



# TEASER

## Teacher as Avatar

Human-centered AI in vocational education and training: Overcoming the "Turing trap" through the use of teaching-learning avatars in VET practice



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# 1. Introduction: The Digital Imperative in Vocational Education and Training (VET)

The European VET landscape is at a critical turning point, characterised by an unprecedented speed of technological innovation. The **digital imperative** describes the strategic need for educational institutions to proactively adapt to the rapid developments in the field of artificial intelligence and digital presence (avatars) in order to ensure the relevance of training for the future labor market. While technological diffusion into industry is usually gradual or abrupt – as recently demonstrated by the massive rise of generative language models – VET institutions are faced with the task of integrating these innovations not only technologically, but primarily **pedagogically**. This is where the TEASER project ("The teacher as an avatar in vocational education and training") comes in to channel the technology-induced pressure for change into structured and learning-oriented training practices.

## 1.1 The rapidly advancing integration of AI and avatars into the industry

In high-tech sectors such as **Chemistry 4.0, mechatronics and information technology**, the integration of AI systems is already a lived reality. Today's artificial intelligence applications process extensive information, generate new content, and support decision-making through predictive analytics in production.

- **Productivity gains:** Studies show that the use of AI tools like ChatGPT can increase productivity among knowledge workers by up to **35%**, while increasing job quality and satisfaction.
- **Technological synergies:** The industry is increasingly using the marriage of AI and immersive technologies (AR/VR), with avatars acting as interactive, three-dimensional embodiments of this intelligence.
- **Digital twins:** In occupational fields such as chemistry training, "digital twins" are used to control complex plants (e.g. LC2030), which requires highly specialized operating skills on the part of the specialists.

## 1.2 Discrepancy between technological progress and pedagogical readiness

Despite the technological dynamics in the economy, there is a significant gap between the potential of the tools and the **practical pedagogical readiness** of the staff in many educational institutions.

- **Lack of preparation: Trainers** and teachers are often inadequately prepared for this abrupt transformation process. In most cases, there is a lack of the necessary digital skills to integrate AI applications into the classroom in a way that is capable of learning.
- **Structural barriers: Surveys** as part of the needs analysis (n=69) showed that although digital strategies exist, practical implementation often remains inconsistent. The main reasons for the lack of qualification are identified across institutions as **a massive lack of time (53%)** and the lack of tailor-made, practical offers.
- **Uncertainty among the staff:** Many teachers are left without proper guidance, which can lead to reservations about a supposed "dehumanization" of education.

## 1.3 Research Objective: Scientific Monitoring of Educational and Ethically Reflected AI Integration

The central goal of the scientific support provided by the TEASER project is the development, testing and evaluation of a **human-centered qualification model** that strengthens the expertise of the staff instead of replacing it.

- **Avoiding the "Turing trap":** A fundamental research leitmotif is the avoidance of the substitution of human interaction. AI and avatars are consistently positioned as **digital assistants** that take on repetitive tasks (e.g., standardized safety briefings) to create space for social interaction and individual support.
- **Ethical guardrails:** The integration must be built on a solid ethical foundation that includes transparency obligations, data protection (GDPR) and the critical examination of AI hallucinations (plausibility checks).
- **Strategic orientation:** The project operationally supports the requirements of the **EU Digital Education Action Plan** (Actions 5, 6 and 8) and promotes the professionalisation of staff along the DigCompEdu framework.

In summary, the research approach aims to turn teachers from passive consumers into **active shapers** of digital transformation and to establish a "Digital Pedagogy" that always links technological innovations to a concrete pedagogical question.

