Teaching Together with Virtual Humans: Designing a Human-AI Collaboration Intervention with and for Online Teachers

Lieselot Declercq, Department of Educational Studies, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium & d-teach, Hamoirlaan 12 A05, 1180 Brussels, Belgium, lieselot.declercq@ugent.be*
Melissa Tuytens, Department of Educational Studies, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium, melissa.tuytens@ugent.be
Bram De Wever, Department of Educational Studies, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium, bram.dewever@ugent.be
**Corresponding author*

Abstract
This short paper presents the design phase of an intervention study exploring human-AI collaboration with a virtual human in online teacher education. The study investigates how online K-12 teachers, through collaboration with a virtual human, develop AI literacy, ethical awareness, and pedagogical reflection within their online professional learning environment. The study, to be conducted at an online international school, adopts the ADDIE instructional design model and draws on the European AI Literacy Framework, a framework for teacher professional development, and principles of Networked Learning. The virtual human is a responsive, embodied AI agent powered by generative technology using existing virtual human technology. The virtual human acts as a co-instructor and reflective partner for participating online teachers, supporting them as they explore the educational use of AI and learn to create AI-generated visuals to enhance their online teaching practice. Research objectives include: (1) modelling human-AI collaboration through joint instruction by the researcher and the virtual human to support online teacher professional learning, (2) enhancing AI literacy through experiential learning with AI, and (3) designing an instructional model collaboratively informed by online teacher's real-life practices, integrating a virtual human as pedagogical support. The intervention is currently in the design phase and, developed by the researcher with input from online teachers, using real cases from their daily practice to ensure relevance and authenticity. Grounded in design-based research, it follows the five iterative phases of the ADDIE model: Analyse, Design, Develop, Implement, and Evaluate. The intervention consists of a four-week online module that integrates synchronous and asynchronous components, blending human and AI facilitation to foster creativity, engagement, and ethical awareness. Future phases will empirically examine online teachers' experiences of learning 'with' guidance 'from' a virtual human and evaluate how this human-AI interaction shapes their understanding of AI's pedagogical potential, where online teachers learn about AI while simultaneously learning with AI. Anticipated areas of investigation include transparency, emotional authenticity, and the distribution of pedagogical responsibility in human-AI collaboration. By combining instructional design, AI literacy, and professional learning theory, this work contributes to the development of human-centred, ethically grounded AI applications in online teacher education. It also seeks to advance the dialogue on how virtual humans can enrich networked online professional learning communities and support online teachers in shaping the future of education in the age of AI.

Keywords
Virtual humans, human-AI collaboration, AI literacy, teacher education, professional development, instructional design, online education, networked learning

1. Introduction

Artificial Intelligence (AI) is becoming an increasingly influential factor in education, raising questions about how teachers teach and learn, and how they develop the competences needed to engage responsibly with intelligent technologies (OECD, 2021, 2025; UNESCO, 2024, 2025). The OECD (2021) highlights that technologies such as AI, robotics, and blockchain are transforming how education is delivered and experienced, and it identifies both opportunities and challenges for their use in pedagogical practice, including the involvement of teachers in

Proceedings of the Fifteenth International Conference on Networked Learning 2026,
Edited by: Declercq, L., Loeckx, J., De Laat, M., Dohn, N. B., Ryberg, T.

shaping how these tools are adopted and integrated. UNESCO (2025) emphasises that the integration of AI in education raises complex pedagogical and human-centred questions that demand further exploration. Recent analyses show that people may unintentionally develop emotional attachments to converstational AI chatbots (Williams, 2025). This raises important ethical considerations for the design of more acvanced AI agents, including embodied virtual humans used in educational contexts. Instead of treating AI as a replacement for human teachers, this study explores the potential of AI as a collaborative and reflective partner capable of fostering dialogue, creativity, and metacognition.

