COSC 267 Introduction to Human-Computer Interaction
Midterm Report
AI Personalized Learning Coach

Team Members

Yujin Tang (f007yh4)
Jun Jie Ou Yang (f0080w9)

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Formative Research Summary

To ground our design, we conducted four semi-structured interviews: three undergraduate students (all international) from our lab (creative computing lab), and one from lab 206. Our goal was to understand trust, control, and feedback dynamics in current adaptive learning tools.

Key insights:

- Students appreciate personalization but feel disempowered when systems adapt without transparency. They want *editable learning paths* that respect their goals.
- *Explanations matter most during feedback moments.* Learners tend to ignore pre-task hints but value post-error clarifications that connect system reasoning to their performance.
- Instructors emphasize *traceable evidence* for AI decisions to verify fairness and detect misconceptions early.

These findings shaped our project's two central design dimensions: **(1) co-creation of learning paths** and **(2) explanation timing**, balancing user agency and algorithmic guidance.

Relevant Prior Work and Positioning

Khan Academy Mastery Learning. Adjusts content difficulty algorithmically but offers little user control or explanation. Our work extends this by enabling user edits and transparent justifications for recommendations.

Cognitive Tutor (Koedinger et al., 1997). Delivers fine-grained step feedback but with fixed rules. We adapt this model by testing different timing conditions (pre-, in-, post-activity explanations).

Explainable AI for Education (Holstein et al., 2020). Emphasizes teacher-facing transparency. We integrate learner-facing explainability for increased trust and autonomy.

Our contribution is an **AI learning coach that combines explainability and controllability**, supporting learners as co-designers of their study trajectories while maintaining instructor oversight.

Initial Prototypes and Experiment Design

We designed three prototype variants (currently in Figma and to be tested through Wizard-of-Oz simulation):

1. **Default Path (Baseline):** Auto-generated sequence of topics based on quiz performance, with no user editing or explanation.
2. **Co-Creation Path:** Users can modify difficulty, topic order, or activity context while the system ensures alignment with learning objectives.
3. **Explainable Path:** Same as (2) but adds adaptive explanations delivered before, during, or after learning activities to measure effects of timing.

Experiment Design: A between-subjects study (n 24) will compare the three interface conditions. Each participant will complete a short sequence of tasks, with logging of:

- *Behavioral metrics:* path edits, time-on-task, persistence.
- *Cognitive outcomes:* pre/post learning gain and transfer performance.
- *Affective responses:* perceived trust, fairness, and system clarity (Likert 1–7).

Follow-up interviews will capture user reasoning and perceived transparency.

Research Methods and Timeline (Oct 30–Nov 25, 2025)

Methods:

- Semi-structured interviews and thematic analysis (formative phase)
- Wizard-of-Oz prototyping (design phase)
- Controlled experiment (evaluation phase)
- Mixed-methods analysis: descriptive statistics, effect size comparisons, and qualitative coding

Timeline:

- **Week of Oct 27–Nov 2:** Finalize task templates and data-logging structure; refine interview codes into design principles.
- **Nov 3–9:** Complete Figma prototypes (three interface variants); internal pilot test of timing logic and data recording.
- **Nov 10–16:** Conduct controlled study with 20–24 students; collect behavioral logs and survey responses.
- **Nov 17–23:** Analyze data, compute effect sizes, and synthesize findings into report visuals.
- **Nov 24–25:** Finalize project report and prepare in-class presentation.

Refined Constructs and Key Measures

- **Traceable Evidence:** Data-backed rationale explaining why an activity was recommended, linked to prior performance.
- **Learning Path:** Editable, goal-aligned sequence of activities optimized through learner-system negotiation.
- **Outcome Variables:**
  - *Trust* (Likert scale average)
  - *Persistence rate* (completion ratio)
  - *Learning gain* (post–pre test difference)
  - *Path edits per session* (proxy for agency)

Expected Contribution and Deliverables

Our deliverables by November 25 include:

- Three Figma prototypes (baseline, co-creation, explainable variants)
- Dataset and analysis of the controlled experiment
- Final presentation slides and written report synthesizing findings

By systematically comparing interaction modes, we aim to reveal how explanation timing and co-creation features affect learning trust, transparency, and sustained engagement—contributing design principles for future educational AI systems.