## 2. Theoretical Foundation: Models of Media Integration

### 2.1 The TPACK Model: Synergy of Expertise, Pedagogy and Technology

The **TPACK model** (Technological Pedagogical Content Knowledge) serves as a central orientation framework in the project to precisely redefine the role of teachers in the digital transformation. It describes the necessary interaction of three areas of knowledge:

- **Content Knowledge (CK):** The trainers remain the experts in their respective disciplines such as chemistry, IT or mechatronics. The technology does not relieve them of their technical depth, but requires it as a basis for content validation.
- **Pedagogical Knowledge (PK):** Technology is consistently understood as a means to an end. Every application must be based on a didactic question that is guided by the guiding principle "**If AI is the answer, what was the question?**".
- **Technological Knowledge (TK):** Teachers need specific skills in using **low-threshold tools** to create avatars (e.g., HeyGen, Synthesia) and integrate AI chatbots into learning environments.

The decisive **intersection of these three areas** enables a human-centered "Digital Pedagogy". In this synergy field, AI amplifies human expertise instead of replacing it, which is at the core of the TEASER approach to avoiding the "Turing trap".

### 2.2 The SAMR Model as a Metric for the Degree of Transformation

In order to make the progress of the digital transformation in the VET institutions measurable and evaluable, the **SAMR model** is used. It describes four stages of technology integration, from mere addition to complete redesign of learning processes:

1. **Substitution:** A linear avatar replaces a printed work instruction with a video without any functional change in the learning process.
2. **Augmentation:** The use of **QR codes directly on machines** enables immediate access to avatar safety instructions. The technology improves the effectiveness of information provision at the point of action.
3. **Modification:** Teaching and learning scenarios are designed in such a way that AI is functionally integrated into the task. Examples of this are the analysis of cybersecurity attacks using real-time AI feedback or AI-supported troubleshooting (debugging) during programming, which deepens the learning process in a way that would not be possible without these tools.
4. **Redefinition:** Dynamic avatars enable forms of interaction that were previously technically impossible. In social work, for example, professional feedback discussions with an AI persona can be trained in a protected, virtual space, which opens up completely new didactic possibilities for training social skills.

## 2.3 Classification in European Framework of Reference for Languages: DigCompEdu and UNESCO

To standardise qualification measures, the model integrates two essential international frameworks:

- **DigCompEdu:** The European framework for the digital competence of teachers is specifically expanded in the project to **include AI competences**. This includes, in particular, the reflective selection of digital resources, the design of teaching-learning processes and the active promotion of the AI literacy of trainees. TEASER thus operationally supports Actions 5, 6 and 8 of the **EU Digital Education Action Plan**.
- **UNESCO AI Competency Framework for Teachers:** This global reference tool defines **15 competencies in five dimensions**, including a human-centered mindset, the ethics of AI, and AI pedagogy. Following this framework, the TEASER model divides competence development into three progression stages that build on each other:
  - **Acquire:** Build a solid knowledge base about generative AI and avatar typologies.
  - **Deepening:** Targeted application of the tools to solve pedagogical problems in professional practice.
  - **Create:** Empower teachers as "learning designers" who independently design complex interactive learning content and adaptive environments.

Through this theoretical foundation, the project ensures that teachers are transformed from passive users to **active designers** who confidently use AI systems to increase the quality of education.

## 3. The Paradigm of Human-Centeredness: Avoiding the "Turing Trap"

At the heart of the TEASER qualification model is the fundamental conviction that technological innovations in vocational education and training must not be an end in themselves, but must be consistently designed in a human-centred way. The project pursues a strategic vision that does not regard artificial intelligence (AI) and avatars as isolated tools, but as complementary components of modern "digital pedagogy". A key leitmotif of this scientific support is the conscious examination of the opportunities and risks of automation in order to create sustainable acceptance among teachers and students.

### 3.1 Definition of the Turing trap in the educational context: complementation instead of substitution of human teacher expertise

In the context of vocational education and training, the so-called "**Turing trap**" describes the risk of designing AI systems and avatars in such a way that they try to imitate human interaction or completely replace teaching staff. The TEASER project counters this idea of substitution with a model of **complementation**, in which technological intelligence is used to amplify the specific expertise of human trainers ("Amplify").