Current discussions on teacher professional development related to AI suggest that technical aspects often receive substantial attention, while pedagogical, ethical, and relational dimensions are less consistently addressed (UNESCO, 2024, 2025). This observation invites further reflection on how teachers are supported in developing pedagogically meaningful engagements with AI. To bridge this gap, this study explores how online teachers can learn with a virtual human. The virtual human is an embodied AI agent powered by generative AI. In this study, the virtual human is intentionally and pedagogically designed to support online teachers in exploring, reflecting on, and experimenting with the educational use of AI in their own online teaching practice.

The present study implements the 'teaching together with virtual humans' intervention to design and examine an AI-supported professional learning environment where online teachers engage in authentic, co-created learning activities that integrate virtual humans as pedagogical partners. This intervention aims to explore how human-AI collaboration may contribute to online teachers' professional learning and the development of AI literacy. It aligns with a broader shift in education towards networked learning (de Laat & Dohn, 2019; Networked Learning Editorial Collective, 2021a, 2021b), where professional growth emerges through collaboration, shared reflection, and the interplay between human and technological agency.

Accordingly, this study addresses the following research questions:

1. How can virtual humans be meaningfully integrated as pedagogical partners in online teacher education?
2. In what ways can human-AI collaboration foster online teachers' AI literacy, ethical awareness, and reflective practice?
3. How can co-design approaches support the creation of sustainable, human-centred online professional learning with AI?

2. Research context and design

The study builds on prior research at the online school, where online teachers showed interest in experimenting with AI and raised pedagogical, ethical, and affective considerations that point to a need for targeted professional development (Declercq et al., 2024). To respond to this need, the current intervention follows a design-based research approach, using the ADDIE instructional design model (Molenda, 2003) as an iterative framework for design, implementation, and refinement, applied here in the context of online teacher education.

2.1 Theoretical frameworks

The intervention design integrates three complementary frameworks that together provide a multidimensional foundation for the study, linking pedagogical, professional, and ethical dimensions into an integrated model for AI-enhanced online teacher education. First, the AI Literacy Framework (OECD, 2025) structures the intended learning outcomes of the intervention. It supports participating online teachers in progressing from understanding how AI works to using, evaluating, and responsibly creating with AI in online educational contexts. Second, Merchie et al.'s (2018) evaluative framework for teacher professional development ensures that the intervention aligns with evidence-based principles of effective professional learning, such as coherence, active learning, feedback, and sustained reflection. These principles are embedded throughout the design phases and serve as guiding criteria for iterative refinement and evaluation of the intervention. Finally, Networked Learning theory (de Laat & Dohn, 2019; Networked Learning Editorial Collective, 2021a, 2021b) provides a postdigital lens for understanding human-AI collaboration as a relational process distributed across teachers, learners, and technologies. This perspective situates AI not as a replacement for human educators but as a pedagogical partner within interconnected learning networks. This framing aligns with the study's broader focus on co-learning and co-teaching with virtual humans in online teacher education.

2.2 Co-design process

Central to the study is collaboration with online teachers as co-design partners. Rather than introducing a pre-defined AI module, the researcher designed the overall learning pathway, with support of an instructional design team, while integrating authentic examples and practices collected from online teachers. These real-life teaching cases, such as short lesson segments or feedback activities, serve as contextual anchors for experimentation and shared reflection, ensuring validity and professional ownership.

The co-design process follows five iterative phases of the ADDIE model:

1. Analyse: identify online teachers' needs and readiness for AI integration through baseline surveys and interviews.
2. Design: the researcher develops the overall learning flow integrating the virtual human, informed by authentic teaching cases provided by online teachers.
3. Develop: prototype AI-supported modules and adaptive virtual human interactions.
4. Implement: deliver a four-week online intervention focused on AI literacy, ethics, and creative design.
5. Evaluate: assess changes in AI literacy, pedagogical beliefs, and reflective practice.

