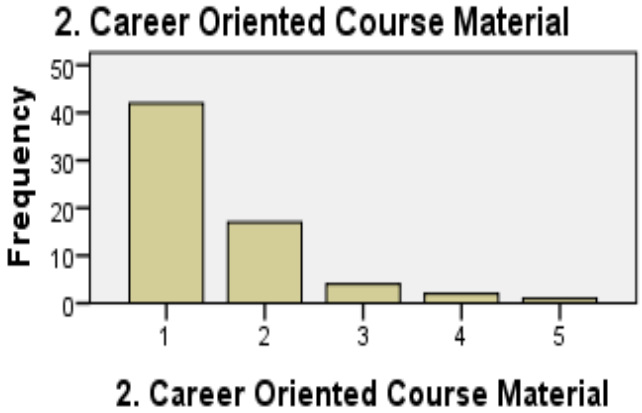

Fig. 2. Bar chart 1 (for Teachers Q2: Career Oriented Course Material)

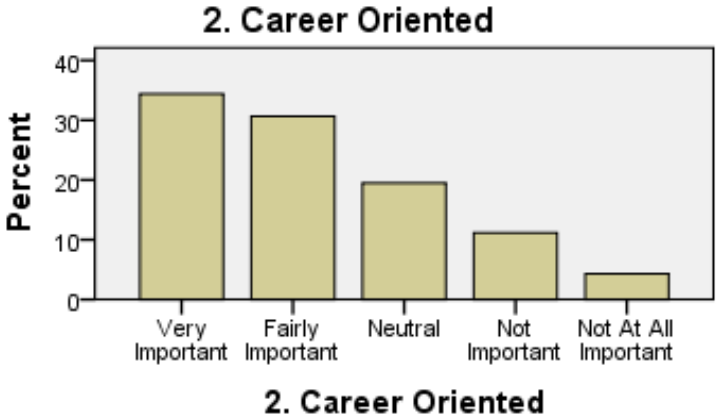

Fig. 3. Bar chart 2 (for Students Q2: Career Oriented Course Material)

After analyzing individual questions and applying various statistical techniques, Priority lists of the Needs were generated for both Students and Teachers.

Tables 5 and 6 below display the percentages of responses in the (Very Imp + Fairly Imp) category, Neutral category and (Not Imp + Not at all Imp) category with respect to total responses for both Students and Teachers respectively.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Prioritized list of Students: Refer Table 5 below:

TABLE 5. (Highest to lowest on Percentage of Importance)

Attributes (descending order)	Percentage of Very Imp / Fairly Important	Percentage of Neutral	Percentage of Not Important / Not at all Important	Highest Percentage
1. Appropriate & Updated Course Material	67.1%	18.3%	14.6%	67.1%
3. Practical approach towards Understanding of concepts	66.9%	19.4%	13.7%	66.9%
21. Practical Approach	65.6%	18.3%	16.1%	65.6%
2. Career Oriented Course Material	65%	19.5%	15.5%	65%
19. Educational Competency	64.3%	16.3%	19.4%	64.3%
23. Good Motivational skills	64%	15.1%	20.9%	64%
7. Usage of Technology (Smart classes / Electronic text books etc.)	63%	21.5%	15.5%	63%
22. Discussion Oriented	62%	22.2%	15.8%	62%
4. Availability of Books/Journals etc.	60.7%	16.9%	22.4%	60.7%
11. Teaching support facilities (Labs / Workshops etc.)	59.9%	19.2%	20.9%	59.9%
17. Industry based practicals / case studies	59.7%	20.4%	19.9%	59.7%
6. Lectures	57.1%	21%	21.9%	57.1%
8. Group based discussions (Knowledge sharing)	57.1%	24.3%	18.6%	57.1%
20. Industry background	55.8%	23.1%	21.1%	55.8%
18. Exam scheduling / time table	55.2%	21.7%	23.1%	55.2%
16. Feedback on Assessment from Teachers	55.1%	23.7%	21.2%	55.1%
15. Multiple choice	53.3%	30.9%	15.8%	53.3%