- **The teacher as an indispensable expert:** Even in the age of generative AI, the teacher remains the decisive authority, as only he or she has the necessary expertise to precisely formulate didactic questions and verify the quality of AI outputs through plausibility checks.
- **Preservation of didactic sovereignty:** The pedagogical decision-making power over the use, selection and control of technological tools remains with humans at all times; technology functions only as a means to an end.
- **Avoiding imitation attempts:** Instead of feigning human empathy, AI is targeted where its strengths lie in information processing and consistency, while teachers consolidate their role as mentors and role models.

## 3.2 The avatar as a "digital assistant": relieving the burden of repetitive tasks to create pedagogical freedom for social interaction

In order to operationally circumvent the "Turing trap", avatars and AI agents are consistently positioned as **digital assistants** that relieve educational staff of time-consuming routine tasks. This strategic delegation enables a significant increase in efficiency in everyday training.

- **Automation of repetitive instructions:** Avatars take over standardized tasks, such as teaching occupational health and safety instructions to machines (e.g. CNC systems or autoclaves) or explaining complex technological process flows. The use of QR codes directly at the point of action ensures consistent information quality without the teacher having to repeat the same content several times a day.
- **Efficiency in preparation:** The use of intelligent AI assistants to create and evaluate lesson plans massively reduces the time required from about 40 minutes to just 5 to 10 minutes.
- **Creation of pedagogical freedom:** The time gained through automation is used in a targeted manner to **create freedom for social interaction** and the individual support of learners. In particular, trainees with increased support needs or those in difficult learning situations can thus be supervised more intensively by the human teacher.
- **Social and emotional support:** While AI imparts knowledge and automates tasks, the role of the teacher remains indispensable for the social and emotional support of learners, as these dimensions cannot be substituted by avatars.

In summary, the paradigm of human-centeredness transforms the job profile of the teacher from the sole knowledge broker to a **learning companion and coach** who maximizes his pedagogical impact in direct interpersonal work through the use of digital assistants.

## 4. Empirical needs analysis: The "status ante" in Europe

In order to develop a well-founded strategy for the introduction of artificial intelligence and avatars, a comprehensive analysis of the status ante in the partner institutions was carried out in the TEASER project. This investigation served to identify the specific organizational, technical, and pedagogical needs and to ensure that technological adoption is based on real-world requirements. The results form the strategic and pedagogical foundation for the development of the human-centred qualification model and the institution-specific management roadmaps.

### 4.1 Methodology of the transnational investigation

The data collection was carried out between the fourth quarter of 2023 and the first quarter of 2024 in the four partner countries Germany (DE), the Netherlands (NL), Cyprus (CY) and Slovenia (SI). A **mixed-methods approach** was chosen, which interlocks quantitative data from surveys with qualitative findings from in-depth interviews.

- **Quantitative online survey (n=69):** The survey of educational staff was based on a version of the European Commission's **SELFIE tool** adapted for the project. A total of **69 valid questionnaires** from trainers and teachers from the fields of chemistry, mechatronics, IT and social work were evaluated. The focus was on six core areas: management, collaboration, infrastructure, continuing education, pedagogy and the self-assessment of digital skills.
- **Qualitative in-depth interviews:** In parallel, structured interviews were conducted with a total of **eight decision-makers** (managing directors, department heads). A guide with 15–20 questions addressed strategic visions, organizational barriers and ethical guardrails.
- **Validation:** The methodological tools were first developed in English, translated into the local languages, and the results were finally consolidated and validated during a mobility in Slovenia in April 2024.

### 4.2 Key Findings: Strategic Inconsistencies and Infrastructural Hurdles

The analysis paints a clear picture of the current starting point in the European VET landscape, with a great interest in AI contrasted with a significant gap in practical implementation.

- **Strategic inconsistency:** While about **60% of respondents** said that a digital strategy basically exists in their institution, its practical implementation was often perceived as patchy or inconsistent. There is an urgent need for concrete guidelines for the use of AI.
- **The hurdle "time":** A critical result is the discrepancy between management support and real resources. For example, while 100% of teachers in Cyprus received support from management, staff in Germany rated the **time available** to deal with AI negatively on average. Overall, **53% of respondents** cited lack of time as the biggest barrier to innovation.

