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ERASMUS+ Innovation Alliance «Business Model Innovation with Artificial Intelligence for Urgent Green Agenda»

Innovation in Teaching in the Age of AI

State of the Art, Needs, Gaps and Barriers in University and VET

WP2 – Pillar 3 (Innovative Teaching) | Literature review and empirical findings

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LITERATURE - AI RESHAPING TEACHING

Innovation was already moving from transmission to active learning – AI accelerates it, but the evidence base remains fragile.

95

studies in the PRISMA review of teachers' use of AI (2015–2024)

The teacher's role shifts

From content deliverer to facilitator: AI absorbs grading, drafting and admin, freeing time for mentoring, judgement and ethics.

5

recurring categories of use; conversational AI is by far the most studied

Assessment is a site of transformation

Formative feedback suits GenAI; human oversight stays essential. The literature converges on process-based and authentic assessment.

1,735

students across 17 studies: medium-to-large positive effect of ChatGPT on engagement

Limits of the evidence

Few studies, mostly controlled settings, concentrated in the US and China and in STEM. Reduced human interaction seen in some contexts.

Sources: Tan, Cheng & Ling (2025); Marshall et al. (2024); Ilieva et al. (2025); Întorsureanu et al. (2025); Panadero et al. (2023); Heung & Chiu (2025)

LITERATURE - GAPS AND BARRIERS

Barriers exist at four levels – training alone cannot solve them.

1 Individual

- AI literacy urgent but under-researched
- Cognitive overload and identity threat
- Ethics is the weakest teacher competence

2 Institutional and policy

- Enthusiasm outpaces readiness: slow approval
- Missing or unevenly enforced AI policy
- Dependency on commercial providers

3 Pedagogical and research

- 65% of studies on AI in teaching vs 35% on teacher development
- Evidence often based on perceived usefulness
- Human–AI co-teaching largely unstudied

4 Ethical, equity and epistemic

- Accountability spread across teachers, developers, institutions
- Bias and unequal access may widen inequality
- Over-reliance threatens critical thinking

Sources: Tan et al. (2025); AbdulRab (2023); Marshall et al. (2024); Seufert et al. (2025); Schmidt et al. (2025); UNESCO (2021); Întorsureanu et al. (2025); European Commission (2022)

LITERATURE - UNIVERSITY AND VET

Different contexts, five shared conclusions – VET adds a professional-safety dimension: is the solution safe and appropriate?

1

AI augments, it does not replace

Teachers become facilitators; AI augments human learning and practice.

2

Access is not innovation

Value lies in how a tool or platform is integrated into learning design.

3

Teacher training is the key gap

Only 35% of studies address AI in professional development.

4

Beyond technical skill

Intelligent-TPACK adds ethical knowledge to technology, pedagogy and content.

5

Gains coexist with over-reliance

Engagement gains come with a risk that AI replaces cognitive and professional judgement.

Sources: Marshall et al. (2024); Schmidt et al. (2025); Bauer et al. (2025); Tan, Cheng & Ling (2025); Seufert et al. (2025); Heung & Chiu (2025)

METHODOLOGY - MIXED-METHOD DESIGN

Surveys gave range, interviews gave depth – together they show both the current state of AI use and emerging changes in practice.

329

survey respondents: 286 students, 33 teachers, 10 education support staff and developers

Surveys: breadth

Identify broader patterns, gaps, barriers and opportunities across respondent groups and countries, in university and VET services.

4

semi-structured, in-depth interviews with teachers

Interviews: depth

Explain the survey findings through concrete experiences of teaching, learning, assessment and AI integration.

6

countries: Finland, Sweden, France, Germany, Latvia and Romania

Analysis: gaps, barriers, opportunities

Findings consolidated for each of the three groups – teachers (survey + interviews), students, education support staff – then across groups.

Source: AI4GreenBUS teachers', students' and education support staff surveys and teacher interviews (2026).

RESULTS · THREE VOICES, ONE PATTERN

AI use is outpacing educational transformation – across teachers, students and education support staff.

1

Teachers

33 surveys + 4 interviews

- Heavy use for planning, materials and feedback – yet pedagogy has changed little
- Take-home work can be done with AI; no common replacement for assessment yet
- Opportunity: AI to design better activities and as an object of critical learning

2

Students

286 surveyed

- Faster and easier – but is it deeper? "I'm depending on AI more and more"
- 64.4% say teacher encouragement of AI helped their learning (5.9% negative)
- They ask to be taught how to use AI well

3

Education support staff

10 surveyed

- Teacher readiness ranges from basic to advanced
- Barriers: time, capacity, information overload, uncertainty
- Training impact rarely evaluated – a bridge role between tech, pedagogy and strategy

Source: AI4GreenBUS surveys and teacher interviews (2026). Finland, Sweden, France, Germany, Latvia, Romania.

RESULTS · FOUR INTERCONNECTED GAPS

Surveys and interviews across the three groups point to the same four gaps.

1 Literacy gap

- Teachers and students both use AI
- Critical, ethical, purposeful use is uneven

2 Pedagogy gap

- Useful for efficiency and content production
- Deeper transformation of teaching remains inconsistent

3 Output – learning gap

- AI improves what students produce
- ...without guaranteeing knowledge, reasoning and skills

4 Individual – institutional gap

- Experimentation outpaces policy, training and support
- Assessment models not yet adapted

Source: AI4GreenBUS surveys and teacher interviews (2026).

CONCLUSION AND RECOMMENDATIONS

AI adoption is well under way, but innovation remains uneven – literature and fieldwork point in the same direction.

1

Invest in professional development

Hands-on, peer-based and coaching formats for teachers and trainers, including ethics.

2

Redesign assessment

Process-based, authentic tasks (oral, practical, reflective) that AI cannot easily replicate.

3

Guide rather than restrict

Teach students to use AI to support – not replace – thinking, backed by clear institutional policy.

CORE MESSAGE

From answers to learning

Shift AI from a productivity and answer-generation tool to pedagogically purposeful use that strengthens learning, critical thinking and professional competence.



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