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ΣΧΟΛΗ ΧΗΜΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΤΟΜΕΑΣ ΙΙ

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Αιμιλία Πρωτόγερου & Παναγιώτης Παναγιωτόπουλος

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AI & the new landscape in Higher Education: Teachers

Opportunities

- Personalized teaching through adaptive learning systems
- Automation of administrative tasks (e.g., grading, emails, student analytics)
- AI-supported research (e.g., literature reviews, data analysis)
- Development of innovative teaching methods (e.g., chatbots, simulations)
- New research avenues in AI ethics, governance, and applications

Risks

- Erosion of the educator's role and authority
- Dependence on opaque or biased algorithms for pedagogical decisions
- Challenges in detecting plagiarism and AI-generated content
- Ethical concerns (e.g., data privacy, surveillance, bias in AI tools)
- Dependence on opaque or biased algorithms for pedagogical decisions
- Increased inequality among educators depending on access to or familiarity with AI tools

AI & the new landscape in Higher Education: Students

Opportunities

- Personalized learning experiences tailored to learning pace and style
- Faster feedback and support via AI tutors or assistants
- Development of AI literacy and future job market readiness
- Enhanced self-directed learning and content generation

Risks

- Academic integrity risks (e.g., unauthorized use of AI in assignments)
- Loss of critical thinking and over-reliance on AI-generated responses
- Exposure to inaccurate or hallucinated content from AI tools
- Digital divide: not all students have equal access or technical skills to use AI effectively

The context of this work: The AI-THOS project

An **Erasmus+ project** that aims to equip higher education institution (HEI) educators, students, and researchers with the knowledge and skills necessary **to use AI technologies responsibly,** in **full alignment with ethics and research integrity (ERI) principles.**

Key objectives:

1. **Develop and pilot a "Train-the-Trainer" programme** for HEIs teaching staff
2. **Develop and test the AI-THOS Curriculum** for students and young researchers
3. **Create a comprehensive online course** to support learning and dissemination

Consortium (4 Universities & 2 non-Academic partners)

The context of this work: AI-THOS "**Train-the-Trainer Programme**"

Educational material that aims to increase **the awareness, knowledge and skills of HEI teaching staff** (professors, researchers, PhD students) **across various academic levels and scientific disciplines,** with a focus on the responsible use of AI in teaching and research.

How it was developed:

- **Comprehensive review** of existing AI tools, educational methods, guidelines for research integrity etc.
- **Survey in 130 teachers (≥ 30 per country)** to assess: awareness and familiarity with AI tools in educational settings, current use and perceived benefits or challenges, concerns related to ethical and integrity issues in AI adoption
- **In-depth interviews with 20 teachers from various disciplines (5 per country)** to better understand: their perceptions and engagement with AI tools in teaching, focusing on personal experiences, integration practices, attitudes, concerns, training needs, and disciplinary variations.

- **1st testing and feedback:** 3-day International Bootcamp in Slovenia involving teaching staff from all participating countries (> 4 per country).
- **2nd testing and feedback:** National workshops in the 4 countries (> 40 participants in the Greek workshop)

Structure of Train-the-Trainer Programme: the 5 core sections

1. **EU Code of Conduct for Research Integrity**: Aims to familiarize teaching/research staff with ERI principles considering the “AI reality”.
2. **AI tools in Higher Education**: Provides an overview of widely used AI tools in teaching and learning, i.e., key functionalities and educational applications, basic principles and good practices for effective and responsible use, introduction to prompt engineering techniques
3. **Using AI to Support Alternative Teaching Methods**: Presents real-life examples of using generative AI to implement alternative teaching methods in undergraduate and postgraduate courses.
4. **Methodology for Co-designing new learning resources**: Aims to familiarize teaching staff with a collaborative/reflective process of creating pedagogically sound educational resources relating to ERI in the AI era.
5. **Reflection on the educational material**: Provides guidelines (specific methods, questions and tasks) for individual and group reflection on the Programme and presents reflection methods to be used in teaching practices.

Responsible use of AI in teaching and learning: Alignment with Ethics & Research Integrity (ERI) principles

4 Basic Research Integrity (RI) principles (EU Code of Conduct sets principles and standards for responsible research across Europe):

- Reliability
- Honesty
- Respect
- Accountability

Key additions in the 2023 EU CoC regarding AI:

- Emphasis on Transparency in AI Usage
- Responsibility for AI-Generated Content
- Addressing Potential Misconduct Involving AI
  - Fabrication: Generating fictitious data or results.
  - Falsification: Manipulating research processes or altering data.
  - Plagiarism: Presenting AI-generated content without proper attribution.