- **Infrastructure vs. software:** Basic hardware such as tablets and PCs is usually available in sufficient quantities. However, there is often a lack of **specific AI licenses** and an integrated digital learning environment that goes beyond standard applications.
- **Desire for "no-code" solutions:** A core concern of decision-makers and teachers is the development of **low-threshold applications**. In order to ensure acceptance and sustainability, the use of generally available tools that can be operated without programming knowledge is preferred.

### 4.3 Synthesis of the "Educational Questions"

The synthesis of the data forms the bridge to the practical development of the learning scenarios. A central guiding principle of TEASER is that technology must never be used as an end in itself, but as an educational response to an existing challenge. According to the guiding question **"If AI and avatars are the answer, what was the question?"** the identified "Educational Questions" act as a didactic anchor for each scenario.

The study led to the derivation of specific pedagogical questions for the focus professions:

- **Occupational safety (DE/SI):** How can avatars be used to make the teaching of safety instructions on complex machines (e.g. autoclave, CNC) more consistent, attractive and task-related directly at the **"point of action"**?
- **Complexity reduction (CY):** How can interactive AI companions improve the understanding of abstract IT concepts (e.g. cybersecurity threats or Python debugging) and thus increase motivation?
- **Inclusion and Onboarding (NL/SI):** How can AI avatars help overcome language barriers among non-native speakers (NT2 students) or make the onboarding process more efficient for new learners and teachers?

In summary, the empirical analysis shows a **high willingness to transform**, provided that this is supported by structured training programs, clear ethical guidelines and time resources.

## 5. Implementation and Pilot Results: A Cross-State Evaluation

The implementation phase was the culmination of the TEASER project, in which the strategic and didactic framework conditions developed in WP2 were subjected to a practical stress test. By developing and evaluating at least 10 tailor-made teaching and learning scenarios (TEASER challenges), it was possible to show how AI and avatars contribute to solving specific pedagogical problems.

### 5.1 Systematic preparation of the 10 TEASER challenges in chemistry, IT and mechatronics

The scenarios developed were specifically designed to link technological innovations with the requirements of modernised training regulations. Each scenario is based on a specific "educational question" that pedagogically legitimizes the use of technology.

- **Chemistry & Biology Sector (DE):** The focus here was on managing complex process flows and safety instructions. An example is the **three-point calibration scenario on the LC2030**, in which avatars act as "digital twins" to convey highly precise but repetitive measurement processes asynchronously and task-related. Another highlight is the use of QR code-controlled avatars for **safety briefings at autoclaves**, which provide consistent information directly at the point of action.
- **IT & Informatics (CY) sector:** AI solutions were used in this area for content delivery and problem solving. Scenarios such as **Cybersecurity Basics** use avatars to introduce phishing threats, while learners use ChatGPT as an interactive "buddy" to analyze attack reports. In the **Python programming** scenario, AI serves as a "24/7 coding buddy" for debugging, which lowers the frustration threshold and accelerates learning progress.
- **Mechatronics & Workshop Sector (SI):** The focus here was **on increasing workshop safety**. By using eight different avatars for potentially dangerous machines (e.g. CNC systems, welding machines), trainees receive attractive instructions that can be repeated at any time via QR code, which minimizes the risk of accidents and relieves the teaching staff.

Technologically, all scenarios are based on the "**software hopping approach**" established in the project. A "technical chain" is used: technical scripts are linguistically optimized by generative AI (ChatGPT), voiced with high-quality voices (ElevenLabs) and finally converted into lip-synched avatar videos using no-code platforms (HeyGen, Synthesia).

## 5.2 Methodology of two-stage piloting and quality assurance

In order to guarantee a high level of didactic maturity and technical stability, an iterative, two-stage evaluation procedure was implemented.

1. **Phase 1: Initial Piloting (May/June 2025):** The first phase focused on the basic interaction and identification of barriers. Critical feedback on audio quality (robot-like voices) and a lack of navigation instructions led to targeted optimizations for the second run.
2. **Phase 2: Final evaluation (autumn 2025):** The final evaluation was carried out under real conditions with trainers and trainees. The minimum number of cases defined in the project application (at least 2-3 teachers and 10 learners per partner) was consistently achieved and in some cases significantly exceeded (e.g. 150% compliance rate in Cyprus).

