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Higher Education Teacher Trainer's Guide on the Implementation of Training on Transformative Digital Pedagogies

Authors: Elis Kakoulli Constantinou, Nicoletta Pantela, Maria Christoforou, Stavroulla Hadjiconstantinou, Maria Victoria Soule, Olga Vindaca, Patrick Flynn

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List of Acronyms and Abbreviations

AR: Augmented Reality

COIL: Collaborative Online International Learning

CPD: Continuing or Continuous Professional Development

HiVR: High-Immersion Virtual Reality

LiVR: Low-Immersion Virtual Reality

MR: Mixed Reality

PBL: Problem-Based Learning

PjBL: Project-Based Learning

SHiVR: Student-centred High-Immersion Virtual Reality

TDPs: Transformative Digital Pedagogies

VR: Virtual Reality

XR: Extended Reality

Summary

The *Higher Education Teacher Trainer's Guide on the Implementation of Training on Transformative Digital Pedagogies* was produced as part of the Erasmus+ project **Transformative Digital Pedagogies for Higher Education (TDP4HE)** (Project Reference: 2022-1-LV01-KA220-HED-000085277- P4). The guide contains practical instructions along with theoretical background for implementing training on transformative digital pedagogies for academic teaching staff. It promotes a move away from traditional didactic teaching methods toward transformative digital pedagogies (TDPs), emphasising active, student-centered learning that strategically integrates emerging technologies to enhance engagement, co-creation of knowledge, and authentic learning experiences. In essence, the guide empowers trainers to deliver a high-quality professional development programme that ensures academic staff are prepared to meet the challenges and opportunities of the digital higher education landscape.

1. Introduction

During the last years, education is experiencing the need for a shift towards initiatives that prepare higher education educators for the adoption of more learner-centred pedagogical approaches through the integration of new and emerging technologies. Policy frameworks such as The European Digital Education Action Plan 2021-2027 (European Commission, 2022), and the European Digital Competence Framework for Educators (European Commission, 2025) promote teacher training and upskilling to foster digital pedagogies and practices. They emphasise the need for highly structured and targeted training programmes, as well as support provided to educators in this era of swift social and technological developments.

The COVID -19 pandemic demonstrated that many higher education institutions and their faculty were unprepared for a transition to digital teaching and learning environments. The challenges faced by higher education during that period proved that there was a critical need for structured, strategic guidance to move beyond "emergency remote teaching" to high-quality, sustainable digital education.

This trainer's guide aspires to contribute to the effort of bridging this gap by serving as a tool that supports trainers and educators in the provision of effective training on Transformative Digital Pedagogies (TDPs) across the European Union and beyond.

1.1 Purpose of the guide

This guide provides a comprehensive framework for integrating TDPs into teaching and learning, introducing key concepts, innovative teaching methodologies, and practical strategies for fostering learner-centred, technology-enhanced, and future-ready education.

The primary purpose is to support trainers in:

- Understanding the principles and impact of TDPs in higher education.
- Designing, delivering, and evaluating training programmes that empower educators to adopt transformative teaching practices.
- Utilising digital tools to enhance active learning, inclusivity, and professional growth.

1.2 Target audience for the guide

This guide is intended for teacher trainers and facilitators in higher education contexts who will be delivering training programmes addressed to academic teaching staff. It provides them with the structure, content, and methodologies necessary to implement teacher training programmes in higher education to prepare academic staff for the design and delivery of more engaging, student-centred, and digitally

enriched learning experiences. The guide can serve as a useful tool for university departments and centers responsible for the professional development of their teaching faculty. It supports teacher trainers and educators across disciplines**,** whether they are part of the TDP4HE consortium or from other institutions within or beyond the EUt+ alliance.

Furthermore, the guide can also be a valuable resource for researchers, educational developers, and administrators involved in enhancing teaching and learning through innovation. Additionally, it may be of interest to professional associations and networks focused on pedagogy and didactics in higher education, offering insights and practical guidance to inform broader institutional and policy-level discussions on transformative digital education.

1.3 How to use this guide

The guide is structured to provide insights into both conceptual foundations and practical applications of innovative and transformative teaching and learning practices.

Section 1 – Introduction to the Guide

The first section provides an overview of the Guide, including its purpose, target audience, and how to use it.

Section 2 – Transformative Digital Pedagogies and Teaching Methodologies

The second section introduces core pedagogical concepts, frameworks, and methodologies that redefine teaching and learning in digital contexts.

Section 3 – Designing and Delivering a Training Programme on Transformative Digital Pedagogies

The third section offers step-by-step guidance for developing, implementing, and assessing effective training programmes for educators.

Section 4 – The TDP4HE Training Programme

The fourth section presents a ready-to-use training model that can be adapted to different institutional contexts.

Users of the Guide are encouraged to read sequentially for a full understanding or consult specific sections as a reference during programme development and implementation.

2. Transformative Digital Pedagogies and Teaching Methodologies

This section discusses the need for a paradigm shift in teaching and learning in higher education and introduces the concept of TDPs, explaining why they are central to the evolution of teaching and learning in higher education. It also explores learner-centred approaches and innovative teaching methodologies, which enable educators to design experiences that are authentic, collaborative, and adaptable to diverse student needs.

2.1 The Need for a Paradigm Shift in Teaching and Learning in Higher Education

The landscape of higher education is undergoing significant transformation, driven by societal, technological and economic changes. Traditional approaches, centered primarily on the transmission of knowledge from educator to student, are increasingly insufficient. As highlighted in strategic analyses from Latvia and other European countries such as Lithuania, Estonia, Ireland, etc., the future of higher education requires a paradigm shift that emphasises learner-centered education, active engagement, research-informed practices, and the integration of digital technologies (Vindača, 2023). This shift is essential not only for fostering scientific excellence and innovation but also for preparing students to navigate complex, rapidly changing environments with critical thinking, adaptability, and problem-solving skills.

A central aspect of this paradigm shift is the transformation of the role of academic staff. In contemporary higher education, educators are expected to move beyond knowledge delivery and guide students in generating, applying, and critically evaluating knowledge. Pedagogical competence now encompasses mastery of subject content, the ability to design and implement interactive learning experiences, reflective practice, and digital literacy. According to Vindača (2023), comparative analyses of different countries provide examples of how this shift is being conceptualized and implemented:

- **Latvia:** Emphasises the integration of scientific qualification, pedagogical qualification, and organisational competence, with pedagogical competence focused on supervising students, designing study processes, and continuous professional development in transformative digital contexts.

- **Lithuania:** Highlights personal competence, discipline-related competence, and didactical competence. Focuses on clearly defined learning goals, research-based content, ICT integration, collaborative learning, and

continuous feedback for improvement.

- **Estonia:** Combines research and teaching competence with educational technology and English proficiency. Uses an academic evaluation matrix to ensure quality teaching and research performance, promoting continuous development.

- **Ireland:** Prioritises personal development, professional identity, communication, disciplinary knowledge, and digital capacity. Frameworks are reflective and evidence-based, supporting lifelong learning and professional growth.

- **United Kingdom:** Focuses on core knowledge, areas of activity, and professional values. Encourages excellence in teaching, engagement, guidance, and continuous professional development within a globally competitive higher education landscape.

- **Denmark:** Promotes knowledge of teaching, reflection, responsibility, peer supervision, and pedagogical development projects. Problem-based learning and collaborative environments are emphasized, supporting continuous improvement and innovation.

- **Canada (as an international perspective):** Highlights fundamentals of learning, engaging students, and assessing learning outcomes. Emphasises active learning, critical thinking, high-impact practices, and integrity in assessment, though does not fully cover organizational or digital competence as in European models.

Finally, the paradigm shift in teaching and learning is tightly linked to digital transformation and lifelong learning. Higher education institutions must integrate digital tools to enhance learning experiences, facilitate collaboration, and ensure accessibility. At the same time, promoting lifelong learning ensures that academic staff remain agile, competent, and capable of adapting to new technologies, pedagogical innovations, and societal needs. By embracing this comprehensive paradigm shift, higher education can cultivate a generation of learners and educators capable of contributing meaningfully to a digitally empowered and knowledge-driven society.

2.2 Understanding Transformative Digital Pedagogies

2.2.1 What are Transformative Digital Pedagogies?

TDPs represent a paradigm shift in higher education from traditional, transmission-based models of teaching to approaches that are interactive, learner-centred, and digitally enhanced (Bitar & Davidovich, 2024).

Transdisciplinary learning, defined as mutual and transformative, emphasises problem-solving, transcendence, and transgression. Its learner-centred, problem-focused approach enhances outcomes, motivation, versatile skills, and practical knowledge application. By actively engaging with complex problems, learners develop deeper cognitive engagement and transferable abilities (Lavrinoviča, 2021).

Three key characteristics are identified (Lavrinoviča, 2021, p. 95):

1. **Transcendence** – integrating knowledge from multiple disciplines to form a holistic understanding.
2. **Problem-solving** – applying transdisciplinary approaches to real-world challenges, fostering essential skills and competences.
3. **Transgression** – engaging diverse stakeholders in co-design, co-production, and co-dissemination to achieve socially robust outcomes and shared ownership.

2.2.2 Teaching methodologies and practices

This section highlights a range of proven teaching methodologies that place emphasis on active engagement, collaboration, and learner autonomy. These teaching methodologies and practices are based on Social Constructivist (Vygotsky 1978) theories of learning, according to which learning is achieved through social interaction, collaboration and engagement in problem-solving situations. Another influential theory of learning nowadays, which has had an impact on TDPs, is Connectivism (Siemens, 2005), which emphasises the use of technology in the learning process and networking.

Some of the most influential active learning approaches are the following:

- **Learner-centred approaches**

Learner-centred pedagogy shifts the spotlight from the teacher to the learner. Instead of passively receiving information, students actively shape the learning process. International bodies such as UNESCO often highlight this as a benchmark for effective education.

Bremner (2021) points out that while phrases such as *"putting the learner first"* are appealing, they don't fully capture the depth of learner-centred education (LCE). He proposes a flexible framework that allows educators, researchers, and policymakers to select and define the aspects most relevant to their own context.

Key elements of LCE (based on Bremner, 2021):

- **Active participation:** Students learn by doing (e.g., project- or problem-based tasks).
- **Interaction:** Pair and group activities foster peer learning and teamwork.
- **Real-world relevance:** Skills and knowledge directly linked to life outside the classroom.
- **Higher-order thinking:** Encouraging creativity, problem-solving, and critical analysis.
- **Responsiveness to needs:** Lessons adapted to prior knowledge, interests, and learning styles.
- **Shared decision-making:** Learners contribute to choices about content, methods, and assessment.
- **Autonomy:** Opportunities for independent study and responsibility for learning.
- **Metacognition:** Students reflect on how they learn, not just what they learn.
- **Formative assessment:** Ongoing feedback and peer/self-assessment alongside grades.
- **Holistic focus:** Addressing not only intellectual but also emotional and social needs.

❖ Inquiry-Based approaches

Inquiry-based teaching engages learners in tackling open-ended problems that have multiple solutions. Different forms of inquiry exist: problem-based learning (PBL), case-based learning (CBL), or lectures that precede guided problem-solving (Tawfik et al., 2020).

Across these variations, students are encouraged to:

- Identify variables and issues within complex situations.
- Develop and test hypotheses.
- Propose and evaluate possible solutions.

This model nurtures critical thinking, adaptability, and resilience in approaching ill-structured problems.

❖ Problem-Based Learning (PBL)

Originally developed at McMaster University in the 1960s for medical education, PBL immerses students in solving real-world problems. It blends active, collaborative, and self-directed learning. Problems are usually presented as open-ended cases, requiring research, teamwork, and critical discussion (Abdullah et al., 2019).

Example: Industry 4.0 Courses (Salvador et al., 2023)

- **Context:** Undergraduate and postgraduate engineering students in Brazil collaborated with four companies.
- **Implementation:**
  - Students worked in mixed-level teams on industry-defined challenges.
  - Weekly lectures by international experts complemented project work.
  - Company visits, data collection, and team meetings supported the process.
  - Assessment included industry partner feedback and 360° peer evaluation.
- **Outcome:** Students created solutions such as a mobile app to digitalize plant maintenance processes, gaining technical, teamwork, and problem-solving skills.

❖ Project-Based Learning (PjBL)

PjBL involves students working on extended projects that combine subject knowledge with collaboration and practical problem-solving (Guo et al., 2020; Tsybulsky & Muchnik-Rozanov, 2019). Projects typically lead to a final product that is shared with an audience.

