Human-Centered AI for Personalised English Language Learning in Higher Education: A Pedagogical Framework for Student Engagement and Teacher Decision-Making

A conceptual and methodological framework for context-aware, human-centred analytics-to-action

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AI ≠ an automatic decision

More data does not necessarily mean better pedagogical decisions

WHAT WE CAN SEE

LMS logins • deadlines • quiz attempts • material views • interactions

WHAT WE CANNOT KNOW

Is the task clear? Was access available? Was the student offline?

PEDAGOGICAL RISK

Turning measurable activity into a label: “engaged / disengaged”

KEY MESSAGE

An analytical signal is a reason to investigate—not a ready-made conclusion about a student.

From pattern detection to an evidence-informed action

The issue is not only algorithmic accuracy, but also the process of pedagogical decision-making.

RESEARCH QUESTION

How can AI and learning analytics support personalised English language learning while preserving teachers' professional judgement and accounting for contextual uncertainty?

OPERATIONAL RESEARCH GAP

- how to distinguish a signal from a pedagogically meaningful change;
- when an individual baseline is sufficiently reliable;
- how context can lower confidence or pause an intervention;
- how to document a decision and evaluate its consequences.

What does the paper propose?

01 MULTIDIMENSIONALITY

Behavioural, cognitive, emotional and social evidence is analysed separately.

02 CONTEXTUAL FILTER

Uncertainty changes confidence in a signal and may suspend action.

03 DECISION MATRIX

Signal → evidence review → teacher decision → proportionate support → follow-up.

SCOPE OF THE CLAIM

This is a conceptual and methodological framework, not an empirically validated system.

A human-centred cycle: from data to learning support

Each stage leaves room for verification, explanation and human judgement.



FEEDBACK LOOP

Intervention outcomes feed back into the cycle: continue • adapt • discontinue support.

Principle: never move automatically from a “risk score” to an intervention.

Engagement is not a single number

BEHAVIOURAL

Participation • task completion • submission regularity

COGNITIVE

Strategies • reflection • revision quality • use of feedback

EMOTIONAL

Interest • perceived difficulty • confidence • sense of belonging

SOCIAL

Interaction with the teacher • peers • collaborative language practice

Compare learners primarily with their own trajectories

A baseline should be used only when data are sufficient and conditions are comparable.

PROPOSED INITIAL PROTOCOL

≥ 6 valid weekly observations across ≥ 6 instructional weeks

Comparable conditions • check missing data • exclude confirmed disruptions

WHEN DATA ARE INSUFFICIENT

- do not calculate a standardised deviation;
- do not rank or label the student;
- show descriptive data and flag low confidence;
- refer interpretation to the teacher.

Even $|Z| \geq 2$ should be treated only as a possible review trigger in a pilot—not as an automatic basis for intervention.

Context is not a footnote—it is a decision-governance mechanism

Access disruptions change what can reasonably be inferred from digital traces.

NO KNOWN DISRUPTION	The signal may proceed to teacher review.
POSSIBLE DISRUPTION	Lower confidence; check the context.
CONFIRMED DISRUPTION	Suspend negative inference; support access.
DATA QUALITY ERROR	Pause the signal until data quality is restored.

Context flags should be minimal, protected and time-limited—not a permanent “risk profile”.

One signal can have different explanations and lead to different actions

Example: written-task completion has declined, while participation in discussions remains stable.

SIGNAL	CHECK	POSSIBLE RESPONSE	EVALUATE THE EFFECT
Fewer written submissions	Task difficulty, rubric, text quality and access to tools	Text model, staged drafting process, targeted feedback	The next comparable text assessed with the same rubric

The conclusion is not “the student is disengaged”, but “we need to identify appropriate support”.

Support, not surveillance

Human-centred principles must be built into system procedures, not merely stated as aspirations.

1. **DATA MINIMISATION** — Collect only data needed for a defined learning purpose.
2. **TRANSPARENCY** — Explain the evidence underlying a signal.
3. **RIGHT TO CHALLENGE** — Students and teachers can clarify or correct an interpretation.
4. **HUMAN OVERSIGHT** — Teachers may accept, adapt, reject or defer a recommendation.
5. **PROPORTIONALITY** — No automatic sanctions or inferences about sensitive states.

A system should be judged not only by predictive accuracy, but also by fairness, trust and decision quality.

Scientific rigour means being clear about the limits of evidence

What has been developed conceptually—and what still needs empirical testing.

WITHIN THE PAPER

- Synthesis of theory and principles
- Operational decision sequence
- Signal-to-support matrix
- Contextual rules for pausing decisions

FOR FUTURE RESEARCH

- Longitudinal piloting
- Language outcomes and engagement quality
- False positives and false negatives
- Teacher workload, trust and fairness

LIMITATIONS **No individual-level dataset was analysed; the framework does not establish causal effects and is not a validated predictive model.**

THE CENTRAL TAKEAWAY

AI should help teachers see the learning situation more clearly—not make decisions in their place.



Thank you for your attention!