The data collection was based on a **mixed-methods approach** that combined structured online questionnaires (based on 5-point Likert scales), analysis of chat transcripts, and observations and portfolio reflections. As a quality benchmark, **a user satisfaction of at least 80%** was set, which was successfully validated in the core areas of practical application.

## 5.3 Aggregated evaluation of the pedagogical impact

The aggregated analysis of the pilot results demonstrates a significant added value of AI and avatar integration for vocational education and training.

- **Massive reduction in planning time:** One of the most impressive results concerns the administrative efficiency of the educational staff. By using specialized AI assistants (e.g., the **Teaser AI Assistant**), the time it takes to create and evaluate pedagogically coherent lesson plans has been reduced from an average of 40 minutes to **5 to 10 minutes**. This gives trainers valuable freedom for individual support of learners.
- **Increased motivation and commitment:** The trainees rated the modern, visual communication through avatars as authentic and motivating. The avatar acts as a helpful "red thread" through the learning process and supports the individual learning rhythm through on-demand availability via QR code. The pilot in Slovenia, for example, documented a **recall rate of safety instructions of 85%**.
- **Subjective increase in competence (DigComp 2.2):** The evaluation shows a significant increase in digital sovereignty. Both teachers and students developed a higher sensitivity for the critical evaluation of AI-generated information (**plausibility checks**) and learned to competently counter AI hallucinations. The educational staff has also acquired the ability to independently design professional learning media by means of "software hopping" without having to rely on external programming capacities.

## 6. Ethical guardrails and the preservation of "human agency"

The implementation of transformative technologies such as generative AI and avatars in educational institutions is not a purely administrative or technical act, but requires a fundamental **ethical foundation**. The TEASER project takes a human-centred approach that ensures that technological innovations are always in line with European values and legal standards. The central goal is to **preserve human agency**, which means that human control over the AI-supported teaching process is maintained at all times and the rights of teachers and learners are protected.

### 6.1 Data protection implications in dealing with generative AI (GDPR/GDPR)

The protection of personal data in accordance with the **General Data Protection Regulation (GDPR)** is a top priority when implementing AI tools. The empirical needs analysis clearly showed that legal uncertainties are one of the main barriers to practical implementation.

- **Principle of data economy:** Trainers and employees must be strictly instructed **not to enter any personal, business-sensitive or confidential information** into public AI applications (such as ChatGPT), as all uploaded documents and scripts become part of a digital footprint.
- **Handling of biometric data:** There is particular sensitivity to the use of facial and voice data when using avatar platforms. The creation of deepfakes or the cloning of real people without their **express, written consent** is a violation of personal rights.
- **Pragmatic solutions of the TEASER model:** In order to minimise legal risks in training practice, the project prefers to rely on **fictional persons and scenarios**. Since there is no connection to real individuals, compliance with the GDPR requirements is significantly facilitated and a safe space for experiments is created.

### 6.2 Development of codes of conduct for teachers and learners

In order to create trust and acceptance, the TEASER strategy model provides for the introduction of binding **codes of conduct**, which are coordinated in the strategy dialogue between management and users.

1. **Code for Educational Staff:** This focuses on the **obligation to be transparent**. Employees are required to disclose the use of AI tools and the prompts used to management and learners. In addition, there is an **obligation to review the content of** all AI-generated technical texts and safety instructions.
2. **Code for trainees:** The focus here is on the **labelling requirement**. Learners must mark AI aids in their work and be able to prove their individual learning progress and personal achievement despite technological support.

3. **Quality assurance through labeling:** To signal that human testing has been carried out, project results can be labeled with labels such as **"AI approved by TEASER team"**, which makes the final human inspection transparent to stakeholders.