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

type or Essay type assessment				
14. Yearly or Semester based assessment	51.75%	23.4%	24.9%	51.7%
12. Notes based teaching system	50.8%	20.6%	28.6%	50.8%
10. Student to Teacher ratio (Class size)	50.6%	24.7%	24.7%	50.6%
5. Number of lectures allocated to the course	49.2%	24.3%	26.5%	49.2%
9. Projects & Assignments	48.5%	23.8%	27.7%	48.5%
13. Continuous Assessment (weekly / Monthly)	45.4%	32%	22.6%	45.4%

Prioritized list of Teachers: Refer Table 6 below:

TABLE 6. (Highest to lowest on Percentage of Importance)

Attributes (descending order)	Percentage of Very Imp / Fairly Important	Percentage of Neutral	Percentage of Not Important / Not at all Important	Highest Percentage
1. Appropriate & Updated Course Material	92%	3%	5%	92%
19. Educational Competency	92%	3%	5%	92%
23. Good Motivational skills	91%	3%	6%	91%
7. Usage of Technology (Smart classes / Electronic text books etc.)	91%	6%	3%	91%
21. Practical Approach	89%	5%	6%	89%
3. Practical approach towards Understanding of concepts	89%	8%	3%	89%
2. Career Oriented Course Material	88%	7%	5%	88%
4. Availability of Books/Journals etc.	88%	6%	6%	88%
11. Teaching support	85%	13%	2%	85%

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

facilities (Labs / Workshops etc.)				
17. Industry based practicals / case studies	85%	12%	3%	85%
5. Number of lectures allocated to the course	85%	10%	5%	85%
6. Lectures	85%	9%	6%	85%
22. Discussion Oriented	83%	14%	3%	83%
8. Group based discussions (Knowledge sharing)	83%	15%	2%	83%
13. Continuous Assessment (weekly / Monthly)	79%	16%	5%	79%
9. Projects & Assignments	79%	19%	2%	79%
10. Student to Teacher ratio (Class size)	76%	18%	6%	76%
14. Yearly or Semester based assessment	76%	18%	6%	76%
18. Exam scheduling / time table	74%	24%	2%	74%
15. Multiple choice type or Essay type assessment	70%	22%	8%	70%
20. Industry background	64%	30%	6%	64%
16. Feedback on Assessment from Teachers	61%	21%	18%	61%
12. Notes based teaching system	53%	32%	15%	53%

The Priority lists of teachers and students are compared and the similarities and differences are listed below:

1. TOP 3 needs of Students include-
   - Appropriate and Updated Course Material
   - Practical Approach towards understanding of Concepts
   - Practical Approach of Teachers

   Whereas the TOP 3 needs of Teachers include-
   - Appropriate and Updated Course Material
   - Educational competency of teachers
   - Good motivational skills in teachers

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

2. Appropriate and Updated Course material is the most important need for both the groups.
3. The results of the Teachers are more skewed than Students (Highest percentages for Students typically lie between 50% and 65% whereas for Teachers the highest percentages typically lie between 60% and 90%).
4. 5 out of TOP 6 Needs are common for both the groups.

The Needs are categorized under different Groups as follows:

1. Courseware: Q1 to Q5
2. Assessment techniques: Q6 to Q12
3. Teaching Methodologies: Q13 to Q18
4. Teachers' competencies: Q19 to Q23

The T-test was performed to compare the difference in the Means of Students and Teachers. The outcome of both is shown in the Table 7 and Table 8 respectively.

TABLE 7: One Sample Test for Students

One-Sample Test

	T	df	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Mean_Course_Material	45.472	349	2.296	2.20	2.39
Mean_Teaching_Method	52.312	349	2.475	2.38	2.57
Mean_Assessment_Methods	54.193	349	2.524	2.43	2.62
Mean_Teachers_skills	41.528	349	2.271	2.16	2.38

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

TABLE 8: One Sample Test for Teachers

One-Sample Test

	t	df	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Mean_Course_Material	17.443	65	1.56667	1.3873	1.7460
Mean_Teaching_Method	21.383	65	1.74495	1.5820	1.9079
Mean_Assessment_Methods	25.994	65	2.10390	1.9423	2.2655
Mean_Teachers_skills	20.286	65	1.69697	1.5299	1.8640

The results indicate that there is significant difference in the Means of various groups but the group 'Assessment Methods' ranks as the highest Need for both Students and Teachers followed by the group ' Teaching Methods'.

