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Design of Graduate Learning Outcome Management Features in INSPIRE OBE Application

Rivaldy Tulung, Alwin Sambul, Sary Paturusi
Master Program of Informatics, Postgraduate Program, Sam Ratulangi University, Manado, Indonesia
emails: tulungmichael@unsrat.ac.id, asambul@unsrat.ac.id, sarypaturusi@unsrat.ac.id
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Abstract — Outcome-Based Education (OBE) positions Program Learning Outcomes (PLO/CPL) as the core reference for curriculum design, course planning, and assessment. In practice, study programs often struggle with maintaining consistent CPL data, mapping each CPL to supporting courses, and assigning contribution weights required for measurable attainment calculations. This study presents the design of a CPL management feature within the INSPIRE application at Universitas Sam Ratulangi to centralize CPL definition, link CPL items to relevant courses, and manage contribution weights in a traceable, well-documented manner. A prototype approach was employed so that interface designs and validation rules could be iteratively evaluated with key users (study program coordinators). The resulting design enables CPL input based on curriculum context, connects each CPL to a list of courses with defined contribution weights, and prepares a data structure that supports the OBE traceability chain down to Course Learning Outcomes (CPMK) and Sub-CPMK. The feature improves traceability between graduate targets and supporting courses, reduces reliance on scattered documents, and provides a reliable foundation for subsequent monitoring and evidence-based quality assurance.

Keywords — OBE, learning outcomes, curriculum mapping, weighting, INSPIRE.

I. Introduction

Outcome-Based Education (OBE) places learning outcomes at the center of curriculum design, course planning, assessment, and quality assurance. Program Learning Outcomes (PLO/CPL) represent the competencies graduates must achieve and must be supported by curriculum structure, course plans, and measurable assessment evidence. Prior studies highlight that OBE can improve graduate quality and curriculum relevance; however, successful implementation depends on consistent mapping and evaluation mechanisms.

At the study program level, PLO management typically starts with defining PLO items according to the curriculum, followed by mapping each PLO to supporting courses and assigning contribution weights. This step is critical because weights influence how course results are aggregated into measurable PLO attainment. When mapping and weighting are done manually or distributed across multiple documents, inconsistencies become more likely and curriculum evaluation becomes slow and difficult to audit.

This research focuses on designing a PLO management feature within the INSPIRE application. The objective is to provide data structures and user interfaces that support (1) PLO input by study program coordinators, (2) standardized mapping from PLO to supporting courses, and (3) controlled weight management as a foundation for traceable OBE calculations and future attainment monitoring.

II. Research Method

The feature was developed using a prototype method because user needs depend strongly on curriculum rules and usability of interfaces, requiring iterative validation with key users. The data involved include PLO/CPL, course data, CLO/CPMK, Sub-CLO/Sub-CPMK, assessments, lecturers, and students connected to the teaching and learning process.

The development stages were:

1. Requirements identification and PLO data rules validation with study program coordinators.
2. Prototype creation for PLO management interfaces and PLO-to-course mapping, including weight validation rules.
3. Prototype testing using curriculum data and refinement based on user feedback.
4. Finalization of the design and integration of data structures so they can be linked to CLO and Sub-CLO in course planning features.

The system is implemented as a web application using CodeIgniter 3 (PHP) and MySQL. The MVC approach supports modular development and easier maintenance when curriculum changes occur.

III. Result and Discussion

A. System Actors

As detailed in Table 1, the system involves varying levels of responsibility. The Study Program Coordinator configures the curriculum standards (PLO/CPL), followed by the Course Plan Responsible Lecturer who details the specific Sub-CLOs. Educational activities are conducted by the Course Lecturer and Students, involving task assignment and submission. To streamline the process, the System automatically calculates grades and outcome attainment based on these inputs.

Table 1 System Actors

Actor	Description
Study Program Coordinator	Manages PLO/CPL, course mapping, and CLO/CPMK configuration.
Course Plan (RPS) Responsible Lecturer	Completes Sub-CLO/Sub-CPMK and links them to assessments.
Course Lecturer	Assigns tasks, links tasks to assessments, grades students, and finalizes grades.
Student	Submits tasks via INSPIRE portal and views PLO attainment data.
System	Automatically computes final grades and PLO attainment.

B. PLO/CPL Management Workflow

The PLO management feature is provided under the Study Program Coordinator role. The coordinator selects a study program and curriculum context, then the system loads the list of defined PLO items. Each PLO is stored with a code and competency description, enabling consistent referencing across mapping and evaluation (Fig. 6).

