PALens: Action-First Visual Analytics for Faculty Decisions with Limited Student Disclosure

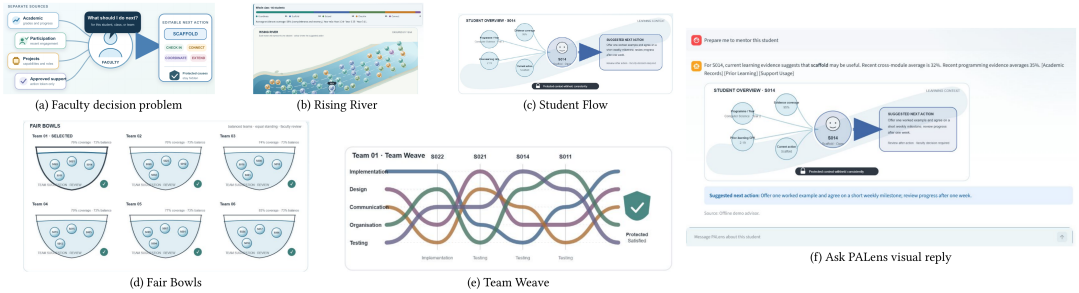
Kan Chen
Singapore Institute of Technology
Singapore
kan.chen@singaporetech.edu.sg

Raymond Chan
Singapore Institute of Technology
Singapore
raymond.chan@singaporetech.edu.sg

Xiaorong Li
Singapore Institute of Technology
Singapore
xiaorong.li@singaporetech.edu.sg

Michael Gastner
Singapore Institute of Technology
Singapore
michael.gastner@singaporetech.edu.sg

Jeannie Lee
Singapore Institute of Technology
Singapore
jeannie@immersification.org



(a) Faculty decision problem (b) Rising River (c) Student Flow (d) Fair Bowls (e) Team Weave (f) Ask PALens visual reply

Figure 1: PALens links class, student, team, and chat views to editable actions while protected causes remain hidden.

Abstract

Faculty must combine fragmented evidence to understand individual students, including students with special educational needs (SEN), interpret class patterns, and form supportive groups. Existing dashboards support awareness but do not necessarily connect these scales to a considerate next action, while confidential causes should remain hidden. We present PALens, a synthetic-data research prototype that combines privacy-conscious visual analytics with faculty chat. Rising River connects class overview, local selection, and student drill-down; Student Flow maps approved evidence to an editable action; Fair Bowls and Team Weave show team balance and complementary capabilities. Chat returns the matching visual and task. A uniform marker shows protected context is hidden, and the model receives approved fields. Walkthroughs with five experienced computer-science faculty indicate perceived usefulness.

CCS Concepts

• **Human-centered computing** → **Information visualization**;
• **Applied computing** → *Interactive learning environments.*

Keywords

learning analytics, information visualization, privacy, human–AI interaction, faculty decision support

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1 Introduction

Faculty decisions span scales. Mentoring, class review, and group formation require evidence from different sources under time and privacy constraints. Dashboards and prose chat can summarize information but leave faculty to reconstruct relationships between the cohort, learner, and group.

Students differ in prior learning, readiness, engagement, confidence, and support needs. Evidence may be scattered across grades, participation, and approved support records. Dashboards can support awareness and sensemaking [Verbert et al. 2014], yet class summaries can hide individual context, while profiles can hide the class pattern. Faculty need to move from class overview to local comparison and student detail. For quiet or struggling students, including students with SEN, this path must support an approved teaching arrangement without exposing diagnoses or counselling narratives. Faculty need useful signals, yet privacy requires trust, transparency, and accountability [Pardo and Siemens 2014].

Group formation adds a third scale. Random or preference-based methods can produce uneven workload and weak peer learning.

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Faculty need to compare capabilities and readiness, understand a team suggestion, and revise it before use. Generic dashboards and prose-only chat do not connect these student, class, and team questions or preserve a clear override path.

We therefore investigate whether one visual and chat workspace can help faculty understand students, interpret a class, and form groups without revealing protected causes. PALens contributes (1) linked views for class and student understanding, (2) team suggestions that faculty can inspect and revise, (3) faculty chat with visual answers, and (4) a visible privacy boundary (Fig. 1). This supports teacher–AI complementarity [Holstein et al. 2019], not automation. We do not claim improved learning.