The PjBL model (Jalinus et al., 2017):

1. Skills briefing
2. Project work (planning, development, collaboration)
3. Evaluation and reflection

Example: Shared Garden Virtual Exchange (Fernández-Raga & Villard, 2020)

- **Participants:** Physics and engineering students from Bordeaux (France) and León (Spain).
- **Project:** Design and build a sustainable ecological garden at the University of Bordeaux.
- **Implementation:**
  - Students collaborated internationally using digital tools (Zoom, Google Docs, Trello, etc.).
  - French students developed the garden on site, while Spanish peers created irrigation system models.
  - Ongoing online exchanges allowed for shared decision-making and design improvements.
- **Skills developed:** English communication, teamwork, ecological awareness, and technical problem-solving.

❖ Case-Based Learning (CBL)

CBL uses real or simulated cases to place students in authentic problem-solving scenarios. It combines features of PBL and inquiry learning, emphasizing contextual understanding and reflective practice (Gholami et al., 2021).

Example: Medical Education with 3D Models (Yan et al., 2023)

- **Context:** Fourth-year medical students studied a real case of bronchial lung cancer.
- **Implementation:**
  - Pre-class: Students examined 3D-printed lung models, videos, and guidelines, followed by a quiz.
  - In-class: Teachers presented the case, facilitated bedside checks, and guided group discussions.

  - Post-class: Students completed another quiz, a survey, and an exam two weeks later.
- **Tools:** 3D printing, video lectures, reference guidelines, online quizzes, and surveys.
- **Impact:** Students demonstrated stronger clinical reasoning and engagement through hands-on and case-driven practice.

❖ Social-Collaborative Learning

Collaborative learning emphasizes collective knowledge building, while cooperative learning is more structured with assigned roles (Oxford, 1997). Social-collaborative learning aligns with Vygotsky's constructivist theory, where knowledge emerges through interaction, peer feedback, and community participation (Bruffee, 1999; Vygotsky, 1978).

With the rise of social technologies, collaboration now extends into digital spaces such as wikis, blogs, social networks, and file-sharing platforms (Parmaxi & Zaphiris, 2015).

Example: Collaborative E-Portfolios in Computer Engineering (Zhang & Tur, 2023; Mora et al., 2020)

- **Participants:** 78 students in computer science and engineering.
- **Implementation:**
  - Students created e-portfolios to document learning progress, share work, and review peers' projects.
  - Faculty acted as facilitators, ensuring constructive peer feedback and reflection.
  - Collaboration tools (Google Sites, WordPress, Weebly, Mahara) supported portfolio design.
- **Impact:** Students enhanced teamwork, digital literacy, motivation, and readiness for professional practice.

3. Designing and Delivering a Training Programme on Transformative Digital Pedagogies

This section provides a comprehensive roadmap for designing and delivering an effective training programme focused on TDPs in higher education. It guides teacher trainers through the key steps involved in developing and implementing a training initiative that is context-sensitive, pedagogically grounded, and responsive to the evolving digital landscape of higher education.

Beginning with a needs assessment and contextualization, the section explores how to identify specific faculty needs and tailor content to institutional settings and disciplinary demands. It then outlines how to formulate clear learning outcomes and select appropriate assessment processes to evaluate both participation and programme impact. Attention is also given to the design of the learning experience itself, covering effective methodologies, module sequencing, and flexible delivery modes (synchronous, asynchronous, or blended). Further subsections guide trainers in identifying suitable digital tools, developing engaging materials, and building communities of practice that support sustained professional learning. Finally, the section addresses the technical requirements and support that are necessary to ensure the smooth delivery of the training programme.

The design and delivery of a training programme on TDPs is guided by the principles of the **Backward Design Model in Curriculum Development** (Wiggins & McTighe, 1998). This approach begins with 1) a clear articulation of the desired learning outcomes regarding what participants should know, be able to do, and value upon completion of the programme. Once these outcomes are defined, 2) identification of appropriate methods of assessment to provide evidence of achievement, and finally, 3) planning of learning experiences and instruction.

The three stages need to be aligned, in other words, they must consistently point back to one another. The goals dictate the assessments, and both the goals and assessments dictate the learning activities. This ensures the curriculum is cohesive, clear, and focused on student understanding and development rather than just "covering" content.

3.1 Needs Assessment and Contextualization

3.1.1 Identifying Specific Needs of Higher Education Faculty

An effective training on TDPs must begin with a clear understanding of the diverse needs of higher education faculty. This involves conducting a thorough needs assessment through surveys, interviews, focus groups, or institutional data to identify existing levels of digital competence, pedagogical challenges, disciplinary expectations, and institutional goals. Faculty may have varying levels of familiarity with digital tools (such as Virtual Reality) and different perceptions of pedagogical innovation. This step ensures that the training programme is relevant, targeted, and responsive to the real conditions faculty face in their teaching practice at the current time.

3.1.2 Adapting Content to Institutional Context and Discipline

Once faculty needs are identified, the content and structure of the training programme must be adapted to reflect the specific institutional context and disciplinary realities. Digital pedagogy is not a one-size-fits-all approach. Disciplines such as the sciences, arts, humanities, or professional fields may require different strategies, tools, and examples. Additionally, institutional culture, infrastructure, policies, and strategic priorities will shape how digital transformation can be implemented. By aligning the training content with both the institutional environment and disciplinary norms, trainers can ensure greater relevance and sustainability of the pedagogical innovations introduced.

3.2 Developing Learning Outcomes for the Training

An effective training programme on TDPs must have clear and quantifiable learning outcomes as they establish a common understanding of what participants should accomplish and act as a roadmap for content creation, teaching methodology selection, and assessment strategy alignment.

By embedding the following principles, trainers can ensure that the programme is both pedagogically sound and aligned with broader institutional and policy expectations.

Principles to follow

- **Constructive alignment** involves defining objectives first, then matching assessments, activities, and content to those objectives (Standards and Guidelines for Quality Assurance in the European Higher Education Area- ESG).
- **European level descriptors** entail the use of the EQF levels and the QF-EHEA/Dublin Descriptors (knowledge/understanding; applying; judgement;

communication; learning skills) to calibrate the ambition of your results at the European level.

- The DigCompEdu **competency** framework comprises professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competency.
- **Recognition and micro-credentials** ensure that the training's outcomes are clear, measurable, and stackable if it is being offered as a micro-credential.

A 4-step workflow

Step 1 - Identify needs and level	Use institutional strategy and participant profiling to decide the scope.
Step 2 - Select what learners should know	Choose the most important things a student should know (cognitive), be able to do (skills), or value (affective) after completing the course/programme
Step 3 - Consult a list of action verbs	Bloom's Taxonomy provides verbs that result in overt behaviour or products that can be observed and measured. *Avoid verbs that are unclear and cannot be observed and measured easily, for example: appreciate, become aware of, become familiar with, know, learn, and understand.
Step 4 - Draft outcomes with action verbs	Draft a list of possible learning outcomes considering what is possible for learners to accomplish in the course. *Use the acronym *SMART* to determine Specific, Measurable, Aligned, Realistic, and Timebound learning outcomes. For example, by the conclusion of the course, participants will collaborate in interdisciplinary teams to co-create a model TDP learning module, presenting it in a digital showcase to demonstrate applied knowledge and peer learning. *(Specific, Measurable, Achievable, Relevant, Time-Bound)*

Source: Adapted from Cornell University, Centre for Teaching Innovation (Cornell University, Center for Teaching Innovation, n.d.).

3.3 Deciding on Assessment Processes

3.3.1 Monitoring and Evaluation of the Training Programme

Effective monitoring and evaluation (M&E) ensure that the training programme on TDPs achieves its intended learning outcomes and provides evidence of impact on teaching practice (Figure 1).

Through evaluation of participants' compliance with the programme's established learning objectives, M&E enables trainers to **monitor progress**. Second, it supports the **impact measurement** by examining how the training enhances pedagogical practices, increases educators' digital competency, and ultimately improves student learning experiences. Thirdly, it provides a foundation for **improvement** by identifying areas of strength, weakness, and potential for enhanced future training initiative design, content, and delivery. Lastly, systematic M&E provides **proof of recognition**, strengthening the requirements for accreditation, institutional quality assurance procedures, and the granting of micro-credentials or other official recognitions of professional growth (Garone et al., 2022).

Key Components of M&E

Baseline Assessment

Use self-assessment tools (e.g., DigCompEdu check-in) or diagnostic activities to establish participants' existing digital and pedagogical competencies.

Ongoing Monitoring

Use formative assessments (e.g., reflective journals, lesson prototypes, peer reviews) to monitor progress and provide timely feedback.

Summative Evaluation

Assess overall achievement of learning outcomes at the end of the programme through performance tasks, portfolios, or digital showcases.

Impact Evaluation

Collect post-training evidence on how participants integrate TDP practices into their professional contexts (e.g., teaching observations, follow-up surveys).

Participants and Stakeholders' Feedback

Gather input from participants, trainers, and institutional leaders to evaluate programme relevance and sustainability.

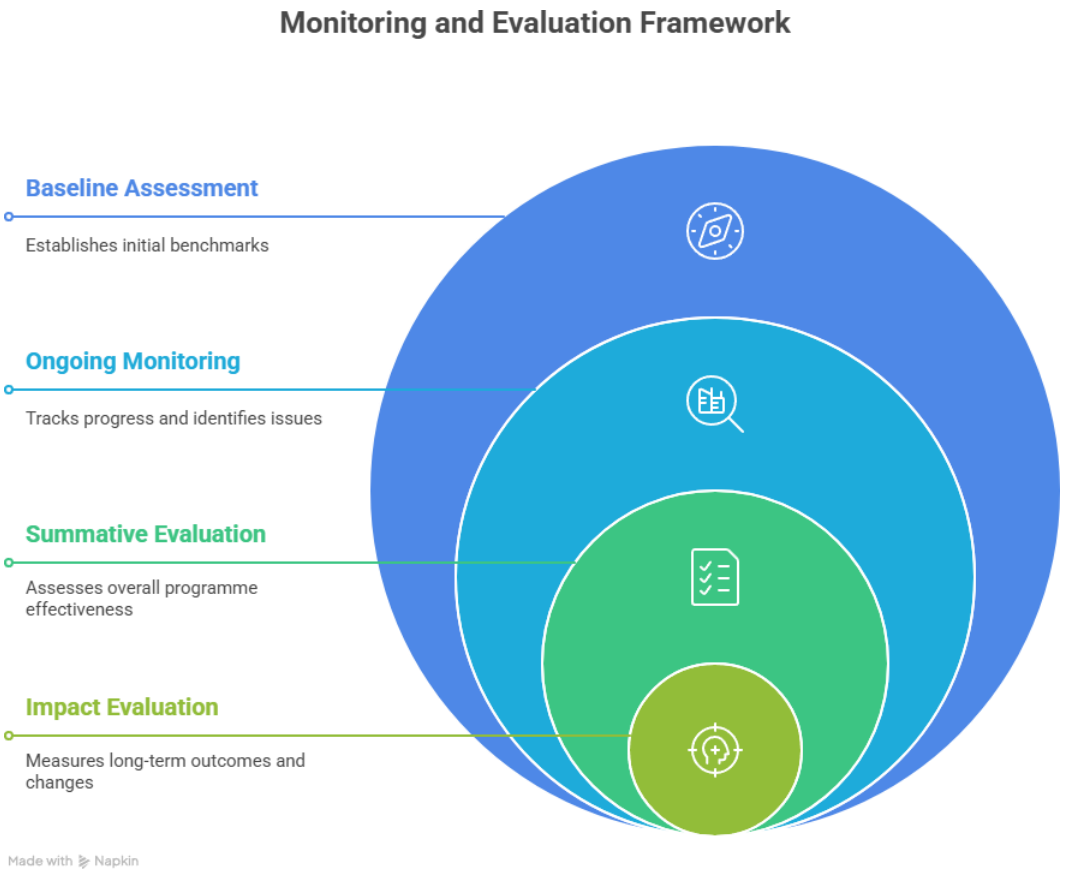


Figure 1. Monitoring and Evaluation of the training programme (image created with the use of Napkin ai)

Methods and Tools

Effective Monitoring and Evaluation (M&E) in TDP training is based on several approaches, each providing distinct insights that, when combined, ensure the training meets its learning outcomes, encourages ongoing development, and facilitates recognition.

Methods/Tools	Description
Digital surveys & analytics	Learning analytics are used to monitor engagement, identify at-risk learners, and personalise interventions.

Competency mapping	Pre- and post-training performance are compared against established standards (e.g., digital competency).
Peer review and reflective practice	Peer review and reflective practice support evidence-based professional growth.
Programme review meetings	Programme reviewing enables trainers and coordinators to adjust delivery in real-time.