Challenges for Researchers and Institutions

- **Training and Awareness:** Institutions should provide training to ensure that researchers are aware of the ethical considerations when using AI tools.
- **Policy Development:** Academic and research organizations are encouraged to develop policies that align with the Code's recommendations on AI usage.
- **Continuous Monitoring:** Given the rapid advancement of AI technologies, ongoing assessment and adaptation of research practices are essential to uphold integrity.
- **An integrated systemic approach for fostering RI** at all levels is needed: RI is **a collective responsibility** shared by **a variety of stakeholders,** i.e., researchers, institutions, research funders, publishers, reviewers, readers as well as governmental authorities responsible for science and research policy (Zhaksylyk et al. 2023; Bouter, 2023).

Alternative teaching methods

- Instructional strategies that go **beyond traditional lecture-based formats**, aiming to enhance **student engagement**, foster **critical thinking**, and promote **deeper learning**.

- Increasingly embraced by higher education institutions to address diverse learning styles, encourage collaboration, and integrate real-world problem-solving into academic curricula.

Types of alternative teaching methods (1)

Teaching Method	Description
Problem-based Learning (PBL)	• Students solve **open-ended**, **real-world** problems through active investigation. • Educator acts as a **facilitator**. • Problems introduced before relevant theory. • **Multiple solutions** often possible. • Emphasizes **self-directed learning**.
Case-based Learning (CBL)	• Students analyze **structured** cases in groups. • Instructor guides discussion and solution development. • More structured and **directed** than PBL. • Emphasizes **guided learning**.
Flipped Classroom	• **Ple-Class Phase (self-directed learning):** ➢ Teachers create or suggest ready-to-use study materials. ➢ Students to read and reflect independently at home. • **In-Class Phase (collaborative learning)** focuses on Q&A sessions, exercises, projects, and discussion. ➢ Emphasis on **applying knowledge and critical thinking**.

Types of alternative teaching methods (2)

Teaching Method	Description
Team-based Learning (TBL)	• **Three-step instruction cycle that builds on flipped classroom principles:** ➢ **Pre-class preparation.** ➢ **In-class readiness assurance testing** to ensure understanding. ➢ **In-class application exercises.**
Jigsaw Method	• Students form small, interdependent groups (**expert groups**) given the responsibility for developing expertise on a subcategory of a larger topic. • Reorganize into **mixed groups** (at least one representative from each expert group). • Each student then **teaches** their material, promoting deeper understanding of the whole topic. • Encourages **collaboration, accountability, and peer teaching.**
Game-Based Learning (GBL)	• Uses **game elements** to enhance learning and engagement. • **Boosted by the rise of digital games** in education. Gradual increase in the number of game types. • Has attracted increasing attention in **AI education** particularly within universities (Zhan et al., 2022). • Can be effective for **abstract topics** like **AI ethics**.

Examples of generative AI use in alternative teaching methods

Example 1: Professor of accounting (Athens University of Economics and Business)

- **Extensive AI use** in course design and teaching (undergraduate and postgraduate levels).

➢ **Problem/case-based learning:**

- During class, students are encouraged to use the **ChatGPT+ functions for data (financial) analysis and web browsing.**
- Students receive financial reports from anonymized companies. Two tasks assigned: a) financial statement analysis, and b) content analysis of large pdf financial documents.
- **Custom AI prompts** provided to support structured analysis.
- Students present findings in class, leading to a relevant and engaging classroom discussion.

Example 1: Professor of accounting (Athens University of Economics and Business)

- **Flipped Classroom with Generative AI Support (Postgraduate Level)**
  - Students (in groups) **prepare 10–15 min presentations** on lecture topics.
  - Permitted to use **ChatGPT+** for gathering information.
  - **Post presentation discussion**, the teacher provides feedback and engages the entire class in a discussion.
- **Focus areas**:
  - **Validity** of sources and empirical evidence used.
  - **Critical assessment** of AI-generated content (i.e., examining whether findings are substantiated by reliable sources or logical reasoning.
  - The teacher guides students in **developing judgement** needed to assess the material critically.

