

OBE-Based Monitoring of Graduate Learning Outcomes in INSPIRE Managerial Application

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Received: 20 December 2025; revised: 15 January 2026; accepted: 21 January 2026

Abstract — Monitoring Program Learning Outcomes (CPL/PLO) is essential in the Outcome-Based Education (OBE) quality assurance cycle, as it supports curriculum evaluation and continuous improvement. Common challenges include fragmented attainment data, limited visualization, and difficulty tracing course contributions down to CPMK, Sub-CPMK, and assessment evidence. This paper presents the design of a CPL monitoring dashboard in the INSPIRE Managerial application at Universitas Sam Ratulangi. The dashboard is designed to list CPL items by curriculum, expand into supporting courses with contribution weights, provide hierarchical views down to CPMK and Sub-CPMK with progress indicators, and display radar charts that depict the contribution/attainment profile of a course across multiple CPL items on a 0-100 scale. The design also includes per-student CPL monitoring to support academic decision-making. The resulting multi-layer visualization and drill-down capability provide real-time transparency for study program coordinators and quality assurance teams to detect attainment gaps, review weighting, and formulate data-driven improvement actions.

Key words — CPL monitoring; academic dashboard; visualization; OBE; quality assurance.

I. INTRODUCTION

Outcome-Based Education (OBE) requires evidence that learning outcomes are achieved through learning activities and assessment. Therefore, Program Learning Outcomes (PLO) monitoring should not stop at the availability of documents; it must utilize learning-result data that can be traced from assessment evidence to graduate-level targets. Without an adequate monitoring system, OBE implementation risks becoming administrative compliance rather than measurable quality improvement.

This need becomes more urgent when study programs must prepare data-driven reports for curriculum evaluation, internal quality assurance, and accreditation. In this context, the INSPIRE Managerial application is designed to help program coordinators monitor PLO attainment concisely while still enabling detailed traceability of course contributions down to CLO and sub CLO levels.

This study focuses on designing an operational monitoring dashboard that supports:

1. Multi-level traceability
2. Visibility of contribution weights among mappings, and

3. Compact yet informative visualization (including radar charts and per-student views) to accelerate decision-making

II. RESEARCH METHOD

The dashboard was developed using a prototyping approach to validate visualization needs quickly with stakeholders. The attainment calculation is based on hierarchical relationships: PLO - course - CLO - sub-CLO, supported by assessment and coursework grades. Contribution weights defined in each mapping relationship are used to aggregate micro-level attainment into PLO-level attainment.

Development stages include:

1. Eliciting monitoring requirements with the program coordinator and quality assurance team,
2. Designing the data structure and aggregation rules for weights across the mapping hierarchy,
3. Building a layered visualization prototype and testing it using curriculum data, and

Refining the dashboard and integrating it with the course plan (RPS/Semester Learning Plan) workflow and grade entry so that attainment data can be updated in real time.

III. RESULT AND DISCUSSION

A. PLO List View by Curriculum

The dashboard provides a PLO list view as the primary entry point for program coordinators to initiate monitoring activities. To avoid misinterpretation caused by mixed curriculum versions, users first select the study program and the active curriculum. This design decision ensures that every PLO displayed, along with its indicators and related mappings, is evaluated strictly within the same curriculum context.

Each PLO is displayed using a code and a short description, enabling quick scanning. The list-based approach is intentionally kept simple to reduce cognitive load at the first layer; coordinators can immediately identify which PLO needs attention before opening deeper details. In addition, this view supports routine monitoring workflows, such as periodic checks during the semester or before quality assurance meetings, because it provides a stable structure for navigating attainment information.

From a monitoring perspective, this layer answers the question: “Which PLO should be investigated further?” Once a PLO is selected, the dashboard transitions to the next layer that explains where evidence of attainment is expected to originate, namely, supporting courses and their mapped outcomes.

B. Supporting Courses and Contribution Weights

After a PLO is selected, the dashboard expands to show the list of supporting courses that contribute to the selected PLO. Each course is accompanied by a contribution weight, which represents how strongly the course supports the PLO based on the curriculum mapping. This view is crucial because it operationalizes the mapping: rather than being a static document, the relationship between PLO and course becomes visible as a measurable structure used for monitoring.

This layer serves two practical purposes:

1. Validation of mapping logic (curriculum quality control). Coordinators can review whether the distribution of weights is reasonable. For example, if one course dominates the weight excessively, the PLO attainment may become overly dependent on a single course. Conversely, if many courses are mapped with very small weights, the mapping may appear diluted and harder to manage.
2. Early detection of missing evidence or incomplete implementation.

The dashboard helps identify courses that show no attainment evidence (e.g., 0% progress). A 0% indicator may suggest that assessment data are not yet available, the CLO/sub-CLO mapping is incomplete, or grade input has not been finalized. This allows coordinators to focus follow-up actions on specific courses and clarify whether the issue is due to scheduling, assessment input, or mapping configuration.

When the user expands a course row, the system displays mapped CLOs (CPMK) along with their weights and attainment values computed from assessment data. Presenting CLO weights at this stage ensures transparency: the coordinator can see not only “how high the attainment is,” but also “how the course contributes to the PLO through specific CLO structures.” As a result, this layer answers the question: “Which courses (and which CLOs inside them) are responsible for the PLO’s attainment status?”

C. Hierarchical Drill-Down to CLO and Sub CLO

The dashboard supports hierarchical drill-down from PLO → course → CLO → sub-CLO, enabling more granular monitoring that is directly actionable at the course implementation level. This design is important because program-level attainment issues are often rooted in specific learning components: a particular CLO may be underachieved, or certain sub-CLOs may lack adequate assessment coverage.