3.4. Designing the Learning Experience

Designing the Learning Experience provides practical guidance on key elements of training design, including selecting pedagogical approaches that reflect TDP principles, structuring modules to build skills progressively, integrating synchronous, asynchronous, and blended formats, selecting appropriate digital tools and platforms and developing high-quality training materials. This is where the designer of the training programme maps out the specific lessons, activities, and instructional materials that will equip trainees with the knowledge and skills necessary to successfully demonstrate the evidence determined in the previous stage of the Backward Design Model (Determining acceptable evidence stage). Apart from discussing how this can be applied in a TDP training context, , this section highlights the importance of building a Community of Practice (CoP) to sustain learning beyond the programme and outlines the technical requirements necessary for smooth implementation.

3.4.1 Effective training methodologies

Effective training methodologies are essential for equipping educators with the knowledge, skills, and mindset needed to implement TDPs in higher education. The suggested training methodologies align with the ***European Quality Frameworks*** and can foster active learning, collaboration, critical reflection, and practical application (Figure 2).

Blended and hybrid learning

It combines face-to-face sessions with online components to provide flexibility and model technology-enhanced learning. Participants experience firsthand the design and facilitation of blended environments.

Experiential and practice-based learning

It involves hands-on activities such as lesson design, micro-teaching sessions, and integration of digital tools into authentic scenarios. It reinforces skill transfer by simulating real classroom challenges.

Collaborative learning and peer exchange

It utilises group projects, peer review, and co-creation tasks to encourage knowledge sharing and critical dialogue. It promotes reflective practice and the co-construction of innovative teaching solutions.

Problem-based and challenge-based learning

It engages participants in solving authentic pedagogical challenges (e.g., designing inclusive assessments or gamified learning modules). It develops creative problem-solving and fosters digital confidence.

Flipped sessions

The core content is provided in advance via videos, readings, or interactive modules, while live sessions focus on application, analysis, and co-creation, maximising interaction and deep learning.

Reflective practice and coaching

Participants engage in guided reflection, self-assessment, and coaching conversations to critically evaluate their learning and professional growth.

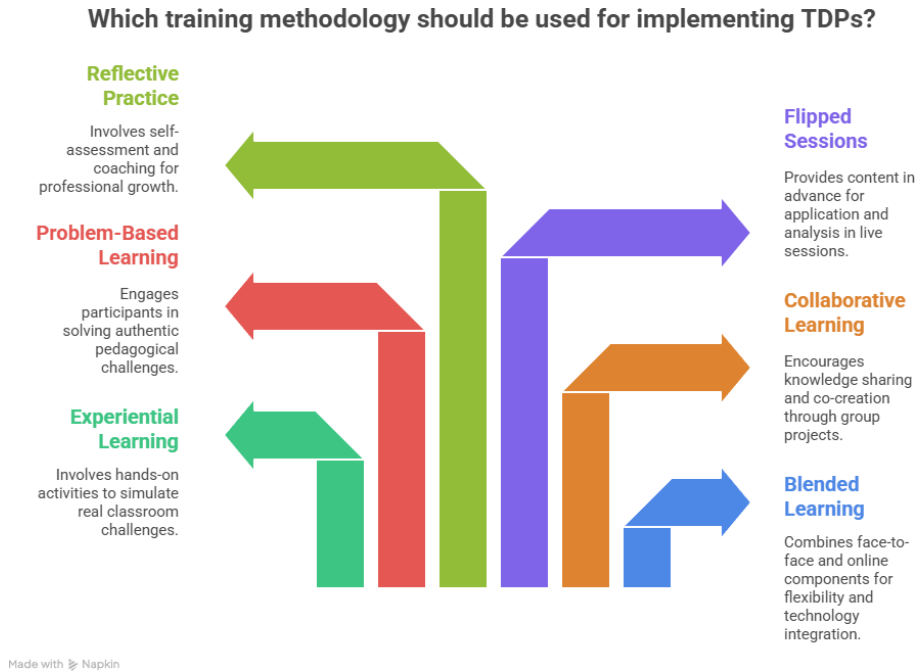


Figure 2. Educator Training Methodologies (image created with the use of Napkin ai)

3.4.2 Deciding on the Modules and their Sequencing

A training programme should consist of a logical and pedagogically sound series of modules that progressively increase participants' confidence, knowledge, and skills. Sequencing ensures that core ideas are covered first, then chances to apply, incorporate, and put what has been learned into practice.

Principles for structuring modules

1. **Progressive complexity**
    - Begin with core concepts of TDPs, digital competence frameworks, and pedagogical foundations.
    - Move to applied design, digital tool integration, and innovative methodologies.
    - Conclude with implementation strategies, assessment, and long-term professional growth planning.
2. **Constructive alignment**
    - Align each module with defined learning outcomes, ensuring activities and assessments support skill acquisition at the appropriate cognitive level.
    - Use backwards design to ensure that every module contributes to the overall programme goals.
3. **Flexibility and adaptation**
    - Structure modules to accommodate diverse contexts and participant needs.
    - Design optional or elective modules for advanced or specialised skills (e.g., AI in education, gamified learning).

3.4.3 Flexible Structures (e.g., synchronous, asynchronous, blended)

All three types of flexible instructional structures, synchronous, asynchronous, and blended, offer distinct educational benefits. Due to time and location constraints that limit their access to education, students in higher education are increasingly demanding learning models that go beyond the traditional campus/online dichotomy (Li et al., 2022).

Instructional models

Synchronous learning involves real-time interaction through live lectures, discussions, or workshops, enabling immediate feedback and fostering a sense of community and connectedness.

Asynchronous learning allows participants to engage with content at their own pace through recorded lectures, readings, and forums, promoting reflection, autonomy, and flexibility.

Blended learning integrates synchronous and asynchronous elements, whether in-person or fully online, leveraging the strengths of both to create richer learning experiences.

Although learners can benefit from certain aspects of online learning, it should be designed and implemented in a way that considers the needs of learners (Harper et al., 2024), emphasising the importance of a well-structured and paced course that fully exploits and integrates synchronous and asynchronous modes of blended learning (Géraldine et al., 2021).

3.4.4 Identifying and Curating Digital Tools and Platforms

A key component of creating successful training programmes on TDPs is choosing and curating relevant digital tools and platforms. The Digital Education Action Plan (European Commission, 2022) emphasises the importance of selecting technologies that match institutional contexts, pedagogical approaches, learning outcomes, and accessibility standards.

Figure 3 presents the criteria on which selecting appropriate digital tools for the delivery of a TDP training programme should be based.

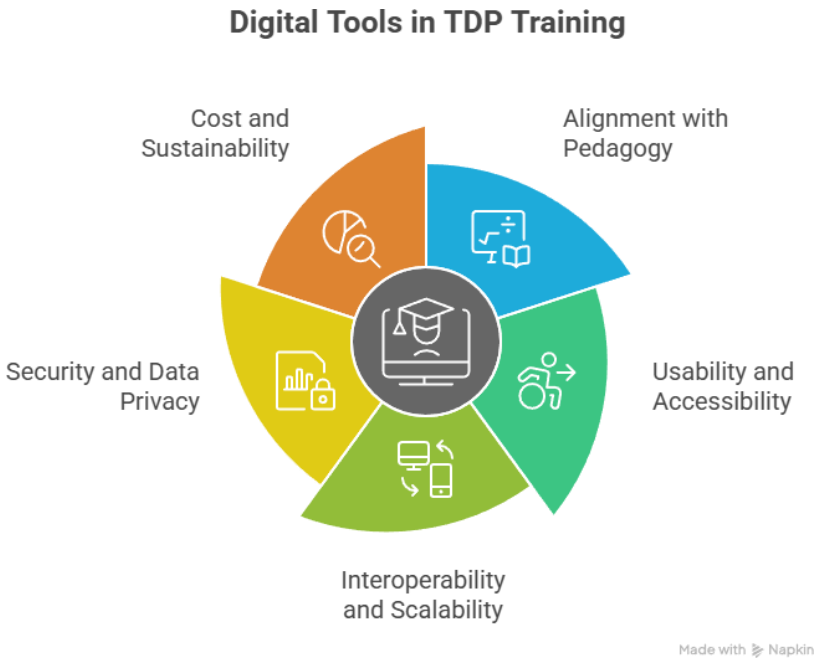


Figure 3. Criteria for selecting digital tools for the delivery of TDP training programmes (image created with the use of Napkin ai)

Identifying digital tools

Alignment with Pedagogy and Learning outcomes

Tools should serve the intended learning goals—whether fostering collaboration, supporting assessment, or encouraging reflection. For example, Padlet or Miro for group work; Kahoot! for formative assessment.

Usability and Accessibility

Tools must be easy to use across devices and accessible to all learners. Applying Universal Design for Learning (UDL) principles and meeting accessibility standards (e.g., WCAG 2.1) ensures inclusivity.

Interoperability and Scalability

Tools should integrate seamlessly with Learning Management Systems (LMS) like Moodle or Canvas. They also need to be scalable, adapting to different group sizes and contexts.

Security and Data Privacy

Compliance with GDPR and institutional data-protection rules is essential. Particularly important for tools that handle sensitive learner data and online interactions.

Cost and Sustainability

Use of OERs and free/freemium platforms helps manage costs. Long-term planning is needed for licensing, updates, and technical support.

Digital Tools and Platforms

- Learning Management Systems (LMS): Moodle, Canvas, Blackboard – central hubs for course delivery.
- Collaboration and Communication: Microsoft Teams, Slack, Zoom, BigBlueButton.
- Content Creation and Sharing: H5P, Genially, Canva, Loom, OBS Studio.
- Assessment and Feedback: Google Forms, Mentimeter, Quizizz, Turnitin.
- Reflective and Portfolio Tools: Mahara, PebblePad, blogs, or e-portfolios.
- Community-Building Tools: Discussion forums, social media groups, professional networks (LinkedIn, ResearchGate).

3.4.5 Developing Training Materials (presentations, handouts, activities)

This section offers practical guidance for designing and developing effective training materials that support digital and multimodal pedagogies. From classroom presentations to hands-on activities and supplementary handouts, the materials aim to engage learners through meaningful interaction, authentic content, and transdisciplinary approaches. Each example, whether tech-enhanced or not, illustrates innovative ways to scaffold learning and integrate digital tools into context-specific instruction.

Examples of pedagogical scenarios/frameworks for MR, VR and AR hardware in HE courses

Activity 1: Simulation of an authentic Surrealistic environment

The immersive environment in *Dreams of Dali* can serve as an instructional design tool, increasing familiarity with course-related content in English for Fine Arts and helping to simulate an authentic, surrealistic environment that deviates from static art-related images and passive surrealist representations of the art movement in the classroom. The following activity is proposed by Christoforou and Efthimiou (2023), adapted by Frazier et al. (2021).

Activity: Maximising content learning

- Target level: B2
- Time: 90 minutes

Aims: Students immerse themselves in *Dreams of Dali* to experience situated representations of course content and different parallel modes of meaning representation, and to practise their English language skills (writing a descriptive and argumentative text about their experience in the multimodal simulated environment using linguistic elements such as spatial adverbs, adjectives, words/phrases for expressing opinion, active and passive verbs, past tenses, comparisons, etc.).

Resources/materials: VR headset, *Dreams of Dali* app, list of spatial adverbs and adjectives/ regular & irregular verbs, guidelines for writing a descriptive and argumentative text, list of active and passive verbs, comparative/superlative guidelines.

Possible problems: *Dreams of Dali* offers an individual experience, but a limited number of VR headsets (either tethered or standalone) may slow down the process.

Procedure: This activity helps students explore parallel modes of meaning representation in Salvador Dalí's surrealist paintings. Subsequently, it provides students with the opportunity to demonstrate their perception of the painting through written and oral activities.

Stages:

1. The students are given lists of spatial adverbs and adjectives/ regular & irregular verbs, active and passive verbs, and comparative/superlative guidelines.
2. The instructor demonstrates to students how to become familiar with the VR hardware and software.
3. Students are immersed in *Dreams of Dali* individually for approximately 10 minutes each.
4. Once the simulated experience in the surrealistic environment is over, students orally compare the various modes of meaning-making they had been exposed to (see Table 1).
5. The instructor gives the students the guidelines for writing a descriptive and argumentative text, followed by a discussion with the students in class.
6. The students design (Kress, 2000) their texts and justify their linguistic choices. The instructor may interfere in the writing stage if errors are detected.
7. Based on the instructor's comments, the students write the final version of their text.
8. The students reflect on their whole experience (stages 1-7) in their diaries. The reflections may serve as a new source for language learning.
9. The students orally present their VR experience and knowledge gained in *Dreams of Dali* to the first-year students of the following academic semester.

