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A Tool for Course Outcome Attainment

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Abstract **- Data mining is an innovative approach for teaching and learning process in education. National Board of Accreditation (NBA) is outcome based learning education. Faculty has to measure and assess the CO and PO attainment with respect to a number of direct and indirect tools, where a lot of clerical errands get involved. The assessment may get troubled due to the time constraints and various other activities. There is no such active system which will reduce these efforts. Our tool atomizes it. Through the Knowledge based tool for PO attainment we can reduce the intricacy in PO attainment process of NBA. Mainly the Knowledge based tool is used to reduce the clerical work of faculty in the assessment. In the given system classification algorithm and Bloom's taxonomy is used in mapping COs with POs .This system helps us to appraise mapping between COs and POs for each subject with the help of direct and indirect measures.**

Keywords**— Educational data mining, Classification model, student analysis, blooms taxonomy.**

I. INTRODUCTION

Indian higher education system is one of the top five leading systems in the world. The challenge is to make sure its excellence (quality) to the stakeholders along with the development. To meet this challenge, the concern of excellence needs to be addressed, debated and taken forward in a systematic manner. National Board of Accreditation (NBA) was originally constituted to assess the qualitative competence of educational institutions from Diploma level to Post-Graduate level in Engineering and Technology, Management, Pharmacy, Architecture and related disciplines. NBA conducts evaluation of programs of technical institution on the basis of laid down norms. NBA accreditation is a quality assurance scheme for higher technical education. It is open to all Institutions.

II. BACKGROUND

In engineering education it is frequently necessary to judge whether and how well students have learned a body of material or mastered a skill or how well an instructor has taught a course, or how well a product or process has met its design specifications, or how well an instructional program has met its educational objectives. A two- step process should be used to make the judgment rationally:

A. Assessment

Decide on the data that will be used as a basis for making the judgment and the procedures (observations, measurements, experiments, surveys) that will be used to obtain the data, then carry out the procedures and perform whatever analytical operations are needed to put the data into a form suitable for the next step. Assessment tools are categorized into direct and indirect methods to assess the programme educational objectives, programme outcomes and course outcomes.

1) Indirect Measures
•Alumni Survey
•Employer Survey
•Student Exit Survey
•Course Exit Survey
2) Direct Measures
•Project Evaluation
•Course Evaluation

B. Evaluation

Using the assessment outcomes and pre-established criteria draw inferences and make evaluative judgments.
(1) Inferences of direct and indirect measure Based on assessment outcomes the result is evaluated whether that subject has PO attainment of "LOW, MEDIUM, and HIGH" as shown in figure 2.
1) The achievement is considered to be "high" if the percentage of PO attainment is greater than or equal to 70%.
2) The achievement is considered to be "medium" if the percentage of PO attainment is greater than or equal to 50% and less than 70%.
3) The achievement is considered to be "low" if the percentage of PO attainment is less than 50%

III. Assessment of Pos, PEO and Cos

A. Programme Outcomes

PO describes what students should know and be able to do at the end of the programme. POs are to specify, measurable and achievable.
The Computer Engineering Diploma holder will be able to:
1. Basic knowledge:
a. Apply knowledge of fundamentals of Science & Computer Science to develop software and hardware for solving real life applications.
2. Discipline knowledge:
b. Gather, analyze and interpret user requirements for developing software.
3. Experiments and practice:
c. Design software and computer based system and identify, diagnose, and solve hardware and software problems.
4. Engineering Tools:
d. Use latest and advanced technologies in Computer hardware and software field.
5. The engineer and society:
e. Observe cyber security, social issues and responsibilities relevant to computer science.
6. Environment and sustainability:
f. Deal with environmental issues and responsibilities relevant to

computer science such as safe disposal of electronic gadgets, etc.
7. Ethics:
g. Follow professional, legal, and ethical responsibility in engineering practice.
8. Individual and team work:
h. Function effectively and efficiently in Multidisciplinary or diversity of user communities.
9. Communication:
i. Communicate effectively by oral, written, and graphical means with large number and diversity of audience for requirement gathering, system development, user training, preparing reports, and providing work products.
10. Life-long learning:
j. Engage in life-long learning, independently to acquire and apply new technologies.