In the drill-down view, each CLO and sub-CLO is accompanied by a progress/attainment indicator (0–100). The role of this view is to convert a broad attainment concern into a clear diagnostic path. When coordinators observe low attainment at the PLO level, they can immediately trace it to the course(s) and then to CLO/sub-CLO elements that require

improvement.

This layer supports improvement actions that are typical in OBE cycles, such as:

1. Course plan (RPS/Semester Learning Plan) review: adjusting topic sequencing, strengthening prerequisite alignment, or improving learning activities to better support the targeted CLO/sub-CLO.
2. Assessment instrument refinement: improving rubrics, revising question difficulty balance, or ensuring that assessment items truly measure the intended sub-CLO.
3. Alignment checks: ensuring that sub-CLO assessment evidence exists and is correctly linked to the intended outcomes so that calculated attainment is meaningful.

The drill-down capability also strengthens vertical transparency: stakeholders can justify program-level decisions with traceable evidence. This is especially useful in curriculum evaluation meetings and accreditation contexts because the program can demonstrate a coherent chain of evidence from assessment to outcomes. In practical terms, this layer answers: “What exactly inside the course is causing low attainment, and what should be improved?”

D. Radar Chart for Course Contribution Attainment Profile

To complement tabular drill-down views, the dashboard provides a radar chart that summarizes a course’s multi-PLO profile on a 0–100 scale. The motivation for this visualization is operational efficiency: coordinators often need a quick overview of how a course supports multiple PLOs without reading many rows of tables.

The radar chart helps users identify patterns such as:

1. unbalanced contribution/attainment, where a course strongly supports some PLOs but remains weak in others;
2. consistent weaknesses across several PLO dimensions, indicating the need for broader course redesign; or
3. unexpected gaps, where a course is mapped to a PLO but shows low attainment, suggesting either implementation issues or mapping misalignment.

Importantly, the radar chart is designed as a summary tool, not a replacement for detailed evidence. After identifying weak PLO dimensions on the chart, users can immediately use the drill-down feature to trace which CLO/sub-CLO and assessments contribute to that weakness. This combination reduces the risk of subjective interpretation because the visualization is directly linked to detailed attainment evidence. Thus, this layer answers: “How does this course perform across PLOs at a glance, and where should we drill down?”

E. Per-Student PLO Monitoring

In addition to aggregated monitoring, the dashboard includes per-student PLO monitoring to support individual-level evaluation. This feature is useful for early intervention because attainment gaps may appear unevenly across students: some students may consistently underperform in specific PLO dimensions even when the cohort average looks acceptable.



Figure 1 List of PLO

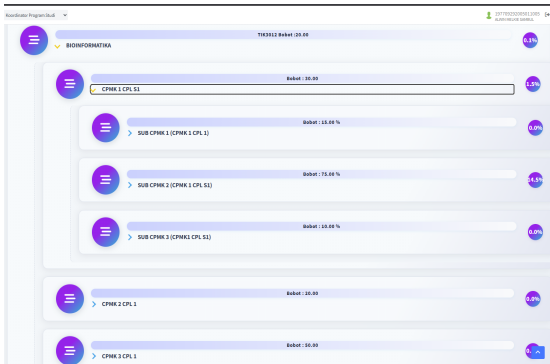


Figure 2. Drill-down view from course to CLO and sub-CLO with attainment indicators.



Figure 3. Radar chart of course attainment profile across PLOs (0–100)

The per-student view enables the study program to:

1. observe distribution and variation of PLO attainment among students,
2. identify students who require targeted academic support (e.g., advising, remedial activities, or learning resource recommendations), and
3. support evidence-based decisions for academic guidance without relying solely on final GPA.

To keep the main monitoring workflow simple, the per-student view is positioned as an optional layer accessed when

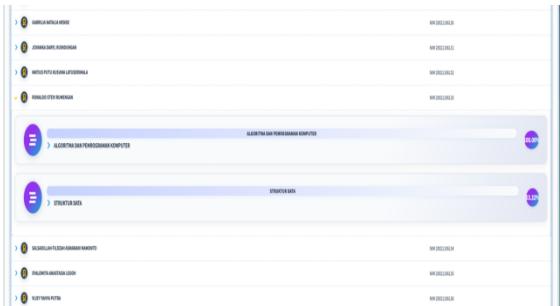


Figure 4. Per-student PLO monitoring view to support early intervention.

Tabel 1. Dashboard Components and Functions

Component	Dashboard Function
PLO List	Displays curriculum-based PLOs as the entry point for attainment exploration
Supporting Courses	Shows each course’s contribution weight to the selected PLO
CLO and Sub CLO	Provides detailed attainment for identifying curriculum/course improvement areas
Radar Chart	Presents a compact contribution/attainment profile of a course across multiple PLOs
Per-Student Monitoring	Shows individual PLO attainment to support academic decision-making

needed, ensuring the primary coordinator workflow remains focused on program-level quality improvement while still allowing deeper analysis for academic support cases. This layer answers: “Which students need intervention, and which PLO dimensions are weak for them?”.

With this design, the dashboard functions not only as a reporting interface but also as an operational analytics tool. The data are designed to be updated in real time because they are sourced from the RPS workflow, assessments, coursework, and grade entry. This supports evidence-based quality assurance and accelerates continuous improvement cycles at both course and program levels.

IV. CONCLUSION

The PLO monitoring dashboard design in the INSPIRE Managerial application provides layered visualization from PLO to course, CLO, and sub-CLO levels, complemented by progress indicators and a 0–100 radar chart. Drill-down capability and per-student monitoring improve real-time transparency for program coordinators and quality assurance teams to identify attainment gaps, review contribution weighting, and formulate data-driven improvement actions. By

integrating with the RPS workflow and grade entry, the dashboard becomes a key component for more accountable OBE implementation.

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