Sources:

Christoforou, M., Efthimiou, F. (2023). Introducing *Dreams of Dali* in a Tertiary Education ESP Course: Technological and Pedagogical Implementations. In: Zaphiris, P., Ioannou, A. (Eds.) Learning and Collaboration Technologies. HCII 2023. Lecture Notes in Computer Science, vol 14041. Springer, Cham. https://doi.org/10.1007/978-3-031-34550-0_4

Frazier, E., Lege, R., & Bonner, E. (2021). Making virtual reality accessible for language learning: Applying the VR application analysis framework. *Teaching English with Technology*, *21*(1), 131-143.

Activity 2: Brain anatomy using neuro-imaging reconstruction – collaborative activity

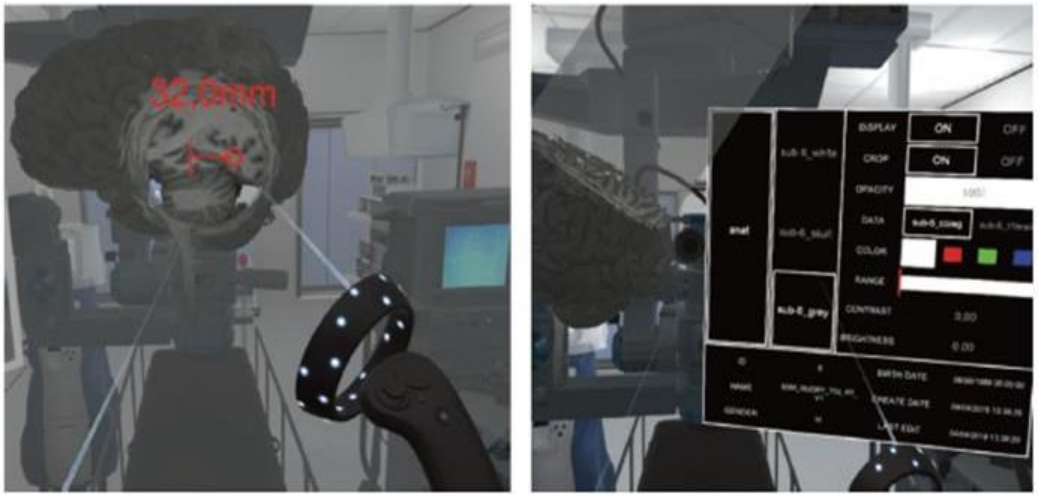
Virtual Reality can serve as a practice aid for neurosurgeon students, facilitating and enhancing:

- familiarity with brain anatomy and 3D manipulation.
- students' 3D navigation skills by presenting merged neuroimaging data from actual patient brains, supplemented with simulated tumour artefacts.
- Identification of precise tumour locations and sizes.

Steps:

1. Step 1 could involve a synchronous lecture in the classroom for knowledge transmission. Instructors can engage their students in a collaborative activity since the application allows both teachers and students to utilise it collectively.
2. Step 2 could continue to VR for further knowledge gain and simulated practice. This application significantly contributes to the modernisation and partial replacement of traditional brain tumour surgery training. The figures below illustrate the user interface, showcasing a measurement tool on the left and a control panel for adjusting various display parameters on the right. Virtual controllers are present within the environment to streamline manipulation and interactions.

Procedure and distant communication for train driving, view of driver (left), view of operator (right). (Image source: Philippe et al., 2020)



Brain tumour detection and measurement for surgery preparation based on neuro-imaging data.

(Image source: Philippe et al., 2020)

How VR can be integrated to contribute to Knowledge transmission, Practice, Feedback, and Evaluation, in connection with other tools and activities.

General purpose	Step 1	Step 2	Step 3	Step 4
#8 Brain anatomy at school	Knowledge transmission	Knowledge transmission	Practicing	Evaluation
	Lecture	Simulation		
	Collective activity	Collective activity		Individual activity
	Synchronous	Synchronous		Asynchronous
	Classroom	VR Simulation		

Source:

Philippe, S., Souchet, A. D., Lameras, P., Petridis, P., Caporal, J., Coldeboeuf, G., & Duzan, H. (2020). Multimodal teaching, learning and training in virtual reality: a review and case study. *Virtual Reality & Intelligent Hardware*, *2*(5), 421-442.

Activity 3: Machine assembly in the pharmaceutical industry

As part of a comprehensive training programme for production line operators in the pharmaceutical industry, a VR tool is integrated as both a practising and evaluating activity. This VR simulation replicates a real-life machine and guides learners through the actual assembly procedure.

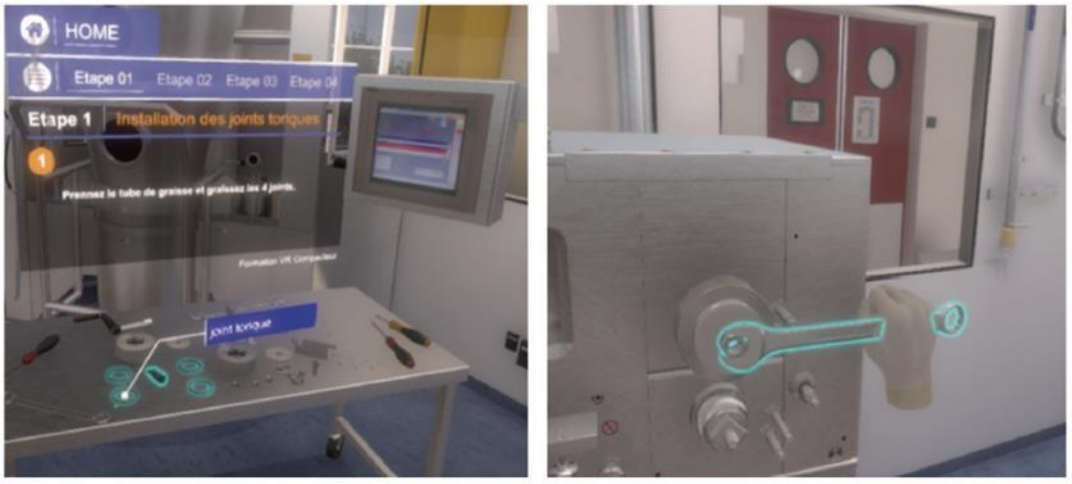
A virtual agent provides step-by-step verbal instructions, while on-screen text displays each task.

Goal: to help learners familiarise themselves with machinery and assembly components in a safe, controlled environment before performing the task physically.

The tool features three progressive learning modes:

- Guided mode - full assistance from the virtual agent and visual cues
- Semi-guided mode - reduced assistance to promote recall and problem-solving
- Non-assisted mode - for final assessment and performance evaluation

Figures below illustrate interface elements such as task progress, instructions (e.g., *"Take the grease tube and grease the joints"*), and highlighted interactive objects. Players use VR controllers to manipulate tools (e.g., spanners), offering realistic kinesthetic engagement.



Machine assembly in the pharmaceutical industry use case (Image source: Philippe et al., 2020).

Step-by-Step implementation in the lesson

Step 1: Introduction and orientation (10 minutes)

- Brief the learners on the purpose of the VR activity within the broader training programme.
- Provide a short demo or video walkthrough of the VR simulation.
- Explain the available learning modes (Guided, Semi-guided, Non-assisted).

Step 2: Familiarization with VR environment (10–15 minutes)

- Allow each participant to explore the VR interface.
- Let them identify and interact with basic elements (e.g., tools, machine parts).
- Answer any technical or navigation questions before formal practice begins.

Step 3: Guided practice session (20–30 minutes)

- Learners engage in the **Guided mode**, following verbal instructions.
- Each assembly step is narrated (e.g., "Take the grease tube and grease the joints").
- Visual cues (e.g., blue halo around tools) assist learners.
- Monitor performance and support as needed.

Step 4: Semi-guided practice (20–30 minutes)

- Learners repeat the assembly in **Semi-guided mode** with fewer cues.
- Encourage learners to recall previous steps and solve issues more independently.
- Observe their ability to handle tools and follow correct procedures.

Step 5: Evaluation in Non-assisted Mode (20 minutes)

- Learners complete the entire task in **Non-assisted mode**.
- No verbal or visual cues are provided. Learners rely on memory and prior practice.
- Assess performance using a predefined rubric (e.g., accuracy, timing, safety compliance).

Step 6: Debrief and feedback (15–20 minutes)

- Provide individual and group feedback based on evaluation results.
- Invite learners to reflect on the experience: What was challenging? What helped them learn?
- Discuss how VR practice relates to real-world machine assembly on the production line.

Step 7: Wrap-up and next steps

- Connect the VR task to other collective/individual activities in the training programme.
- Suggest further practice or targeted support for learners who need improvement.
- Reinforce the importance of procedural accuracy and safety in real-world contexts.

Source:

Philippe, S., Souchet, A. D., Lameras, P., Petridis, P., Caporal, J., Coldeboeuf, G., & Duzan, H. (2020). Multimodal teaching, learning and training in virtual reality: a review and case study. *Virtual Reality & Intelligent Hardware*, *2*(5), 421-442. https://www.researchgate.net/publication/346226237_Multimodal_teaching_learning_and_training_in_virtual_reality_a_review_and_case_study

Activity 4: Integrating AI into patient assessment and clinical decision-making

- Target level: B2+
- Time: 90 minutes

Aims:

Students explore the use of Generative AI as a clinical decision-support tool in patient assessment. They practice English for Specific Purposes (Nursing) by reading and discussing case studies, interpreting AI-generated outputs, comparing clinical reasoning with AI suggestions, and writing reflective and argumentative texts. The activity enhances critical thinking, domain-specific vocabulary, and ethical awareness in healthcare contexts.

Resources/materials: Generative AI platform (e.g., Gemini or ChatGPT), patient case handout, vocabulary list (symptoms, vital signs, medical terminology), clinical intervention checklist, ethical discussion prompts, reflective writing guidelines.

Possible problems: Not all AI platforms offer medically validated output; instructors should clarify the tool is used for *educational purposes only*. Learners may rely too heavily on AI suggestions without critically evaluating them.

Procedure:

This activity helps students understand how AI can be used in clinical settings to assist (but not replace) nursing judgment. It combines simulated patient scenarios, AI-supported diagnosis generation, and ethical discussions around decision-making. It concludes with reflective and argumentative writing tasks.

Stages:

1. Pre-task preparation: Students are provided with medical vocabulary related to symptoms, diagnosis, and interventions (e.g., chest pain, ECG monitoring, myocardial infarction, angina, embolism). The instructor also introduces basic functions and limitations of Generative AI in healthcare.
2. Case study immersion: Each group receives a clinical scenario: a 65-year-old male patient presenting with chest pain, high blood pressure, and shortness of breath.
3. AI-supported diagnosis: Students input the patient's details into a Generative AI platform. The tool suggests potential diagnoses (e.g., angina, myocardial infarction, pulmonary embolism). Students review and discuss the plausibility of each result.
4. Clinical reasoning comparison: Students compare AI-generated suggestions with their own clinical reasoning and collaboratively decide on immediate nursing interventions (e.g., oxygen administration, ECG monitoring, notifying physician).
5. Ethical discussion: The instructor poses the question *"Can AI replace human judgment in patient care?"* Students discuss the ethical and professional implications of AI's growing role in clinical decision-making.

6. Writing task: Students write a short argumentative text evaluating AI's potential in nursing practice, including a reflection on their decision-making process and the ethical tensions discussed. Texts should include domain-specific language and connectors for argumentation.
7. Peer feedback and revision: Students exchange texts in pairs, offering feedback on clarity, structure, and language use. Final versions are submitted after instructor feedback.
8. Reflection: Students reflect individually in their learning diaries on how AI altered their understanding of patient care and decision-making. Reflections may include both clinical insights and language gains.

Suggested reading: Rony, M. K. K., Ahmad, S., Das, D. C., Tanha, S. M., Deb, T. R., Akter, M. R., Khatun, M. A., Khalil, M. I., Peu, U. R., Parvin, M. R., Alrazeeni, D. M., & Akter, F. (2025). Nursing Students' Perspectives on Integrating Artificial Intelligence Into Clinical Practice and Training: A Qualitative Descriptive Study. *Health science reports*, *8*(4), e70728. https://onlinelibrary.wiley.com/doi/10.1002/hsr2.70728

3.4.6 Building a Community of Practice

A Community of Practice (CoP) is a group of professionals who come together around a shared interest or challenge and engage in collaborative learning, knowledge exchange, and reflective practice. Such communities are essential for sustaining professional growth beyond the training programme, encouraging peer-to-peer support, and fostering innovation in teaching practices.

Strategies for Building a CoP

- Start during training: Integrate community-building activities (e.g., collaborative projects, reflective discussions) into the programme.
- Use digital platforms: LMS forums, Microsoft Teams, Slack, or dedicated platforms like Discourse can host ongoing exchanges.
- Create shared repositories: Encourage participants to co-curate digital libraries of tools, case studies, and resources.
- Encourage mentorship: Pair new and experienced educators to build supportive networks.
- Facilitate regular interaction: Virtual meet-ups, webinars, or online discussion circles help maintain momentum.