3. Intervention design

The 'teaching together with virtual humans' intervention is designed as a single, integrated four-week online module, structured into sequential steps that combine embedded human-AI co-teaching with reflective and practice-oriented learning activities. In this study, the term 'AI co-teaching' is used in a dual sense. First, at the design level, it refers to a modelling approach in which the human instructor (in this case, the researcher) and a virtual human act as co-instructors to design and guide the learning pathway. This setup demonstrates how human-AI collaboration can function in a teaching context. This modelling approach illustrates 'teaching by example', allowing participating online teachers to observe and internalize how human-AI collaboration can be enacted in authentic instructional practice. Second, at the learner level, participating online teachers engage in 'AI co-learning' while following the pathway themselves, collaboratively exploring, reflecting on, and applying AI tools in their own practice. Thus, 'AI co-teaching' serves both as a pedagogical model (teaching with AI) and as a learning process (learning about and through AI). The deliberate use of the term emphasizes teaching as both the focus and the medium of exploration, positioning the virtual human as a pedagogical partner rather than merely a learning aid. Each step aligns with the AI Literacy Framework (OECD, 2025) and with professional development principles of Merchie et al. (2018), including coherence, active learning, feedback, and sustained reflection.

Table 1: Four-week module structure of the 'teaching together with virtual humans intervention'

Week	Focus	Teachers' activities	Evaluation	AI Literacy Framework (OECD, 2025) & PD principles (Merchie et al., 2018)
1. Introduction & Educational Use of Virtual Humans	Exploring use cases and interaction	Reflection on co-teaching, motivation, and ethics	Pre-test and open reflection	*Understand + Coherence*
2. Creating AI Visuals	Designing visuals with AI tools	Practice-based experimentation	Task evaluation and reflection questions	*Use + Active Learning*
3. Ethics & Responsible AI Use	Addressing bias, authorship, and transparency	Group discussions and creation of ethical guidelines	Ethics perception scale and qualitative reflections	*Evaluate + Feedback & Reflection*
4. Apply, Share & Reflect	Integrating AI into own lessons	Peer presentations and feedback on practice	Post-test on AI literacy, attitude, and interviews	*Apply/Reflect + Collaboration & Sustained Duration*

4. Human-AI co-teaching model

The virtual human functions as an embedded pedagogical partner rather than a stand-alone tutor. It complements the online teacher's role across the before, during, and after phases of each week's synchronous online learning component. This structure ensures continuity and reflection throughout the four-week intervention while maintaining a balance between human and AI agency.

In this intervention, the human instructor (the researcher) and the virtual human act as co-instructors, jointly guiding participants through the professional development pathway. Each online teacher individually follows the learning modules at their own pace, while collectively engaging in scheduled webinars and asynchronous peer exchanges. These interactive components, including reflective discussions and the sharing of good practices via f.ex. a collaborative Padlet board, foster a sense of community and social learning among participants. This modeling approach illustrates 'teaching by example', enabling participants to observe and experience how human-AI collaboration can be enacted in authentic teaching practice. The model integrates affective, cognitive, and reflective support aligned with the AI Literacy Framework (OECD, 2025) and Merchie et al. (2018)'s principles for effective professional development, as outlined in Table 1.

Table 2: Human–AI co-teaching model for online teacher education

Phase of online lesson	Role of Virtual Human (AI)	Role of Teacher (Human)
Before	Welcome message, goal-oriented introduction, short quiz or FAQ	Intro video or text, learning objectives, activating question
During	Prompting and motivation, clarification, adaptive support (*co-instructor*)	Live webinar, didactic guidance, interaction and facilitation
After	Summary and recap, reflection prompts, personalized quiz	Reflection assignment, feedback and portfolio follow-up

5. Expected contributions and future work

The intervention aims to contribute to both the research and practice of human-AI collaboration in education. Methodologically, it proposes a co-design framework that positions online teachers as active co-creators of AI-supported online professional learning experiences, rather than passive recipients of pre-designed AI tools. Pedagogically, it advances understanding of how virtual humans can be intentionally designed and embedded as pedagogical partners to foster engagement, reflection, and ethical awareness in online teacher professional development.