VI. CONCLUSION

The priority lists of the 'Students Needs' and 'Teachers Needs' have been established and the study clearly shows the inclination of both the groups towards 'Appropriate and Updated Course material'. It is admirable to note that 5 of the TOP 6 academic needs of both the groups are common. The results are much skewed in the case of teachers vis a vis students. We can easily conclude that the Academic Needs of both the groups are similar and hence can be effectively addressed by the Institutions.

VII. FUTURE SCOPE

"Needs" is a very broad term. This research work limits itself to the Academic needs of the Students and Teachers of the Undergraduate Institutions. The future scope of the study may be carried out on a more horizontal and vertical bandwidth. It may cover factors such as Age of the participants, Year of study, Career aspirations, socio-economic background and ethnicity among other factors. More research work may be carried out keeping in mind more mature participants like postgraduate students, students enrolled in technical institutions, management or Professional courses.

REFERENCES

[1] R. A. Kaufman, "Why Needs Assessment," in Needs Assessment-Concept and Applications, 1st ed. New Jersey, Educational Technology Publications, 1979, pp. 8.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

[2] S. Sumathi & S. N. Sivanandam, "Introduction to Data Mining Principles," Introduction to Data Mining and it's Applications, Vol. 29, pp. 3, 2006.

[3] R. S. J. D. Baker and K. Yacef, "The State of Educational Data Mining in 2009: A Review and Future Visions," Journal of Educational Data Mining, Article 1, Vol. 1, No. 1, pp. 3-17, Fall 2009.

[4] C. Romero & S. Ventura, "Educational Data mining: A survey from 1995 to 2005," Expert Systems with Applications, Vol. 33, No. 1, pp. 135-146, 2007.

[5] A. El-Halees, "Mining Students Data to analyze learning behavior: A case study," Department of Computer Science, Islamic University of Gaza P.O.Box 108 Gaza, Palestine, 2009.

[6] B. K. Baradwaj & S. Pal, "Mining Educational Data to Analyze Students," IJACSA, Vol. 2, Issue 6, pp. 63-69, Oct. 2011.

[7] Chong Ho Yu et al., "A Data Mining Approach for Identifying Predictors of Student Retention from Sophomore to Junior Year," Journal of Data Science, Vol. 8, pp. 307-325, 2010.

[8] S. A. Kumar and M. N. Vijayalakshmi, "Relevance of Data Mining Techniques in Edification Sector," International Journal of Machine Learning and Computing, Vol. 3, No. 1, pp. 4-6, Feb. 2013.

[9] A. K. Pal and S. Pal, "Classification Model of Prediction for Placement of Students," I.J. Modern Education & Computer Science, Vol. 5 Issue 11, pp. 49-56, Nov. 2013.

[10] J. Ranjan & K. Malik, "Effective educational process: A data-mining approach", VINE, Vol. 37, Issue 4, pp. 502–515, 2007.

[11] Dr. Mohd Maqsood Ali, "Role of data mining in education sector", International Journal of Computer Science and Mobile Computing Vol. 2, Issue. 4, Apr. 2013.

[12] Agrewal, S., G. Pandey, and M. Tiwari. "Data mining in education: data classification and decision tree approach." International Journal of e-Education, e-Business, e-management and e-learning, 2 (2) (2012).

[13] Sukanya, M., S. Biruntha, Dr S. Karthik, and T. Kalaikumaran. "Data mining: Performance improvement in education sector using classification and clustering algorithm." In International conference on computing and control engineering,(ICCCE 2012),vol. 12. 2012.

[14] U. K. Pandey & S. Pal, "A Data Mining view on Classroom Teaching Language," ICJSI, Vol. 8, Issue 2, Mar. 2011.

[15] http://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/