Lessons learned show that a virtual Community of Practice is sustainable when (Jocius, 2022):

- Integrates synchronous and asynchronous training thoughtfully, supporting varied learning styles and contexts.
- Uses badges for motivation and recognition, mirroring micro-credential design principles.

- Sustains impact over time, underscoring the value of follow-up and ongoing support.

A significant *challenge* in online professional development is sustaining active engagement. Research findings suggest the motivators and barriers influencing teacher participation in online communities (Fuller, 2022).

Motivators for Participation

- A shared sense of purpose and relevance—teachers are motivated when the online CoP aligns with their professional needs.
- Opportunities for collaboration, mutual support, and exchanging practical teaching strategies encourage active involvement.

Identified Barriers

- Lack of clear structure or purpose, leading to disengagement.
- Limited technological proficiency or challenges navigating online platforms hinder participation.
- Time constraints and heavy workloads reduce capacity to engage consistently.

As a result, *design considerations* for incorporating a Community of Practice into the TDP training are also proposed:

- Integrate CoP from day one, with clear purpose and prompt structured interaction.
- Facilitate actively, supporting knowledge sharing, discussion, and relevance.
- Provide user-friendly digital tools, and support for participants less comfortable with technology.
- Recognise time limitations, designing flexible engagement opportunities (short prompts, asynchronous reflections, brief synchronous check-ins).

3.4.7 Technical Requirements and Support

Reliable technology and effective support systems are crucial to ensure equitable access, foster engagement, and minimise disruptions that may undermine the learning experience. The list of actions proposed below could contribute to a smooth and successful implementation of the training programme.

Infrastructure and Connectivity

- Stable internet access
- Hardware requirements - Clear specifications to be provided
- Learning environment readiness - Suitable physical or digital learning environments

Platforms and Tools

- Learning Management System (LMS) - Course materials, communication, and assessment activities should be hosted in a centralised platform.

- Communication tools - Provision of video conferencing software (e.g., Zoom, MS Teams)
- Collaboration and engagement tools - Utilisation of platforms such as Padlet, Miro, Mentimeter, or Slack to facilitate interactivity and peer collaboration.
- Integration and Interoperability - All tools should integrate seamlessly into the LMS and comply with institutional standards.

Accessibility and Inclusivity

- Universal Design for Learning (UDL): Tools and resources should follow accessibility principles, offering multiple means of engagement (text, video, audio, captions).
- Assistive technologies: Support for screen readers, captioning services, and multilingual interfaces should be considered.
- Device compatibility: Platforms must function across operating systems and devices, ensuring inclusivity for diverse users.

Security and Data Protection

- GDPR compliance: All tools and platforms should adhere to EU data privacy regulations, ensuring safe handling of learner information.
- Institutional policies: Security protocols, authentication methods, and ethical use of data must be clear and enforced.

Technical Support Structures

- Helpdesk services: Participants should have access to IT helpdesk support via email, chat, or hotline, particularly during synchronous sessions.
- Guides and tutorials: Step-by-step guides, FAQs, and video tutorials should be available to ensure self-service troubleshooting.
- Orientation sessions: Pre-training workshops on navigating digital platforms reduce anxiety and foster confidence.
- Continuous monitoring: Real-time technical support (e.g., co-hosts or moderators) during sessions helps minimise disruptions.

Sustainability and Scalability

- Cost planning: Institutions should strike a balance between the use of licensed software and Open Educational Resources (OERs) and free tools.
- Scalability: Infrastructure must support expansion for larger cohorts or additional training cycles without compromising performance.
- Regular updates and maintenance: Platforms and tools require continuous updates, security patches, and maintenance to remain reliable.

Sources:

1. European Commission (2022). *Digital Education Action Plan (2021–2027).* Brussels: EC. https://education.ec.europa.eu/focus-topics/digital-education/plan
2. European Commission. (2025). The European higher education interoperability framework. European Education Area. https://education.ec.europa.eu/focus-topics/digital-education/digital-education-hub/workshops-and-working-groups/interoperability-framework
3. Redecker, C. (2017). European Framework for the Digital Competence of Educators (DigCompEdu). Luxembourg: Publications Office of the EU. https://publications.jrc.ec.europa.eu/repository/handle/JRC107466
4. Zhao, X., Shao, M., & Su, Y. S. (2022). Effects of online learning support services on university students' learning satisfaction under the impact of COVID-19. Sustainability, 14(17), 10699.

4. The TDP4HE Training Programme

4.1 Background information

The TDP4HE project aimed to develop a model that integrates transformative pedagogies, encompassing both learner-centred and teacher-centred approaches, with the effective use of digital technologies. The project focused on creating a transdisciplinary training programme that fosters innovative teaching and learning practices among academic staff across various disciplines.

Implemented under the Erasmus+ KA2 – KA220-HED Cooperation Partnerships in Higher Education, Round 1, the initiative is formally titled Transformative Digital Pedagogies for Higher Education (TDP4HE). The project, which ran from September 1, 2022, to August 31, 2025, was coordinated by Riga Technical University (Latvia), in collaboration with the Cyprus University of Technology (Cyprus), Darmstadt University of Applied Sciences (Germany), Technological University Dublin (Ireland), Technical University of Sofia (Bulgaria), Universidad Politécnica de Cartagena (Spain), Université de technologie de Troyes (France) and Universitatea Tehnică din Cluj-Napoca (Romania).

As a result of the project's work, the following outputs have been produced:

- A theoretical and empirical framework of transformative digital pedagogical competences
- A TDPs self-assessment theoretical framework e-tool
- A training Programme on TDPs
- A trainer's guide
- An e-Toolkit with OERs and OEPs for TDPs
- A Community of Practice (CoP)

The TDP4HE project brought together partners from the European University of Technology (EUt+) alliance, which aims to redefine the holistic role of technology and research in higher education in Europe. The purpose is aligned with the strategic priorities of the European Education Area towards a sustainable, digital and inclusive transformation.

4.2 The purpose of the training programme

The TDP4HE training programme is built on the principle that effective teaching is more than just knowing how to use technology. It is about skillfully combining content, pedagogy, and technology to create new and impactful learning experiences. The primary goal of the programme is to equip instructors with the skills necessary to effectively integrate TDPs into their teaching, thereby enhancing their overall teaching methods.

The TDP4HE training programme is intended for academic teaching staff in higher education institutions, both within and outside the TDP4HE consortium and EUt+ Alliance, as well as globally. It also aims to attract researchers, scholars, and administrative staff who are interested in exploring and using new learning and teaching methods. The programme is also designed for European, national, and regional associations that specialise in higher education didactics and pedagogies.

4.3 Needs Analysis

The TDP4HE training programme was created based on needs analysis conducted to identify the gaps related to the academic staff's digital and pedagogical readiness. More specifically, the design of the programme was based on the results of a needs analysis of pedagogical practices at the eight universities of the European University of Technology (EUt+). This analysis was a SWOT (Strengths, Weaknesses, Opportunities, Threats) assessment of the eight ELaRA institutions, carried out in Fall 2021 by members of EUt+'s European Laboratory For Pedagogical Action, Research And Student-Centred Learning (ELaRA). Moreover, according to Soule and Kakoulli Constantinou (2024), the training programme also drew on the results of another study within the EUt+ Alliance, which aimed at defining the teaching profiles of academic staff across its eight member universities. This study revealed a significant finding: before the COVID-19 pandemic, most of the educators who participated in the study, primarily relied on traditional, face-to-face instruction, favouring teacher-centred approaches such as lectures and tutorials, with limited integration of technology (Kakoulli Constantinou et al., 2025). Soule and Kakoulli Constantinou also discussed the growing demand for digital transformation and the emphasis the United Nations (2015) has placed on developing digital readiness. They continued by outlining the need, which is especially evident in higher education, where many educators still lack the necessary skills and competencies to effectively leverage technology for improving and transforming classroom practices (European Commission, 2021).

The TDP4HE consortium, which consists of technical universities within the Eut+ alliance, also confirmed the lack of ongoing training programmes focused on pedagogical and digital competencies for academic staff.

4.4 Learning Outcomes

By the end of the training programme, the participants should be able to:

- Demonstrate an understanding of effective teaching and learning methodologies in Higher Education.
- Articulate the significance of technology in pedagogy within the contemporary landscape of Higher Education.

- Formulate learning objectives, design course content, and establish learning outcomes.
- Implement and assess various teaching methodologies, including learner-centred approaches, inquiry-based methods, problem-based learning, project-based learning, case-based learning, critical thinking strategies, and social-collaborative learning.
- Integrate emerging technologies into the pedagogical process effectively.
- Employ diverse assessment techniques.
- Utilise digital resources to facilitate the learning journey.
- Identify strategies for evolving their pedagogical practices within an ever-changing educational environment.

4.5 Assessment Processes

Assessment within the TDP4HE training programme is designed not only to evaluate knowledge acquisition but also to foster reflection, innovation, and professional growth. In line with transformative pedagogical principles, the assessment process emphasises continuous feedback, collaborative learning, and the development of digital competence.

The approach balances **formative and summative assessments** while incorporating authentic, flexible, and voluntary tasks that allow participants to demonstrate their learning in meaningful ways. Digital tools are integrated throughout to support engagement, ensure inclusivity, and provide opportunities for interaction and co-creation within the Community of Practice.

Types of Assessments Used in the Programme

1. **Reflective Writing**
    - Short written reflections (100–400 words) on how modules influence perceptions of teaching and learning in the digital era, guided by prompting questions (e.g., challenges in digital teaching, future strategies).

2. **Knowledge Checks and Quizzes**
    - Quizzes on topics such as transdisciplinarity, effective teaching strategies, and emerging technologies.
    - Features include drag-and-drop activities and repeatable attempts for self-paced learning.

3. **Peer Discussions and Collaborative Reflection**

Peer triad discussions on topics like student-centred feedback and technology-supported engagement, followed by individual written reflections on group conversations.

- *Digital tools*: Zoom/Teams breakout rooms, forums, shared Google Docs, or Padlet.

4. **Case Study Analysis**
   - Participants provide real examples of diverse classroom scenarios (e.g., students with disabilities or multilingual learners).
   - Tasks focus on identifying challenges and proposing inclusive psychological and technological strategies.

5. **Interactive Polls and Micro-Responses**
   - Short inputs (under 200 characters) on pedagogical competence or innovative practices.
   - *Digital tools*: Mentimeter, Padlet, or integrated polling functions in LMS/Teams.

6. **Professional Development Planning**
   - Creation of an individual or collaborative **Continuing Professional Development (CPD) plan**, tailored to participants' contexts to encourage engagement with the Community of Practice (CoP).

7. **Self-Assessment and Competence Mapping**
   - Use of the **TDP4HE self-assessment e-tool** to evaluate participants' digital pedagogical competences, to provide personalised feedback and support continuous professional growth.
   - *Digital tool*: TDP4HE self-assessment tool (https://tdp4he.upct.es/).

4.6 Implementation and delivery mode

The Transformative Digital Pedagogies for Higher Education training programme is designed to equip instructors with the skills needed to integrate TDPs into their teaching methodologies.

Below is an overview of the five modules (Module 0-5), including titles, descriptions, topics covered, and learning objectives for each one.

To gain full access to the training programme's content (theories and practical activities), follow the link to the platform: https://aulavirtual.upct.es/course/section.php?id=205028#module-1025852 .

Module 0. Introduction to the programme

Facilitator:

Stavroulla Hadjiconstantinou

Description:

This opening module introduces participants to the purpose, structure, and expected outcomes of the TDP4HE training programme. It provides an overview of TDPs, highlighting the importance of teaching methodologies and the role of technology in modern Higher Education. The module also familiarises participants with the programme's scope, objectives, structure and format. Lastly, it provides a walk-through of the training programme's platform and its features, as well as an introduction to the Community of Practice.

Topics:

1. Welcome note
2. Training programme's scope and learning objectives
3. Facilitators
4. Programme's structure (Module 0-Module 5)
5. Teaching Methodologies
6. Delivery mode
7. Requirements for participants

Learning objectives:

- Describe the purpose, scope, and structure of the TDP4HE training programme.
- Navigate the digital learning environment, accessing resources, communication tools, and technical support as needed.
- Engage with peers in the emerging community of practice, recognising its role in fostering collaboration, reflection, and professional growth.

Module 1. Introduction to Teaching and Learning in Higher Education in the Digital Era

Facilitator:

Olga Vindaca

Description:

The rapid evolution of technology has reshaped the landscape of education, including higher education, requiring academic staff to adapt their teaching methodologies to meet the needs of digital-age learners. This comprehensive training programme is designed to empower

educators with the essential knowledge and skills to navigate the dynamic intersection of pedagogy and technology.