Core functions include adding, editing, and deleting PLO items with controlled input fields (PLO code and description). The design emphasizes consistency so that any PLO update remains traceable and does not break mapping relationships.

C. Mapping PLO to Supporting Courses and Weight Validation

After PLO items are defined, the system supports mapping each PLO to one or more supporting courses to ensure curriculum traceability and to prepare measurable attainment computation. The mapping process is initiated by selecting a specific PLO and then adding one or more courses that contribute to that PLO. For each selected course, the coordinator assigns a contribution weight representing the relative strength of the course in delivering the PLO. The system also supports a weighting policy for required and elective course components, where the combined weight is constrained (e.g., total equals 100) before detailed per-course mapping is applied. This weighting scheme is designed to support later aggregation of course evidence into program-level attainment in a transparent manner.

From a usability perspective, the feature separates PLO definition and mapping activities. The coordinator first manages the PLO master data (code and description) to maintain consistent identifiers across the system (Fig. 2). Once the PLO record is available, the coordinator proceeds to the course-mapping interface to connect the PLO with specific courses and assign per-course contribution weights (Fig. 5). This separation reduces input errors, prevents duplicate PLO labels, and improves consistency during curriculum updates.

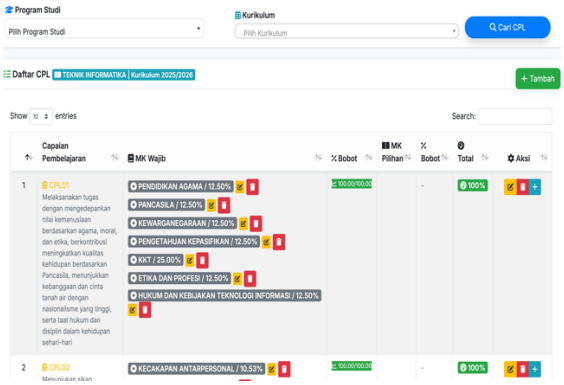

Figure 1. PLO/CPL management page (Study Program Coordinator)

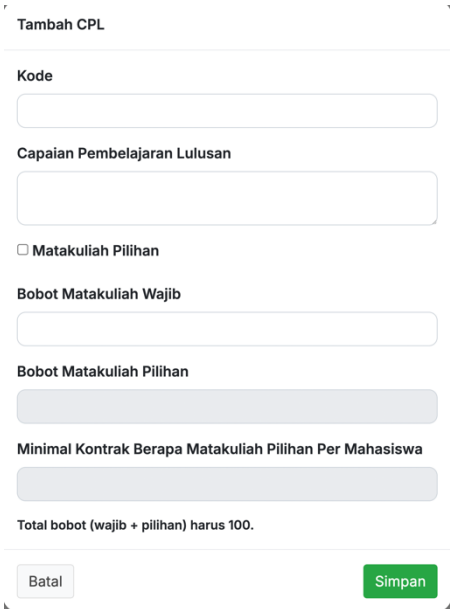

Figure 2. Add PLO/CPL form
(code, description, and course support setting)

To keep weighting consistent, validation rules are applied, for example:

1. weights must be numeric and within an allowed range,
2. the total weight for a PLO across mapped courses is controlled (e.g., must sum to a defined total or remain within a target range, depending on curriculum policy),
3. edits to weights are tracked to maintain auditability during curriculum revisions.

In addition to creating mappings, the system provides maintenance actions to support ongoing curriculum improvements. Coordinators can revise an existing mapping when course roles change or when contribution weights need refinement (Fig. 6). If a course is no longer relevant to a PLO, the linkage can be removed to avoid misleading contribution calculations (Fig. 7). For PLO records themselves, the system includes a controlled deletion mechanism using a confirmation dialog (Fig. 4) to reduce the risk of accidental removal that could affect existing mappings.

