A Role-Based Web System for Outcome Based Education Attainment and Reporting

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Abstract — **Outcome Based Education (OBE) requires systematic tracking of Course Outcomes (COs), Program Outcomes (POs), and Program Specific Outcomes (PSOs) to ensure academic quality and accreditation compliance. In many MSBTE-affiliated institutes, OBE processes are managed manually using spreadsheets, which often leads to calculation errors, data inconsistency, and audit difficulties.**

This paper presents a web-based Outcome Based Education Tracking System that supports faculty-defined CO–PO– PSO mapping and automates attainment calculation and report generation after academic inputs. The system also includes a student stress survey module to collect and summarize academic stress feedback using a Likert-scale-based approach. Stress data is used only for descriptive and observational purposes and does not influence attainment calculations. The proposed system improves transparency, reduces faculty workload, and enhances audit readiness without altering academic decision-making authority.

Index Terms — **Outcome Based Education, OBE Tracking System, CO–PO Mapping, Attainment Calculation, Student Stress Survey, MSBTE.**

I. INTRODUCTION

Outcome Based Education emphasizes the measurement of clearly defined learning outcomes rather than syllabus coverage. MSBTE mandates CO–PO–PSO mapping and attainment analysis as part of academic quality assurance [1]. However, manual handling of OBE data using spreadsheets often results in redundancy, calculation errors, and lack of traceability during audits.

Along with academic evaluation, students experience varying levels of academic stress due to continuous assessments and examinations. While stress-related feedback is commonly collected informally, it is rarely documented in a structured manner. Therefore, there is a need for a centralized system that automates post-input OBE processing and provides structured academic stress feedback without diagnostic or predictive interpretation.

II. SYSTEM ARCHITECTURE AND ROLES

The proposed system is implemented as a role-based web application with centralized data management.

A. User Roles

1. Admin: Manages users and academic structure
2. Faculty: performs CO–PO–PSO mapping, and enters assessment data
3. HOD/Coordinator: Manage courses, Verifies and approves attainment reports
4. Audit User: Views approved reports in read-only mode

B. Functional Modules

1. CO, PO, PSO Management
2. Faculty-defined CO–PO Mapping
3. Attainment Calculation Engine
4. Role-Based Access Control
5. Report Generation and Approval Workflow
6. Student Stress Survey Module

III. OBE ATTAINMENT CALCULATION METHODOLOGY

A. Course Outcome (CO) Attainment Calculation

Course Outcome (CO) attainment is used to evaluate how effectively students have achieved the intended learning objectives of a course. In the proposed system, CO attainment is determined using student performance data obtained from both internal and external assessment components. For each Course Outcome, marks secured by students in various assessment tools such as internal tests, assignments, practical examinations, and end-semester examinations are collected. A target score is predefined for each assessment component in accordance with academic planning guidelines.

The attainment percentage for a Course Outcome is calculated by identifying the proportion of students who score equal to or above the target value. This percentage is computed using the following expression:

Eq. 1:

$$\text{Attainment Percentage} = \left(\frac{Number\ of\ students \geq target}{Total\ number\ of\ students}\right) \text{x } 100$$

Based on the calculated attainment percentage, graded attainment levels ranging from 0 to 3 are assigned as per the department defined attainment criteria. This graded approach provides a more realistic evaluation of learning outcome achievement compared to a binary achieved-or-not assessment method.

To obtain the overall CO attainment, attainment values are calculated separately for internal and external assessments. These values are then combined using predefined weightages, where external assessment contributes 60% and internal assessment contributes 40% to the final CO attainment. The overall CO attainment is calculated as:

Eq. 2:

$$\text{CO Attainment} = (0.6 \times \text{External Assessment Attainment}) + (0.4 \times \text{Internal Assessment Attainment})$$

The final CO attainment value obtained from this process is used as input for subsequent Program Outcome (PO) and Program Specific Outcome (PSO) attainment calculations

B. Program Outcome (PO) Attainment Calculation

Program Outcome (PO) attainment indicates how effectively a course contributes to the achievement of overall program-level learning outcomes. In the proposed system, PO attainment is derived from the attainment values of individual Course Outcomes (COs) through a structured CO–PO mapping process.