Topics:

1. Teaching and learning in Higher Education Institutions - Introduction.
2. The nature of knowledge and the implications of teaching.
3. Updated trends and perspectives of teaching and learning in the Digital Era.
4. Methods of teaching: campus-focused and online-focused.
5. Ensuring quality teaching in the Digital Era.

Learning objectives:

Knowledge:

- Understand the essence of teaching and learning in a digital age.
- Describe the multidimensionality of the quality of teaching and learning.
- Familiarity with different methods of teaching: campus-focused and online-focused.

Skills:

- Technology integration skill – practical application of educational technologies.
- Troubleshooting and problem-solving in the context of technology use.
- Adapting teaching methods to incorporate technology seamlessly.

Competence:

- Digital pedagogy competence – integrating digital tools and strategies into teaching practices, by adopting pedagogical approaches to align with the digital learning environment.
- Communication competence – communicating clearly and effectively through digital channels, adopting corresponding approaches for various online platforms.

Module 2. Didactic Foundation of Learning/Teaching through the use of new/ emerging technologies

Facilitators:

Maria Christoforou
Nicoletta Pantela

Description:

This module provides a comprehensive exploration of how current educational practices intersect with evolving technological landscapes. Participants delve into

theoretical frameworks underpinning pedagogical approaches, examining how emerging technologies can be strategically integrated to enhance teaching and learning outcomes. The module comprises both asynchronous and synchronous components. The asynchronous segment involves pre-task activities, including reading suggested papers, watching videos, and completing quizzes. Additionally, post-task activities follow the synchronous session. During the synchronous session, the facilitators firstly provide a brief introduction to the didactic foundation of learning/teaching through the use of new/ emerging technologies. The module's contents are delivered and executed through a range of methods, including demonstrations and interactive activities. The synchronous session concludes with feedback and Q&A sessions, offering participants insights to contemplate and equipping them with resources to delve deeper into the module's topic. Additionally, facilitators provide participants with an advanced reading list.

Topics:

1. Transdisciplinarity and the development of transversal competences
    a. Effective teaching methods, models, strategies, and learning dynamics:
    b. Learner-centred approaches
    c. Inquiry-based approaches
    d. Problem-based learning
    e. Project-based learning
    f. Case-based learning
    g. Critical digital pedagogy
    h. Social-collaborative learning
2. New/ emerging technologies in pedagogy
    a. MR, VR, AR hardware and AI tools that can support HE pedagogy
    b. E-toolkit: MR, VR, AR applications to implement in HE courses
    c. Pedagogical scenarios/recommendations for MR, VR, AR hardware and AI tools in HE courses
3. Assessment, feedback and reflection (self-assessment, students' assessment, peer observation)

Learning objectives:

- Introduce participants to the didactic foundation of learning/teaching through the use of new/ emerging technologies.
- Help participants understand basic concepts related to teaching methods, models, strategies, and learning dynamics.
- Describe how effective teaching methods intersecting with evolving technological advancements can be integrated into the instructional process.

- Facilitate participants in learning how to conduct assessments, provide feedback, and engage in reflection, including self-assessment, student assessment, and peer observation.

Module 3. Didactic Principles of Study Process

Facilitators:
Mick McKeever
Patrick Flynn
Lucia Morales

Description:

This module explores how new and emerging technologies can be used to support interactive feedback, co-creation of knowledge and engagement with other disciplines and external bodies to provide authentic teaching and learning. It explores how one can consider a move away from traditional didactic teaching methods to ones that utilise new technology to develop a more student-centred learning approach.

Participants read and consider articles that explore how opening up teaching online to invite new partners can produce a new connected curriculum, which repositions the lecturer as a link facilitator in developing the University as an orchestrated network.

The module comprises both synchronous and asynchronous components. The asynchronous portion involves pre-task readings, and a post-task activity builds upon the discussion from the synchronous session through peer-to-peer learning.

For the synchronous session, the facilitators provide an introduction to circular pedagogy and transdisciplinarity and some of the opportunities and challenges and discuss how alternatives to the traditional didactic approach to learning/teaching can be implemented through the use of new/ emerging technologies.

The module contents are delivered through a range of methods, including examples and interactive activities.

Topics:

1. Introduction to Circular Pedagogy & Transdisciplinarity.
2. Effective teaching methods, examples, and strategies:
    a. Effective online feedback
    b. Peer-to-peer learning
    c. Project-based learning
    d. Case-based learning
    e. Service-based learning

   f. Assessment as learning
3. New/ emerging technologies in pedagogy
   a. Software that can support a more interactive pedagogy
   b. E-toolkit
   c. Pedagogical scenarios/case studies

Learning objectives:

- Engage participants with alternatives to the traditional didactic approach to learning/teaching through the use of new/ emerging technologies.
- Develop an understanding of circular pedagogy and transdisciplinarity and their application in online learning.
- Support staff in transforming their assessment and feedback to be more student-centred through the use of new technologies.

Module 4. Introduction to Psychology and Inclusive Education

Facilitator:

Olga Vindaca

Description:

The programme is designed to provide a comprehensive understanding of psychological principles, emphasising a student-centred approach and the importance of inclusive education in creating a diverse and accessible learning environment. It utilises different strategies to accommodate various learning styles and address the unique needs of students with diverse backgrounds and abilities.

Topics:

1. Introduction to psychology and Inclusive education
2. Individual differences of students, personalisation (student-centred approach)
3. Guidelines of inclusive education and how new/emerging technologies can contribute
4. Psychological aspect of effective interaction in the digital age

Learning objectives:

Knowledge:

- Understand psychological principles by gaining a solid foundation in key psychological concepts.
- Familiarity with inclusive education concepts, fostering awareness of diverse learning needs and strategies to create inclusive and supportive classroom environments.

Skills:

- Application of psychological insights to educational practices, tailoring teaching methods to the diverse needs of students.
- Adaptability in teaching approaches - to accommodate various learning styles and abilities, promoting an inclusive learning environment.

Competence:

- Communication competence - to establish positive relationships with students and colleagues, facilitating collaboration in inclusive settings.
- Inclusive teaching competence – by designing and implementing inclusive lesson plans, recognising and addressing the unique strengths and challenges of each student.

Module 5. Professional Development of Academic Staff

Facilitator:

Dr. Elis Kakoulli Constantinou

Description:

This module focuses on the necessity of continuous self and professional development in the digital age, encompassing enhancements in pedagogical competence among academic staff. More specifically, the module focuses on what CPD in the digital era involves and delves into the pedagogical competence of academic staff and ways in which it can be developed. The module also explores the implementation of innovative teaching and learning methods while promoting the significance of lifelong learning. Additionally, it underscores the importance of effective professional practice, integrating elements such as participation in Communities of Practice (CoP), action research, peer observation, mentoring and supervision, and reflective practice among others, alongside insights into commercialization opportunities within the educational landscape.

Topics:

1. Continuous self/professional development in the digital era
2. Pedagogical competence of academic staff
3. Implementation of innovative teaching/learning
4. Lifelong learning
5. Effective professional practice (through participation in Communities of Practice (CoP), action research, peer observation, mentoring, supervision, reflective practice, etc.) and commercialisation of insights.

Learning objectives:

- Understand the concept of Continuous Professional Development (CPD) and lifelong learning in the digital age.
- Understand what pedagogical competence is and how it can be enhanced.
- Identify and explore their own self-development and professional development needs.

- Understand what implementing innovative teaching and learning practices involves and discuss ways in which such practices can be adopted in participants' own contexts.
- Identify ways in which participants can achieve CPD and commercialise their insights obtained during the course of their professional development.

4.7 Open Educational Resources (OERs) and Practices (OEPs)

In addition to the training programme, the project delivered an Open Educational Resource (OER) and Open Educational Practice (OEP) platform, consisting of resources which are designed to support innovative teaching approaches and provide valuable tools for enhancing your educational practices.

The platform includes:

- **Open Educational Practices**
  - Teaching and Learning in Higher Education in the Digital Era
  - Didactic Foundation of Learning/Teaching
  - Didactic Principles of Study Process
  - Introduction to Psychology and Inclusive Education
  - Professional Development of Academic Staff
  - The STEAM educational approach

- **Open Educational Resources**
  - Applications and tools
  - Scenarios
  - Creating a Continuous Professional Development (CPD) action plan

- **User guidance for the creation of OERs and OEPs**
- **How to submit an OER or OEP**
- **References**

To gain full access to the OERs and OEPs, follow the link:
https://opencontent.upct.es/ce86178c20e4445ea7d5f0a65cd3de5b/7ed1722695e04b2e9a777397b9163a99/

5. Staying Connected

5. 1. Joining the TDP4HE Community of Practice (CoP)

A central objective of the TDP4HE project is to promote and support the adoption of innovative and TDPs in higher education (HE) across Europe. To facilitate this, the project has established an Open Online Community of Practice (CoP), specifically designed for academic teaching staff. This virtual space serves as a collaborative environment where educators can connect, share, and develop teaching strategies focused on student-centered and collaboration-based approaches.

The CoP was designed to support the exchange of innovative teaching practices and the dissemination of open educational resources (OER) and open educational practices (OEP). It is intended to be an inclusive platform that welcomes not only academic staff but also researchers, policy makers, and other stakeholders in higher education. Its overarching purpose is to stimulate dialogue, peer learning, and community-driven innovation in digital pedagogy.

Structured around the priorities of “stimulating innovative learning and teaching practices” and “rewarding excellence in learning, teaching and skills development,” the CoP encourages academic staff to remain active in adopting and refining transformative teaching methods. Participants are able to access resources developed throughout the project, engage in discussions, seek support, and collaborate on practical teaching challenges. The platform serves both as a repository for best practices and a forum for ongoing peer interaction.

Technically, the CoP is hosted on Whaller, a comprehensive social and collaboration platform. s The TDP4HE CoP space on Whaller ensures functionality and interactivity through features such as discussion forums, document and image sharing features, and links to training modules hosted on the Moodle platform. The platform is responsive and accessible across devices (PCs, tablets, and smartphones), facilitating broad participation. User support is ensured by technical experts who manage updates and maintain the infrastructure.

In the long term, the TDP4HE CoP aims to become a self-sustained e-community that continues to function beyond the life of the project. Academic staff will be able to self-assess their competencies in digital pedagogy and continue to build their teaching practices through shared resources and peer feedback. Additionally, the CoP is expected to contribute to bridging existing gaps in digital teaching competencies identified by the European Commission, and influence education policy by demonstrating the impact and necessity of transformative pedagogies.

Finally, the platform will support continuity through its integration into the ELaRA alliance, ensuring the training and collaboration it facilitates can continue within the

EUt+ university community. In this way, the TDP4HE Community of Practice not only supports the immediate goals of the project but also lays the foundation for sustained pedagogical innovation across European higher education institutions.

The TDP4HE CoP is hosted here. To gain access to the CoP visit the TDP4HE website and fill in the application form.

5.2. Continuing Professional Development opportunities

In the evolving landscape of European higher education, the need for continuous professional growth is more critical than ever. The TDP4HE Community of Practice (CoP) offers a dynamic and inclusive space where academic staff can engage in meaningful Continuing Professional Development (CPD) tailored to the challenges and opportunities of digital, student-centred teaching.

Educators in higher education today face growing expectations to adopt innovative, technology-enhanced pedagogies, respond to diverse learner needs, and contribute to institutional excellence. However, formal CPD opportunities are often unevenly distributed across institutions and countries. The TDP4HE CoP helps bridge this gap by providing an open, international platform for collaboration, peer learning, and resource sharing that complements and enhances local CPD offerings.

Through its interactive and flexible design, the CoP promotes self-directed, practice-based professional development. Educators can explore new teaching methods, reflect on their current practices, and access practical tools and resources grounded in research and real-world classroom experience. The platform enables members to:

- Stay up to date with the latest in TDPs
- Engage in professional dialogue with peers from across Europe
- Access and share Open Educational Resources (OER) and Open Educational Practices (OEP)
- Participate in structured peer observation activities
- Receive informal feedback and support from fellow educators

This approach aligns closely with European Commission priorities such as stimulating innovation in learning and teaching, and supporting excellence in skills development. By participating in the CoP, educators are not only enhancing their own professional growth but are also contributing to a shared European effort to transform higher education through collaboration and innovation.

Importantly, the TDP4HE platform fosters sustained engagement with CPD, rather than treating it as a one-time training event. Its asynchronous and mobile-friendly format allows educators to participate at their own pace, integrating learning into

their daily teaching practice. Whether engaging in a quick forum discussion, accessing a new digital tool, or joining a peer feedback activity, every interaction becomes part of a broader developmental journey.