2 PALens Method

PALens supports class, student, and team work and ends in an editable teaching action. It combines a shared action layer with four linked visual and chat features. Across them, students have equal visual standing, indicators remain transparent, and faculty can revise every suggestion.

Action layer. *Scaffold*, *Check in*, *Connect*, *Coordinate*, and *Extend* (5 verbs), express what faculty might do next rather than label who a student is. Transparent rules calculate priorities from approved evidence. PALens shows the most relevant verb, evidence coverage, and review status; faculty can revise the recommendation. Evidence coverage means source completeness and recency, not failure risk.

Rising River: class overview and drill-down. Rising River adapts "strive for the upper reaches" as a motif of continued learning, not competition or rank. Every learner appears as an equal-size orb, and faculty arrange the class by year, prior-learning GPA, programme, or current action. Position shows only the chosen order. A stable color and label show the suggested action. Drawing around at least five orbs returns local action counts, average evidence coverage, and a lens-relevant class mix while preserving the remaining cohort as context. Separate Explore and Select modes distinguish student drill-down from group analysis, with a keyboard range as an equivalent path.

Student Flow: evidence and privacy. Opening an orb changes scale from cohort to learner. Programme and year, prior GPA, evidence coverage and recency, and current action flow into one student node and an editable teaching action. The same opaque protected-context capsule appears for every learner, so it does not reveal whether hidden context exists. When an approved arrangement needs coordination, PALens asks faculty to verify it through an authorized channel.

Fair Bowls and Team Weave: inspectable grouping. Fair Bowls adapts "hold a bowl of water level" as a motif of even-handed team review. Candidate teams share the same waterline and equal-size, neutral member circles. Team-level capability coverage and balance support comparison without individual deficit labels. Suggestions use project capabilities, current readiness, and approved participation constraints. Selecting a bowl opens Team Weave: capability threads cross member columns to expose complementarity, while thickness summarizes coverage. Safeguards appear only at team level, and faculty retain the final grouping decision.

Ask PALens: scoped visual chat. Ask PALens offers Student, Class, and Teams scopes. Replies name their source, attach the matching Student Flow, Rising River, or Fair Bowls view, and propose an editable next step. Chat is a route to the same approved evidence and visual explanations, not a second decision system.

3 Interaction Workflow

PALens uses four repeated steps: overview, select, explain, and act. The interface shows the current mode, scope, and answer source. From the class overview, faculty can open one learner or select a region for a local summary. Student review moves from approved evidence to explanation and editable action; team review moves from Fair Bowls to Team Weave before revision. Ask PALens follows the same sequence: choose a scope, ask, inspect the visual reply, and edit its proposed task. Back navigation preserves the context.

4 Privacy and System Boundaries

Indicators and team suggestions are calculated locally. The optional local model receives only a fixed, approved student dictionary; it never receives raw rows, protected codes, diagnoses, or counselling narratives. Class and team summaries stay local, and aggregates are hidden below five learners. The same protected context capsule appears for every student, so the interface does not signal whether hidden context exists. Chat replies identify their scope and source. All records remain synthetic. PALens does not diagnose, sanction, grade, refer, or assign final teams.

5 Early Feedback and Conclusion

Five faculty completed synthetic walkthroughs covering class review, student mentoring, team formation, and faculty chat. They taught computer science and averaged about ten years of experience. They responded positively, especially to support for team formation and student understanding. Two comments, lightly edited for clarity, illustrate these themes: "Forming balanced teams is not easy; this system could make the process more manageable," and "Getting to know my students is not always straightforward; this could help me prepare more effectively for teaching." These comments indicate perceived usefulness only; the walkthrough was not designed to test usability, effectiveness, or learning outcomes. A fuller study should compare PALens with dashboard-only and prose-chat baselines, measuring decision time, teaching-action quality, workload, evidence-source understanding, revisions, and whether faculty infer hidden causes. Accessibility testing should cover keyboard selection, color-independent cues, and screen-reader summaries. After governance and bias review, a longer pilot could study how faculty revise suggestions over time. PALens links student, class, team, and chat tasks, but remains an unvalidated design probe rather than evidence of improved teaching or learning.

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