B. Programme Educational Objective

The PEOs are broad statements that describe the career and professional accomplishments that the programme is preparing graduates to accomplish. PEOs are meant to guide the programme toward continual improvement.
The program educational objectives of the under graduate program in computer engineering are to produce graduates and Programme will prepare students to:
1. Perceive the profession in software development, testing and networking with intellectual contribution to it.
2. Analyze, design and implement new projects from various application domains using modern engineering tools.
3. Practice professional and ethical code, effective communication skills, leadership and teamwork skills.
4. Develop logic, software considering engineering & social issues using multidisciplinary approach.
5. Excel in Computer Engineering Graduate, post graduate programs and succeed in IT industry profession through quality education and perceive a lifelong carrier on personal and professional growth.

C. Course Outcomes

CO are the attributes that the students are expected to demonstrate after completing the course. The result of
CO attainment is used to evaluate the attainment of PO. Different subject has different COs.

IV. BLOOM'S TAXONOMY

Bloom's taxonomy is a way of distinguishing the fundamental questions within the education system. Bloom's taxonomy is a classification system of educational objectives based on the level of student understanding necessary for achievement or mastery. This technique is used to map question paper of university which is scanned and map to know the Cos attainment of that subject.
Table.I :Shows Question Paper analysis according to blooms Taxonomy and Mapping with COs,POs

Unit No.	Question No.	Sub Qs. NO.	Learning Level	Marks	Cos Achieved	Pos Achieved
1	1	a	U	4	1	a,b
2	1	b	R	4	2	a,b,i
3	1	c	U	4	6	a,b
1	1	d	R	4	1	a
5	1	e	R	4	2	a,b,i
6	1	f	U	4	4	a,b,c, d
1	1	g	R	4	1	a
1	2	a	U	4	5	a,b
2	2	b	U	4	6	a,b
3	2	c	U	4	4	a,b
4	2	d	R	4	1	a
5	2	e	R	4	5	a
6	2	f	U	4	3	a,c,d,j
1	3	a	U	4	1	a,i
1	3	b	R	4	5	a,b
2	3	c	U	4	2	a,b,i
3	3	d	R	4	1	a,b,i
4	3	e	U	4	4	a
5	3	f	U	4	2	a,f,h
4	4	a	U	4	3	a,c,d,i
4	4	b	U	4	3	a,c,d,i
3	4	c	A	4	1	a,b,c, d
3	4	d	R	4	4	a
1	4	e	U	4	5	a,b
1	4	f	U	4	5	a,b
2	5	a	R	8	2	a,b,i
3	5	b	U	8	4	a,b,i
1	5	c	U	8	3	a,c,d,j
1	6	a	U	4	1	a,b
2	6	b	R	4	2	a,b
4	6	c	U	4	3	a,c,d,i
4	6	d	U	4	3	a,c,d,i
5	6	e	U	4	5	f,h
5	6	f	U	4	5	f,h

Table I : QP Analysis ,COs & POs Achieved

V. RELATED WORK

Ms. Varsha Gupta et al [1] has described that they have Implemented C4.5 classification for finding out the trend for the system. They have made an automated system for department to analyze and predict student performance, their like and dislikes. A system to find out student trends on the basis of outcomes of indirect surveys. The analysis will summarize the outcome and will classify students based on the results. This system will recognize interest of student in particular areas.

Manmohan Singh et al [2] the classification task is used on student database to predict the students division on the basis of previous database.

Raj Kumar et al [3] has discussed how classification algorithm can be applied for data mining. He has concluded that these classification algorithms can be implemented on different types of data sets like data of patients, financial data according to performances. On the basis of the performance of these algorithms, these algorithms can also be used to detect the natural disasters like cloud bursting, earth quake, etc.

Mr. Vipun Kumar et al [4] presents the top 10 data mining algorithms identified by the IEEE International Conference on Data Mining (ICDM) in December 2006: C4.5, k-Means, SVM, Apriori, EM, Page Rank, AdaBoost, kNN, Naïve Bayes, and CART. These top 10 algorithms are among the most influential data mining algorithms in the research community. With each algorithm, they provide a description of the algorithm, discuss the impact of the algorithm, and review current and further research on the algorithm. These 10 algorithms cover classification, clustering, statistical learning, association analysis, and link mining, which are all among the most important topics in data mining research and development.

Mr. Salmah Fattah et al [5] discussed the idea to develop application software that able to classify the examination question difficulty level based on the Bloom's Taxonomy. The system will be able to display the overall presentation of the examination exam paper in terms of format and the distribution of question difficulty levels.