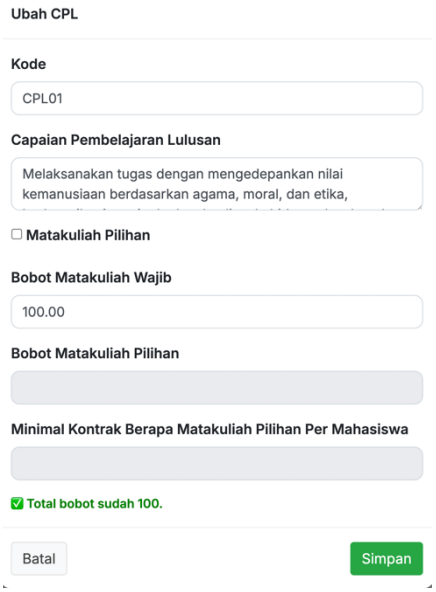

Figure 3. Edit PLO/CPL form
(update PLO/CPL and weighting settings

Figure 4. Delete PLO/CPL

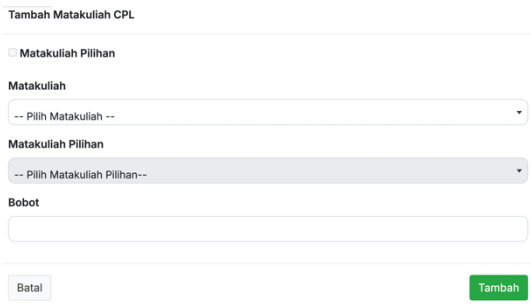

Figure 5. Add course mapping to a PLO/CPL

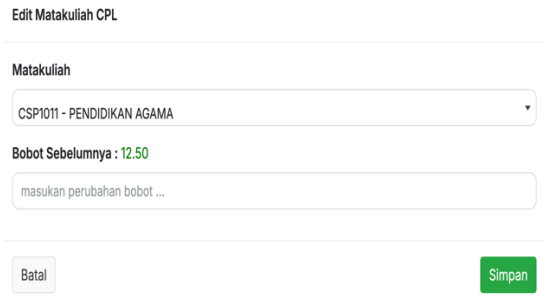

Figure 6. Edit course mapping and contribution weight

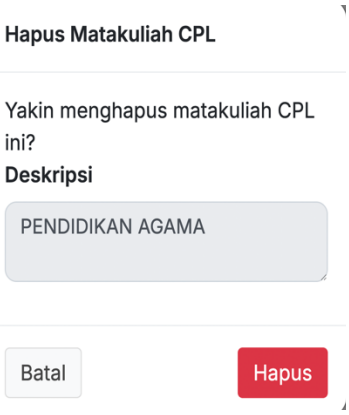

Figure 7. Delete course-to-PLO/CPL linkage

D. Traceability to CLO/CPMK and Evidence-Based Reporting

The main strength of the proposed design is end-to-end data traceability across the OBE structure. The feature strengthens OBE traceability by connecting PLO/CPL to supporting courses and systematically aligning them with CLO/CPMK and Sub-CLO/Sub-CPMK, ensuring that attainment is supported by documented assessment evidence. Because the system stores course mappings and contribution weights, course-level performance can be aggregated into program-level attainment using consistent rules, thereby reducing ambiguity when interpreting attainment results.

Operationally, this centralized dataset minimizes administrative workload. Coordinators no longer need to maintain separate spreadsheets for mapping and weighting, while lecturers gain clearer PLO context when preparing course plans (RPS) and defining CLO/Sub-CLO targets. In addition, structured data and controlled update actions support stronger governance: changes in curriculum mapping remain traceable, and reports can be generated more reliably for quality assurance activities. As a result, the feature provides a practical foundation for evidence-based monitoring of learning outcome achievement and improves readiness for accreditation reviews through more efficient reporting and audit processes.

IV. CONCLUSION

This study presents the design of a centralized PLO/CPL management feature within the INSPIRE OBE application. The feature covers three essential functions: (1) standardized

PLO/CPL definition as master data, (2) systematic mapping of each PLO/CPL to supporting courses, and (3) contribution weight management with input validation and controlled maintenance actions. By organizing these elements in a structured dataset, the design supports the OBE traceability chain from program outcomes to course implementation and further to CLO/CPMK and Sub-CLO/Sub-CPMK, which is required to produce consistent and auditable attainment calculations.

The proposed design improves transparency and reduces administrative workload by replacing fragmented spreadsheets and manual documents with an integrated workflow. It also strengthens governance for curriculum revisions because mappings and weights can be updated in a controlled manner while maintaining traceability for reporting and audit needs. Overall, the feature provides a reliable foundation for future outcome monitoring, evidence-based quality assurance, and accreditation readiness through more efficient documentation and reporting of PLO/CPL alignment and contribution across the curriculum.

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