Moreover, participation in the CoP can support educators in documenting and demonstrating their professional development. Many institutions across Europe now recognise informal and non-formal learning as part of promotion and appraisal systems. Engaging in the CoP provides a clear, traceable record of professional engagement and innovation in teaching.

By joining the TDP4HE Community of Practice, educators are not only improving their own skills but are also helping to shape a new culture of professional learning in higher education—one that is collaborative, open, and future-oriented. This aligns with the broader vision of the European Higher Education Area (EHEA) to foster teaching excellence and support the development of the key competences needed for lifelong learning and employability.

In short, the CoP is more than just a platform; it is a professional learning ecosystem. For any higher education teacher committed to growth, collaboration, and innovation, it offers a unique opportunity to make CPD an integral and empowering part of academic life.

APPENDICES

Glossary of terms

This glossary serves as a practical reference point, ensuring that trainers and participants share a common language when discussing transformative pedagogies, digital competencies, instructional models, and technological tools.

- **Active Learning, Learner-Centered Approaches**: Active Learning, Learner-Centred Approaches refer to a broad set of teaching and learning practices that prioritise student engagement, autonomy, and participation. These approaches place learners at the centre of the educational process, in contrast to traditional Teacher-centred pedagogy, where students are passive recipients of knowledge delivered by the instructor. Active learning encourages students to engage in meaningful activities such as discussion, problem-solving, collaboration, and reflection, fostering deeper understanding and critical thinking.
- **Augmented Reality (AR):** Augmented reality (AR) is a technology that enables users to overlay virtual images or interactive digital content onto their real-world environment, enhancing perception without replacing the physical environment. This is commonly achieved through devices such as smartphones or tablets, making AR one of the most cost-effective and accessible forms of extended reality (XR), since most adults already own compatible devices. AR is widely used in fields ranging from gaming and education to retail and healthcare, enhancing real-world experiences with additional layers of information and interactivity.
- **Blended Learning:** is an approach to education that combines traditional face-to-face classroom instruction with online or digital learning activities. It allows learners to benefit from the personal interaction and support of in-person teaching, while also engaging in self-paced, flexible, and technology-enhanced learning experiences.
- **Collaborative Online International Learning (COIL):** is a pedagogical approach that connects faculty and students from different countries and cultural contexts through online collaboration, with the goal of fostering intercultural competence, global awareness, and disciplinary learning. It involves the co-design of courses or modules by instructors from partnering institutions, where students engage in structured, technology-mediated activities such as joint projects, discussions, and problem-solving tasks. Unlike traditional study-abroad programmes, COIL emphasizes *virtual, inclusive, and reciprocal exchange*, making international and intercultural learning accessible to a wider range of learners.

- **Case-based learning (CBL):** a form of participatory teaching-learning strategy that encourages the assimilation of the work environment, improves the students' transition to practice and finally facilitates the students' reflective learning while developing their problem-solving skills.
- **Connectivism:** *is a* theory of learning for the digital age which posits that knowledge is distributed across networks of people, digital tools, and information sources, and that learning consists of the ability to navigate, connect, and expand these networks. Proposed by George Siemens (2005) and further developed by Stephen Downes, connectivism emphasizes that learning is no longer an individual process of internalizing content, but a *networked process* that relies on cultivating and maintaining connections. In educational practice, connectivism highlights skills such as information filtering, pattern recognition, collaboration, and the effective use of technology to access and contribute to constantly evolving knowledge domains.
- **Constructivism:** is a theory of learning that posits knowledge is not passively received but actively constructed by learners through their experiences, interactions, and reflection. Rooted in the work of Piaget and Vygotsky, constructivism emphasizes that learning is a social and contextual process in which individuals build meaning by connecting new information to prior knowledge. In educational practice, a constructivist approach encourages active, inquiry-based, and collaborative learning, where the teacher's role shifts from transmitter of knowledge to facilitator who scaffolds student understanding and supports the co-construction of meaning (Vygotsky, 1978).
- **Continuous professional development (CPD):** is the intentional maintenance and development of the knowledge and skills needed to perform in a professional context.
- **Digital Fluency for Educators**: Digital fluency moves beyond basic literacy, describing an educator's capacity to confidently, creatively, and purposefully apply digital tools and practices to transform teaching and learning. It involves not only knowing how to use technology, but also *when, why, and in what ways* its use will enhance pedagogy and student outcomes. Digital fluency implies adaptability, innovation, and the ability to critically evaluate emerging technologies, aligning digital practices with curricular goals and diverse learner needs.
- **Digital Literacy for educators:** refers to the ability of educators to effectively locate, evaluate, create, and communicate information using digital technologies in a critical, ethical, and responsible manner. It extends beyond technical skills to include an understanding of digital citizenship, information literacy, and the pedagogical integration of technology to support learning and teaching. For educators, digital literacy encompasses both professional competencies (e.g., managing digital resources, assessing credibility of

sources) and instructional practices (e.g., designing technology-enhanced learning experiences).

- **Digital Pedagogy (beyond technology integration)**: Digital Pedagogy (beyond technology integration) refers to pedagogical approaches that critically and creatively engage with digital technologies, not merely as tools for delivering content, but as integral to shaping how learning occurs. It moves beyond the simple inclusion of digital tools in the classroom and instead reimagines curriculum design, assessment, collaboration, and interaction in ways that are responsive to the possibilities and challenges of digital environments. Digital pedagogy focuses on learner agency, multimodal literacies, participatory cultures, and inclusive access, encouraging both educators and learners to reflect on how digital media and platforms influence meaning-making, identity, and power in education.
- **Embodiment**: It refers to the immersive experience in which users feel as though their virtual body (or avatar) belongs to them, enabling a sense of presence and agency within the digital environment. As a VR affordance, embodiment allows users to interact physically and sensorially with the virtual world, fostering deeper engagement, spatial awareness, and affective connection through simulated bodily experiences. It can be broken down into three interrelated dimensions: self-location (the sensation of being located within the virtual body), agency (the ability to control movements of the virtual body) and body ownership (the feeling that the virtual body is "one's own”). In educational contexts embodiment in VR can enhance multimodal and sensorial learning by enabling learners to "inhabit" scenarios, manipulate virtual objects, and engage meaningfully with content through gesture, movement, and spatial interaction.
- **Educational psychology:** the scientific study of how people learn and develop in educational settings, and how teaching practices, instructional design, and learning environments influence that process. It integrates insights from psychology, neuroscience, and pedagogy to examine cognitive, emotional, social, and motivational factors that shape learning. Core areas include theories of learning (e.g., behaviorism, constructivism, socio-cultural theory), student development, classroom management, assessment, and the role of individual differences.
- **Extended Reality (XR)**: Extended reality is a broad term that includes three distinct immersive technologies: augmented reality (AR), mixed reality (MR), and virtual reality (VR). These forms vary in the level of immersion they provide to users, existing on a spectrum from the least immersive (AR) to the most immersive (VR).
- **Flipped Classroom:** is a pedagogical approach in which direct instruction is delivered outside of the classroom—typically through digital media such as

video lectures, podcasts, or online readings—while classroom time is repurposed for interactive, collaborative, and higher-order learning activities. This approach is grounded in constructivist principles, as it shifts the focus from passive reception of information to active engagement, problem-solving, and knowledge application, enabling teachers to provide more individualized guidance and feedback during class.

- **Generative Artificial Intelligence (Gen AI)**: Generative AI refers to a class of artificial intelligence systems capable of creating new content, such as text, images, audio, video, or code, based on patterns learned from large datasets. Unlike traditional AI, which primarily classifies or predicts, Gen AI generates original outputs that resemble human-produced work. Models such as large language models (e.g., ChatGPT) and generative image tools (e.g., DALL·E) are examples of Gen AI. These systems can support creativity, communication, and problem-solving across disciplines, including education, by enabling users to co-construct meaning, personalize learning experiences, and produce multimodal content.
- **Hybrid Learning:** is a pedagogical approach that strategically integrates face-to-face instruction with online learning experiences in a coherent and complementary manner**.** Unlike simple course supplementation with digital tools, hybrid learning involves a purposeful design where in-person and virtual components are interdependent, enabling flexibility in time, place, and pace of learning. It aims to combine the social interaction and immediacy of classroom teaching with the accessibility, personalization, and technological affordances of online environments, thereby fostering deeper engagement and improved learning outcomes.
- **Immersion**: It refers to the degree to which a VR system can shut out the physical world and fully engage a user's senses in the virtual experience. It is primarily a technological property, involving visual, auditory, and sometimes haptic feedback to create a surrounding, enveloping environment
- **Inclusive education:** *a* pedagogical and social approach that ensures all learners, regardless of their abilities, backgrounds, or circumstances, have equitable access to high-quality education within mainstream learning environments. It is grounded in principles of equity, diversity, and participation, emphasizing the removal of barriers to learning and the provision of appropriate support, resources, and differentiated instruction to meet varied learner needs. Inclusive education goes beyond the integration of students with disabilities to embrace all forms of learner diversity—including cultural, linguistic, socio-economic, and gender differences—thereby fostering a sense of belonging, respect, and active engagement for every student.
- **Lifelong learning**: learning that takes place at all stages of life cycle and, in more recent versions that is embedded in all life contexts from the school to

the workplace, the home and the community. Lifelong learning is the continuous building of skills and knowledge during one's life that occurs through experiences faced lifetime.

- **Massive open online courses (MOOC):** online courses designed for large-scale participation, open access via the internet, and free or low-cost enrolment, typically offered by universities or educational platforms. They provide structured learning experiences that may include video lectures, readings, assessments, and interactive forums. The "massive" dimension refers to their scalability, allowing potentially thousands of learners to participate simultaneously, while "open" indicates accessibility without traditional entry requirements.
- **Metaverse**: is the emerging 3-D-enabled digital space that uses virtual reality, augmented reality, and other advanced internet and semiconductor technology to allow people to have lifelike personal and business experiences online.
- **Mixed Reality (MR):** Mixed reality (MR) shares similarities with augmented reality (AR) in that it allows users to view and interact with virtual elements superimposed onto their physical environment. However, unlike AR, which typically requires a smartphone or tablet screen, MR is experienced through dedicated headsets or smart glasses (e.g., Microsoft HoloLens or Meta Quest 3). This technology enables a more seamless and immersive experience by embedding virtual content directly into the user's real-world surroundings. In MR, virtual objects not only appear anchored in the physical space but can also respond to the user's gaze, gestures, and sometimes voice commands. As a result, MR fosters a stronger sense of spatial integration and interaction between digital and physical elements, minimizing the perceptual disconnect caused by screen-based viewing in AR.
- **Open Educational Resources (OER):** teaching, learning, and research materials that are freely available in the public domain or released under an open license that permits their free use, adaptation, and redistribution by others with minimal or no restrictions. They may include textbooks, lesson plans, videos, assessments, or digital tools, and are designed to reduce barriers to access, support innovation in pedagogy, and promote equity in education.
- **Open Pedagogy:** refers to a teaching and learning approach that leverages the use of OER and open practices to engage learners as active participants and co-creators of knowledge. Rather than being passive consumers of content, students contribute to the learning process through collaboration, creation, and sharing of openly licensed materials. This approach emphasizes transparency, inclusivity, and participatory learning, aligning with constructivist and student-centered pedagogies.

- **Presence**: Sense of presence in VR refers to the psychological perception or feeling of "being there" within a virtual environment. It occurs when users cognitively and emotionally accept the virtual world as their temporary reality, often losing awareness of the physical surroundings. This affordance is central to effective VR experiences, as it enhances engagement, emotional response, and authenticity in interaction.
- **Project-Based Learning (PjBL)**: Project-Based Learning (PjBL) is widely recognised as an effective pedagogical strategy for enhancing student learning outcomes in higher education. As a form of inquiry-driven, collaborative learning, PjBL engages students in active exploration of meaningful questions or challenges over an extended period. In this approach, learners typically work in teams to investigate real-world issues or design solutions, culminating in the creation of a tangible product or presentation intended for a specific audience. Throughout the process, students apply interdisciplinary knowledge, reflect on their learning, and evaluate both the outcome and the collaborative effort involved. PjBL promotes critical thinking, creativity, communication, and self-management skills, aligning closely with 21st-century educational goals and the demands of contemporary professional environments.
- **Problem-Based Learning (PBL)**: Problem-Based Learning (PBL) is a learner-centred instructional approach in which students develop knowledge and skills by actively engaging with real-world or open-ended problems. Rather than receiving direct instruction, students collaboratively explore complex scenarios, identify what they need to learn, and work together to propose solutions. This method promotes inquiry, critical thinking, and self-directed learning. PBL integrates principles of active, experiential, and collaborative learning, positioning the teacher as a facilitator who guides students' inquiry and monitors their learning processes. The problems presented in PBL are often designed as realistic cases or scenarios that reflect authentic challenges, thereby fostering deeper engagement and practical application of knowledge.
- **Social Constructivism**: the construction of knowledge as a social process (Vygotsky, 1978). This suggests that individuals create or construct knowledge through the interaction of their past experiences and what they already know and the ideas, experiences and activities with which they come in contact, in other words their social surroundings. For Social constructivism, social interaction, collaboration and engagement in problem-solving processes are important for the success of the learning process.
- **Social High-Immersion VR (SHiVR)**: SHiVR refers to immersive virtual environments that enable users to interact socially and collaboratively in real time through embodied avatars. Combining high sensory immersion (typically via head-mounted displays) with features such as spatial audio, gesture tracking, and shared virtual spaces, SHiVR supports a strong sense of presence

and co-presence. It allows users not only to feel "inside" the virtual world but also to engage meaningfully with others, making it particularly valuable for education, language learning, and communication-based tasks that benefit from embodied, context-rich interaction.