Example 1: Professor of accounting (Athens University of Economics and Business)

- **Examination Method:**
  - Replaces **traditional essay assignments** (1–3 months) with **live evaluation**.
  - Each student has **1 hour** to prepare a **financial analysis presentation on a specific company.**

- **Aim to**:
  - **Ensure originality** of student work.
  - **Prevent misuse** of AI for pre-written essays (e.g., via ChatGPT).
  - Evaluate **critical thinking and real-time problem-solving**.

Example 1: Professor of accounting (Athens University of Economics and Business)

- **Educational-learning outcomes:**
  - Increased student engagement in the educational process.
  - Improved comprehension of the teaching material and more efficient financial analysis.
  - Class time used for
    - Discussing analysis results
    - Teacher-student interaction
    - **Critical thinking development**
  - Flipped classroom enables deeper engagement and frees more class time for discussion, interaction, and higher-order thinking.
  - Students build AI competencies, crucial for new graduates, particularly for careers in finance and economics.

Example 4: Associate Researcher on machine learning at the “Athena” Research Center

Course Context:
Postgraduate programme in **Language Technology** using **problem-based and cooperative learning** methods.

- **Problem-Based Learning Practice:**
  - Students solve **programming exercises** individually or in groups.
  - Permitted to use **ChatGPT+** for code generation.
  - Required to **submit chat links** for teacher review.

- **Evaluation Focus:**
  - Review of **interaction between students and ChatGPT+** to evaluate their problem-solving processes.
  - Assessment of how students **divide problems into subproblems**, ask ChatGPT+ to **generate code** for specific subproblems, and **improve the code** they have written themselves.

Example 4: Associate Researcher on machine learning at the "Athena" Research Center

- **Aspects of Jigsaw Method with ChatGPT+ (Postgraduate Level)**
  - ➢**Collaborative reading practice**
    - Students work in **reading groups b** of 5. Each student selects to read a book chapter or a paper and presents it to the group.
    - All students submit presentations and/or pdf annotations/comments and a summary of the relevant discussion.
- **AI Integration:**
  - ➢Students provide **ChatGPT+ interaction logs** for sections where they needed support.
  - ➢Teacher assesses:
    - **Critical and targeted use** of ChatGPT+
    - Depth of students' **conceptual engagement**
- **Pedagogical Framework:**
  - ➢Inspired by the Jigsaw method
  - ➢Flipped classroom adoption under consideration

Example 4: Associate Researcher on machine learning at the "Athena" Research Center

- **Educational-learning outcomes:**
  - Through **problem-based learning**, students cultivate problem-solving skills and specifically their ability to use ChatGPT+ for programming exercises.
  - The use of a Generative AI tool in programming exercises facilitates the acquisition of technological knowledge and skills among students from the humanities, helping them become more easily familiar with these domains.
  - In the Jigsaw-like Method, students enhance their ability to effectively utilize ChatGPT for comprehending educational materials to a degree that enables them to present the main points to their peers.
  - Both methods help students become acquainted with the transparent and ethically sound use of AI, under the guidance and supervision of their teacher.

Conclusions: Educational Benefits of AI Tools in Teaching

- Teachers must
  - Develop the **necessary knowledge and AI literacy** to effectively integrate AI tools into their courses in a beneficial way for students' learning. **Integration of AI tools in education requires significant preparation.**
  - Provide **guidance on responsible and transparent AI use** to students.
  - **Adapt evaluation methods** (e.g., oral exams, in-class assessments) to address AI-related challenges.
- Emphasis should be placed on **faculty training** and **curriculum updates** to build AI competencies (build a relevant culture and mindset).
- **Key take aways:**
  - AI **cannot replace** the role of teacher.
  - Teachers are essential in **leveraging AI to improve educational outcomes**.

Conclusions: The evolving role of teacher in the AI era

- AI tools can enhance **interactive teaching methods** and support **better learning outcomes.**

➢ **Key benefits:**

- Foster **critical thinking** and **problem-solving** skills
- Enable **student-centered and personalized learning** (e.g., providing assignments of varying difficulty, and tailored guidance).
- Support **deeper understanding** of complex material.
- Support and strengthen **responsible AI use** (critical evaluation of AI output, data treatment/data privacy, transparency and mutual trust, accountability)

➢ **Additional Advantages:**

- Advanced AI-based self-assessment provides valuable insights.
- Enables instructors to refine course content and improve teaching strategies.