As the study is currently in the design phase, this short paper focuses on the conceptual foundations, intervention design, co-design process, and research instruments that underpin the intervention. Empirical data collection will take place in the coming months, focusing on teachers' learning outcomes, attitudes, and perceptions through a combination of pre- and post-measures of AI literacy, reflective artefacts, surveys, and qualitative interviews.

The anticipated findings will inform the iterative refinement of the intervention and contribute to the development of sustainable, human-centred approaches to AI integration in online professional learning. By foregrounding design decisions, pedagogical modelling, and ethical considerations at this stage, the study aligns with design-based research traditions within Networked Learning and contributes to the broader agenda of responsible and socially grounded AI in education.

References

de Laat, M., & Dohn, N.B. (2019) Is networked learning postdigital education?. *Postdigital Science and Education* 1(1), 17-20. https://doi.org/10.1007/s42438-019-00034-1

Declercq, L., De Wever, B., & Tuytens, M. (2024). Perceptions of collaboration between virtual and human teachers in online education. *Proceedings of the International Conference on Networked Learning, 14*(1). https://doi.org/10.54337/nlc.v14i1.8158

Merchie, E., Tuytens, M., Devos, G., & Vanderlinde, R. (2018). Evaluating teachers' professional development initiatives: Towards an extended evaluative framework. *Research Papers in Education, 33*(2), 143-168. https://doi.org/10.1080/02671522.2016.1271003

Molenda, M. (2003). In search of the elusive ADDIE model. *Performance Improvement, 42*(5), 34-37. https://doi.org/10.1002/pfi.4930420508

Networked Learning Editorial Collective. (2021a). Networked learning: Inviting redefinition. *Postdigital Science and Education, 3*(2), 312-325. https://doi.org/10.1007/s42438-020-00167-8

Networked Learning Editorial Collective. (2021b). Networked learning in 2021: A community definition. *Postdigital Science and Education, 3*, 326-369. https://doi.org/10.1007/s42438-021-00222-y

OECD. (2021). *OECD digital education outlook 2021: Pushing the frontiers with artificial intelligence, blockchain and robots*. OECD Publishing. https://doi.org/10.1787/589b283f-en
OECD (2025). *Empowering learners for the age of AI: An AI literacy framework for primary and secondary education* (Review draft). OECD. Paris. https://ailiteracyframework.org
OpenAI. (2025). ChatGPT: A Language Model for Natural Language Processing. https://chat.openai.com/
UNESCO. (2024). *AI competency framework for teachers*. https://unesdoc.unesco.org/ark:/48223/pf0000391104
UNESCO. (2025). *AI and the future of education: Disruptions, dilemmas and directions.* https://unesdoc.unesco.org/ark:/48223/pf0000395236
Williams, R. (2025, September 24). It's surprisingly easy to stumble into a relationship with an AI chatbot. *MIT Technology Review.* https://www.technologyreview.com/2025/09/24/1123915/relationship-ai-without-seeking-it/

Acknowledgements
We thank all participating teachers and the d-teach team for their time and insights, in particular co-founders Annabel Declercq and Koen Verlaeckt. Their insights contributed to the applied context in which this research was conducted. ChatGPT (https://chat.openai.com/) was used by Author 1 to assist in planning this research, reformulate the wording of Author 1's initial ideas, and conducting a spell check and grammar review.

Declaration of Interest statement
Lieselot Declercq is co-founder and director of d-teach online school. No financial compensation or specific funding was received for this research. The authors declare no other conflicts of interest.

Corresponding author
Lieselot Declercq
Department of Educational Studies, Ghent University
Henri Dunantlaan 2, 9000 Ghent, Belgium
lieselot.declercq@ugent.be