

Toward the Alignment of Understandability, Reasoning, and Explainability in TEL

Sonja Klein & René Röpke | TU Wien, Austria

Problem & Motivation

- Functionalities and decision-making of AI-based Learning Technologies (LT) are often “black-boxed”
- Meaningful LT integration into educational contexts is challenging [1]

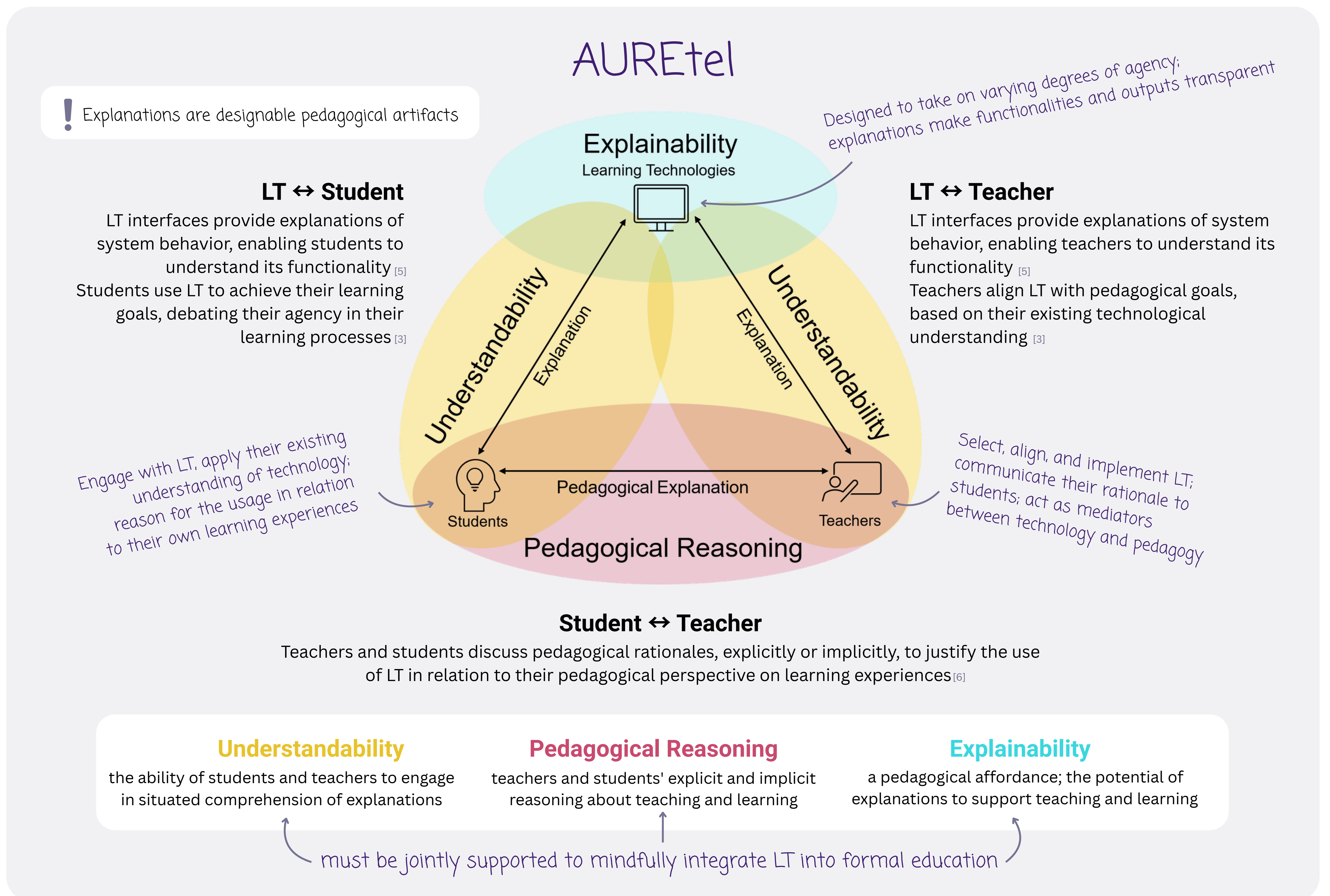
Explainable AI (XAI)

- Goal of making systems' decision-making processes transparent
- Current approaches remain model centric [4]

Technical Transparency
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Educational Understandability

RQ

What explanations do teachers and students, who are directly involved in everyday formal LT-based classroom activities, need to understand in situ?



Preliminary Information Domains

- Technical functioning of AI
- Used data
- Functionalities & capabilities
- Financial aspects
- Pedagogical or instructional principles
- Limitations, uncertainties & errors
- Epistemological modeling of learners
- Ethical, legal & regulatory aspects

Future Research

- Survey on information preferences & self-perceived understandability with teachers
- Iterative design of scenario-based research activity to make pedagogical reasoning explicit
- Participatory design workshops with teachers and students to design explanations

[1] Facchini, A., Termine, A. (2022): Towards a Taxonomy for the Opacity of AI Systems. https://doi.org/10.1007/978-3-031-09153-7_7

[2] Farrow, R. (2023): The possibilities and limits of explicable artificial intelligence (XAI) in education: a socio-technical perspective. <https://doi.org/10.1080/17439884.2023.2185630>

[3] Lachner, A., Backfisch, I., Franke, U. (2024): Towards an Integrated Perspective of Teachers' Technology Integration: A Preliminary Model and Future Research Directions. <https://doi.org/10.14786/ltv.v12i1.1179>

[4] Meylan, R. (2025): Rethinking Explainability in Educational Artificial Intelligence: A Critical Systematic Review of Models, Applications, and Ethical Dimensions. <https://doi.org/10.18623/rvd.v22.n3.3553>

[5] Nieuwint-Gori, J. (2025): Explainable AI in education: A multi-stakeholder approach to transparency and ethical practice. <https://doi.org/10.57568/iulresearch.v6i12.781>

[6] Ojha, V., Watkins, A., Perdriau, C., Isenegger, K., Lewis, C.M. (2024): Instructional Transparency: Just to Be Clear, It's a Good Thing. <https://doi.org/10.1145/3632620.3671091>

[7] Petko, D., Mishra, P., Koehler, M.J. (2025): TPack in context: An updated model. <https://doi.org/10.1016/j.coeo.2025.100244>