Each Course Outcome is mapped to relevant Program Outcomes by the faculty based on the degree of correlation between them. The strength of this correlation is expressed using predefined mapping weightages, where a low correlation is assigned a weight of 1, a medium correlation is assigned a weight of 2, and a high correlation is assigned a weight of 3.

To calculate PO attainment, the attainment value of each Course Outcome is multiplied by its corresponding CO–PO mapping weight. The weighted CO attainment values contributing to a particular Program Outcome are then aggregated to obtain a cumulative value.

The PO attainment is calculated using the following equation:

Eq. 3:

$$\text{PO Attainment} = \frac{\sum(CO\ Attainment\ x\ CO{-}PO\ Weightage)}{Highest\ Weightage}$$

This normalization ensures that PO attainment values remain within a comparable scale regardless of the number of contributing Course Outcomes or variations in mapping strengths.

The computed PO attainment values provide quantitative evidence of the effectiveness of curriculum delivery and are used for academic review, quality assurance, and accreditation-related analysis.

IV. STUDENT STRESS SURVEY DESIGN AND CALCULATION

Student stress is measured using a questionnaire of fifteen questions covering academic workload, teaching–learning experience, emotional state, study behaviour, and lifestyle habits. These questions are grouped into five categories to ensure structured analysis.

Each response is recorded on a five-point scale ranging from Never to Always. Numerical scores are assigned to these responses, and the total stress score is calculated by summing the weighted values. The overall stress percentage is obtained by normalizing the score with the maximum possible value. Based on defined threshold levels, student stress is classified as low, moderate, or high. [2]

The calculated stress levels are used as an indirect input to support academic improvement and student well-being decisions.

A. Survey Scale

A five-point Likert scale is used to collect student responses:

1. Never = 0
2. Rarely = 1
3. Sometimes = 2
4. Often = 3
5. Always = 4

B. Stress Score Calculation

Stress responses are aggregated at the course or batch level. [3]

Eq. 4:

$$\text{Average Stress Score} = \left(\frac{Total\ response\ score}{Total\ number\ of\ students}\right) \text{x } 100$$

Stress levels are interpreted as:

Table 1: Threshold Levels

Sr. no.	Range	Stress Level
1	<= 40%	Low Stress
2	40% – 70%	Moderate Stress
3	>= 70%	High Stress

Stress results are presented alongside attainment data for academic observation only and do not affect attainment calculations.

V. RESULTS AND DISCUSSION

The system enabled accurate and consistent attainment calculations with reduced manual effort. Automated report generation improved data consistency and audit preparedness. The stress survey module provided structured, quantitative visibility of student academic stress patterns without introducing causal or prescriptive interpretations.

VI. CONCLUSION

The proposed Outcome Based Education Tracking System provides a structured and transparent platform for OBE implementation in MSBTE institutes. By automating post-input processing and integrating descriptive stress survey summaries, the system enhances accuracy, traceability, and audit readiness while preserving faculty-driven academic judgment.

REFERENCES

[1] Ministry of Education, Government of India, “National Education Policy 2020,” Government of India, New Delhi, India, 2020.

[2] Audrey Mariamo, Caroline Elizabeth Temcheff, Pierre-Majorique Léger, Sylvain Senecal, Marianne Alexandra Lau, “Emotional Reactions and Likelihood of Response to Questions Designed for a Mental Health Chatbot Among Adolescents: Experimental Study”, JMIR Hum Factors 2021, vol. 8, iss. 1, e24343, Jan-Mar.

[3] R. Gorter, R. Freeman, S. Hammen, H. Murtomaa, A. Blinkhorn and G. Humphris, “Psychological stress and health in undergraduate dental students: fifth year outcomes compared with first year baseline results from five European dental schools”, Eur J Dent Educ, 12, 2008.