## 6.3 Critical Media Literacy: Plausibility Checks and Dealing with AI Hallucinations

An essential part of the "Digital Pedagogy" in the TEASER project is the promotion of **critical media literacy**. Since generative AI systems are prone to so-called **hallucinations** – the generation of factually incorrect but convincing-sounding information – trainers and trainees must develop specific testing skills.

- **The teacher as a guarantor of quality:** Teachers must act as subject experts who check all AI outputs for their scientific accuracy by means of **plausibility checks**. This is particularly important for safety-critical instructions (e.g. in the chemistry laboratory or on CNC machines), as motivation through avatars must never be at the expense of **scientific precision**.
- **Methodology of "checks and balances":** In the learning scenarios (e.g. cybersecurity), learners are explicitly asked to critically question AI-generated information and to independently verify threats. This strengthens the ability to identify "fake news" or biases in digital media.
- **Balance between technology and pedagogy:** The pilot proves that the reflective handling of AI errors can itself be understood as a valuable learning opportunity, provided that the teacher pedagogically controls the process as a **coach and moderator** and sensitizes the students to the limits of technology.

These ethical guardrails ensure that AI integration does not substitute human expertise, but serves as a sound tool for **professionalizing training (avoiding the Turing trap)**.

## 7. Discussion: From Media-Centered to Intelligence-Centered Learning

The results of the TEASER project mark a paradigm shift in digital vocational education and training: the transition from a purely **media-centred view** (the use of hardware and static software) to an **intelligence-centred pedagogy**. While previous innovation projects focused primarily on visual immersion – for example, through digital twins of measuring devices without adaptive intelligence – TEASER integrates generative AI and avatars into the learning process as active, responsive actors. This change requires a profound reflection on the human role in the technological fabric and on the transferability of these approaches to the entire spectrum of vocational education and training.

### 7.1 Reflection on Role Change: The Teacher as Mentor and Curator of Digital Learning Worlds

The piloting of the TEASER scenarios demonstrates a fundamental transformation of the teacher's job profile. The trainer is changing from the "sole knowledge broker" to **a moderator, coach and pedagogical advisor**.

- **Delegation and freedom:** By consistently avoiding the "Turing trap", AI systems and avatars are positioned as digital assistants that take on repetitive tasks – such as standardized safety briefings or walkthroughs of programming concepts. This relieves the administrative burden on the staff and creates valuable time for individual pedagogical support and social interaction.
- **The teacher as a prompt expert:** The teacher remains the decisive authority, as only he or she has the expertise to create didactically valuable "prompts" (instructions) for the AI and to verify their outputs through plausibility checks.
- **Curator and guarantor of quality:** In an intelligence-centered environment, the teacher acts as a curator who pedagogically controls the use of technology and preserves the **human "agency"** in the learning process. It supports learners in critically questioning AI-generated information and checking its reliability.

### 7.2 Scalability of the model: transfer potential to other industries

Although TEASER was primarily piloted in the chemical, IT and mechatronics sectors, the model shows enormous scaling potential for the entire European education area.

- **Social skills and simulations:** The successful implementation of the "Mrs. De Vries" scenario in **social work** demonstrates how dynamic avatar solutions provide a psychologically safe space for training difficult conversational skills without risking real negative consequences for clients.
- **Business and HR:** There is a high transfer potential for **sales training** (avatars as difficult customers) as well as for the simulation of **job interviews** in order to practice negotiation and communication skills in a realistic way.

- **Low-threshold adaptation: Thanks to the "software hopping approach" established in the project**, these simulations can be transferred to other departments without in-depth programming knowledge (no-code). The provision of all results as Open Educational Resources (OER) enables educational institutions throughout Europe to use the didactic blueprints for their own contexts.

### 7.3 Classification in the Technology Life Cycle: The Transition to the "Slope of Enlightenment"

Strategically, the consortium ranks the use of AI and avatars in education on the **Gartner Hype Cycle**.