VI. PROPOSED METHDOLOGY

- To foster the learning by the students NBA adopted a systematic strategy for evaluation.
- The performances of the students are analyzed based on some direct and indirect measures.
- Our proposed system considers these two modules, direct measures includes quantitative methods for tangible outputs and indirect measures for qualitative methods.
- Direct will include all the tangible outcomes on student performance and indirect will include student's personal agreements and disagreements.
- This will result in a summarized solution. This summarized solution will include a result from mapping of direct and indirect surveys and will give us trend.
- Mapping of question papers with COs of respective subjects will be done.
- There will be mapping between COs and Pos which are already defined.
- There will be mapping between POs and PEOs which are already defined.
- The overall results will be compared with mission and vision.

VII. SYSTEM FUNCTIONS

Faculty should perform following function:

1. Prepare CIS(Course Information Sheet) of a course containing following details of course:
   a) Name of Course,Code
   b) Hours per Week
   c) Teaching Media,target set
   d) Course Outcomes,Direct and Indirect Assessment Tools Used.
   e) Maaping and attainment of COs with POs by using Direct and Indirect Method.
2. Attainment of COs is done as follows:
   Here Analysis of Java Programming is done by Direct method:
   Table II shows Direct Assessment tools used for analysis of Java Programming Course, Assessment Values.

CO	Assessment Tool	Assessment in %	Avg Assess in %
CO1	Assignment number: 01	94.33	81.13
	Class Test	76.3	
	Experiment number: 01,02,03,04,12	53.9	
	University Theory Result(>=60% Marks)	100	
CO2	Assignment number: 02	96.76	78.51
	Class Test	57.4	
	Experiment number: 05,06,12	59.9	
	University Theory Result(>=60% Marks)	100	
CO3	Assignment number: 03	99.42	78.20
	Class Test	56.3	
	Experiment number: 08,09	57.1	
	University Theory Result(>=60% Marks)	100	
CO4	Assignment number: 04	96.30	82.55
	Class Test	73.43	
	Experiment number: 10,12	60.5	

	University Theory Result(>=60% Marks)	100	
CO5	Assignment number: 05	98.26	81.69
	Class Test	65.93	
	Experiment number: 11,12	62.6	
	University Theory Result(>=60% Marks)	100	
CO6	Assignment number: 06	80.67	81.38
	Class Test	83.66	
	Experiment number: 07,12	61.2	
	University Theory Result(>=60% Marks)	100	
--	Guestlecture / Seminar / NPTEL video lecture	--	--

Table II: Direct Assessment Tools & Assessment Values

3. Attainment of COs is done as follows:
Here Analysis of Java Programming is done by Indirect method:
Table III shows Indirect Assessment (Course Exit Feedback) used for analysis of Java Programming Course, Assessment Values.

CO	Question in Questionnaire	Assessment in %	Avg Assessment in %
CO1	Can u write a Simple Java Program using basic operators, control statements and using class and object concept?	92.10	92.10
CO2	Can you implement all types of Inheritance?	90.72	90.72
CO3	Can you create user defined package?	92.19	92.19
CO4	Can you implement Multithreading using Java?	91.07	91.07
CO5	Can u design Simple Applet using different font, color, graphics?	92.78	92.78
CO6	Can you implement File Processing program?	88.32	88.32
--	Guest lecture / Seminar / NPTEL video lecture	--	--

Table III: Indirect Assessment Tools & Assessment Values

4. Total Attainment of COs by adding Direct and Indirect Assessment values is done and shown in following table.

COs	Mapping with Program Outcome (PO)	Assessment in %				Target Set	Total Attainment in %
		Indirect 20%		Direct 80%			
CO1	a,b,c	92.10	18.14	81.13	64.90	70%	83.04
CO2	a,b,c,d	90.72	18.14	78.51	62.80	70%	80.94
CO3	a,b,c,d	92.19	18.43	78.20	62.56	70%	80.99
CO4	a,b,c,d	91.07	18.21	82.55	66.04	70%	84.25
CO5	a,b,c,d	92.78	18.55	81.69	65.35	70%	83.9
CO6	a,b,c,d	88.32	17.66	81.38	65.10	70%	82.76
Guest lecture / Seminar / NPTEL video lecture	--	--	--	--	--	--	--

Table IV: Total Attainment in %

CONCLUSIONS

This paper discussed the idea of an effective technique that is generated to reduce the tedious work of Institute faculties. A classification algorithm is used to classify the data and to get clear mine dataset. This system will reduce the time required by an institute to complete the process of NBA. Blooms taxonomy technique and effective search algorithm can be used to map question paper with Cos. Further, this tool can be used for setting up the question paper in the university and for analysis of question paper.

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