- **STEM (Science, Technology, Engineering, and Mathematics):** educational framework was first developed to support an integrated approach to teaching these subjects to prepare students for future innovation and global competitiveness (American Association for the Advancement of Science, 2001).
- **STEAM (Science, Technology, Engineering, Arts and Mathematics)**: is an approach to learning that uses science, technology, engineering, arts, and mathematics as access points to guide student inquiry, dialogue, and critical thinking. This method fosters creativity and problem-solving abilities by encouraging students to participate in inquiry, discussion, and critical thinking.
- **STEAM education:** aims to prepare students for the complexity of the modern world by making STEM subjects more approachable and engaging through the use of the arts
- **Transdisciplinarity:** mutual and transformative learning, distinguished by its emphasis on problem-solving, transcendence, and transgression. The prefix "trans-" denotes learning that occurs "between, across, and even beyond" disciplines (Nicolescu, 2010, 2012) or the creation of knowledge of superior quality compared to simply merging two or more distinct disciplines along with their themes, concepts, and methodologies.
- **Transformative Learning Theory:** *is a* theory of adult learning that emphasizes the process by which learners critically examine and question their existing assumptions, beliefs, and perspectives, leading to a profound shift in worldview and behavior. Central to this theory is the role of critical reflection and dialogue, through which learners identify and challenge taken-for-granted frames of reference, often prompted by a “disorienting dilemma.” In educational practice, transformative learning encourages deep engagement, self-awareness, and perspective transformation, enabling learners not only to acquire knowledge but also to develop more inclusive, autonomous, and integrative ways of understanding themselves and the world (Mezirow, 1998).
- **Transversality:** the integration and application of skills and competences across various disciplines and contexts.
- **Transversal skills and competences (TSCs):** (also referred to as soft skills, key competences, 21st century skills, and global competences) are learned and proven abilities which are commonly seen as necessary or valuable for effective action in virtually any kind of work, learning, or life activity. They are“transversal” because they are not exclusively related to any particular context.

- **Virtual Reality (VR)**: Virtual reality (VR) can be categorized into two main types: low-immersion and high-immersion VR. In low-immersion VR (LiVR), users interact with a virtual environment displayed on a standard screen (such as a desktop monitor) while remaining fully aware of their physical surroundings. This type of VR is commonly found in virtual worlds like *Second Life* or *OpenSimulator*, which are accessible via conventional computers.

  In contrast, high-immersion VR (HiVR) offers a fully immersive experience in a 360° virtual environment through the use of a VR headset, such as the Meta Quest 3. These headsets typically provide both visual and auditory immersion, and users navigate the virtual space using hand controllers (similar to operating within a video game). However, recent advancements have introduced controller-free interaction, allowing users to navigate and interact through hand-tracking or gesture recognition technology, enhancing the sense of presence and ease of use.

  High-immersion VR is widely regarded as the most immersive of the extended reality (XR) technologies, as it isolates users from the physical world and fully immerses them in a digitally constructed environment.

Useful links

- Project official website: https://transformative-pedagogies.univ-tech.eu/
- Project Community of Practice (CoP): https://agora.univ-tech.eu/sphere/2qi213
- Moodle platform:
- The Transformative Digital Pedagogical Competence Framework on the TDP4HE project website here: https://transformative-pedagogies.univ-tech.eu/project-results-reports
- (From Module 2): VR Chemistry Lab overview: https://www.youtube.com/watch?v=md-ijiH9Q_0
- (From Module 2): Extended Reality (XR) and Storytelling for STEAM Education - Office of Research
- (From Module 2): STEAM Institute | Jacksonville University in Jacksonville, Fla.
- (From Module 5) Digital Education Action Plan: policy background

References

Abdullah, Z. D., & Mustafa, K. I. (2019). *The underlying factors of computer self-efficacy and the relationship with students' academic achievement*. *International Journal of Research in Education and Science, 5*(1), 346–354.

American Association for the Advancement of Science. (2001). *Designs for science literacy*. Oxford University Press.

Bitar, N., & Davidovich, N. (2024). Transforming pedagogy: The digital revolution in higher education. *Education Sciences*, *14*(8), 811.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, E. J., & Krathwohl, D. R. (Eds.). (1956). *Taxonomy of educational objectives: The classification of educational goals*. New York, NY: Longmans, Green and Co.

Blundell, C., Lee, K. T., & Nykvist, S. (2020). Moving beyond enhancing pedagogies with digital technologies: Frames of reference, habits of mind and transformative learning. *Journal of Research on Technology in Education, 52*(2), 178–196. https://doi.org/10.1080/15391523.2020.1726235

Bremner, N. (2021). The multiple meanings of 'student-centred' or 'learner-centred' education, and the case for a more flexible approach to defining it. *Comparative Education, 57*(2), 159–186. https://doi.org/10.1080/03050068.2020.1805863

Bruffee, K. A. (1999). *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge* (2nd ed.). Johns Hopkins University Press.

Cornell University, Center for Teaching Innovation. (n.d.). *Learning outcomes: A 4-step workflow*. Cornell University. https://teaching.cornell.edu/teaching-resources/learning-outcomes

European Commission, Directorate-General for Education, Youth, Sport and Culture. (2021). *Education and training monitor 2021: Executive summary*. https://data.europa.eu/doi/10.2766/480191

European Commission (2022). *Digital Education Action Plan (2021–2027)*. Brussels: EC. https://op.europa.eu/en/publication-detail/-/publication/c8eef67f-0346-11eb-a511-01aa75ed71a1/language-en

European Commission. (2025). Digital Competence Framework for Educators (DigCompEdu). https://joint-research-centre.ec.europa.eu/digcompedu_en

Fernández-Raga, María; Villard, Thierry. (2020). Multidisciplinary and international virtual collaboration on the "Shared Garden" between the Universities of Bordeaux

and León. In Helm, Francesca; Beaven, Ana (Eds), *Designing and implementing virtual exchange – a collection of case studies* (pp. 59-68). Research-publishing.net. https://doi.org/10.14705/rpnet.2020.45.1115

Fuller, S. (2022). Building communities of practice in distance learning courses for higher education teacher development. *Compass: Journal of Learning and Teaching in Higher Education*, *15*(1).

Garone, A., Bruggeman, B., Philipsen, B., Pynoo, B., Tondeur, J., & Struyven, K. (2022). Evaluating professional development for blended learning in higher education: a synthesis of qualitative evidence. *Education and Information Technologies*, *27*(6), 7599-7628.

Géraldine, H., Sawsen, L., & Marilou, B. (2021). An examination of teachers' strategies to foster student engagement in blended learning in higher education. *International Journal of Educational Technology in Higher Education*, 18(1).

Gholami, M., Changaee, F., Karami, K., Shahsavaripour, Z., Veiskaramian, A., & Birjandi, M. (2021). Effects of multiepisode case-based learning (CBL) on problem-solving ability and learning motivation of nursing students in an emergency care course. *Journal of Professional Nursing,* *37*(3), 612–619. https://doi.org/10.1016/j.profnurs.2021.02.010

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, 102, 101586. https://doi.org/10.1016/j.ijer.2020.101586

Harper, C. V., McCormick, L. M., & Marron, L. (2024). Face-to-face vs. blended learning in higher education: a quantitative analysis of biological science student outcomes. *International Journal of Educational Technology in Higher Education*, *21*(1), 2.

Jocius, R., O'Byrne, W. I., Albert, J., Joshi, D., Blanton, M., Robinson, R., ... & Catete, V. (2022). Building a virtual community of practice: Teacher learning for computational thinking infusion. *TechTrends*, 66(3), 547-559.

Kakoulli Constantinou, E., Verchier, Y., & Flynn, P. (2025). Defining the teaching profiles of academic staff across a European Universities Alliance: Lessons learned after the pandemic and the way into the future. *International Journal of Innovative Research and Scientific Studies,* *8*(1) 2025, pages: 369-379. https://www.ijirss.com/index.php/ijirss/article/view/4170

Lavrinoviča, B. (2021). Transdisciplinary learning: From transversal skills to sustainable development. *Acta Paedagogica Vilnensia*, (47), 93-107.

Lawlor, K. B. (2012). Smart goals: How the application of smart goals can contribute to achievement of student learning outcomes. In *Developments in business simulation and experiential learning: Proceedings of the annual ABSEL conference* (Vol. 39).

Li, X., Yang, Y., Chu, S. K. W., Zainuddin, Z., & Zhang, Y. (2022). Applying blended synchronous teaching and learning for flexible learning in higher education: an action research study at a university in Hong Kong. *Asia Pacific Journal of Education*, 42(2), 211-227.

Mezirow, J. (2018). Transformative learning theory. In *Contemporary theories of learning* (pp. 114-128). Routledge.

Mora, H.; Signes-Ponta, M.T.; Fuster-Guilló a, A. & Pertegal-Felices, m. (2020). A collaborative working model for enhancing the learning process of science & engineering students. *Computers in Human Behavior, 103,* 140-150. https://doi.org/10.1016/j.chb.2019.09.008

Nicolescu, B. (2010). Methodology of Transdisciplinarity—Levels of Reality, Logic of the Included Middle and Complexity. *Transdisciplinary Journal of Engineering & Science*, 1, 17-18. https://doi.org/10.22545/2010/0009

Oxford, R. L. (1997). Cooperative learning, collaborative learning, and interaction: Three communicative strands in the language classroom. *The Modern Language Journal, 81*(4), 443–456. https://doi.org/10.1111/j.1540-4781.1997.tb05510.x

Parmaxi, A., & Zaphiris, P. (2015). Developing a framework for social technologies in learning via design-based research. *Educational Media International, 52*(1), 33–46. https://doi.org/10.1080/09523987.2015.1005424

Salvador, R., Barros, M. V., Barreto, B., Pontes, J., Yoshino, R. T., Piekarski, C. M., & de Francisco, A. C. (2023). Challenges and opportunities for problem-based learning in higher education: Lessons from a cross-program Industry 4.0 case. *Industry and Higher Education, 37*(1), 3–21. https://doi.org/10.1177/09504222221100343

Siemens, G. (2005). Connectivism: A learning theory for the digital age. International Journal of Instructional Technology & Distance Learning, 2, 3-10.

Soulé, M. V., & Kakoulli Constantinou, E. (2024, June). Digital pedagogies for higher education: the design of an online training programme for academic staff. In *International Conference on Human-Computer Interaction* (pp. 91-102). Cham: Springer Nature Switzerland.

Tawfik, A. A., Branham, B., Hitch, L., Reeves, T. D., Gill, A., & McCook, A**.** (2020). Comparing how different inquiry-based approaches impact learning outcomes. *Interdisciplinary Journal of Problem-Based Learning, 14*(1). https://doi.org/10.14434/ijpbl.v14i1.28624

Tsybulsky, D., & Muchnik-Rozanov, Y. (2019). The development of student-teachers' professional identity while team-teaching science classes using a project-based

learning approach: A multi-level analysis. *Learning and Instruction, 60*, 1–11. https://doi.org/10.1016/j.learninstruc.2018.11.002

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981

Vindača, O. (2023). *Report WP2: Theoretical and empirical framework of transformative digital pedagogical competences. WP2.1 Overview of assessment frameworks.* ERASMUS+ project "Transformative Digital Pedagogies for Higher Education" (Contract No. 2022-1-LV01-KA220-HED-000085277). Riga Technical University.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Yan, X., Zhu, Y., Fang, L. et al. (2023). Enhancing medical education in respiratory diseases: efficacy of a 3D printing, problem-based, and case-based learning approach. *BMC Med Educ 23,* 512 https://doi.org/10.1186/s12909-023-04508-6

Zhang, P., & Tur, G. (2023). Collaborative e-portfolios use in higher education during the COVID-19 pandemic: A co-design strategy. *International Journal of Educational Methodology, 9*(3), 585-601. https://doi.org/10.12973/ijem.9.3.585

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