- **From hype to reality:** After the "Peak of Inflated Expectations" in 2022/23 and a phase of disillusionment, the TEASER approach aims to transition to the **"Slope of Enlightenment"**.
- **Focus on realism:** The project avoids unrealistic trends and instead focuses on achievable, value-added applications such as adaptive learning paths, automated feedback, and efficient lesson planning.
- **The Plateau of Productivity:** In the long term, TEASER serves as an important step towards reaching the "Plateau of Productivity", where these technologies are seamlessly and calmly integrated into hybrid learning environments. The project not only provides the tools for this, but also the necessary "instructions for use" and the strategic framework for sustainable continuity.

In summary, the discussion shows that TEASER has established a **robust "Digital Pedagogy"** for the future, which consistently puts technological progress at the service of human competence development.

## 8. Conclusion and outlook

The TEASER project has successfully shown that the integration of artificial intelligence (AI) and avatars goes far beyond pure technological "hype" and makes a substantial contribution to **the modernisation of European vocational education** and training (VET). By consistently focusing on the principle of "**pedagogy before technology**", a model was created that does not replace teachers, but specifically strengthens their pedagogical expertise through digital assistants. The scientific monitoring shows that the transition from purely media-centred to **intelligence-centred didactics** increases the attractiveness and effectiveness of training in the long term.

### 8.1 Summary of the evidence for the effectiveness of the TEASER approach

The effectiveness of the TEASER model can be underpinned by the aggregated data from the cross-country piloting as well as by the qualitative milestones achieved:

- **High user acceptance and stability:** The developed scenarios were rated as excellent by the participants with an average rating of **4.65 out of 5 points** for user-friendliness. In the IT scenarios, an error rate of zero percent was recorded in the technical implementation.
- **Significant efficiency gain:** By using specialized AI assistants (e.g., the Teaser AI Assistant), the time needed to create and evaluate pedagogically coherent lesson plans has been massively reduced **from an average of 40 minutes to just 5 to 10 minutes**. This confirms the potential of AI to drastically reduce administrative burdens for teachers.
- **Increased learning success:** The use of avatars to teach safety instructions in workshops led to a remarkable **recall rate of 85%** among learners. The trainees particularly appreciated the clear communication of complex process flows and the possibility of being able to call up instructions at the "point of action" at any time as needed.
- **Increased competence after DigCompEdu:** The educational staff demonstrably acquired the ability to independently design professional learning media by means of **"software hopping"** and to critically evaluate AI-supported specialist information. This has created a critical mass of multipliers who will sustainably drive forward the **human-centered use of AI** in their institutions.
- **Avoiding the Turing trap:** The evaluation of the final conference confirmed the consensus that **human expertise** remains the decisive authority, while AI avatars act as tireless assistants for repetitive tasks and thus create space for social interaction.

## 8.2 Future Research Lines: Adaptive Learning Companions and Hybrid Learning Environments

The outlook illustrates a shift from static, purely media-centric solutions to dynamic, **intelligence-centric applications**. The TEASER project marks the transition to the " Slope of Enlightenment" on the Gartner Hype Cycle.

- **Adaptive learning companions:** Future research should focus more on the development of AI agents that provide **adaptive feedback** in real time. The aim is to create personalized learning paths that automatically adapt to the individual prior knowledge and learning pace of the trainees.
- **Hybrid learning environments:** There is great potential in the closer integration of the digital and physical worlds. Future projects could integrate avatars as life-size digital twins directly into real-world lab environments using **AR/XR technologies** to enable even more immersive and interactive education.
- **Generative 3D worlds:** Technological leaps, such as the creation of entire **generative 3D environments**, must continuously be incorporated into institutional roadmaps to keep pace with the rapid development in the AI sector.
- **Scaling and cross-industry transfer:** The identified transfer potential of dynamic avatars to areas such as **sales training or crisis intervention** in social work offers room for far-reaching follow-up research to simulate complex human interactions in protected virtual spaces.

In summary, TEASER provides not only technological tools, but also a **didactic blueprint** that ensures that the digital transformation in vocational education and training is consistently at the service of human competence development. The provision of all results as **Open Educational Resources (OER)** forms the permanent foundation for European knowledge transfer.