INFINITE
AI in Higher Education

JULY 20, 2025

WP2
AI LITERACY TOOLKIT

UNIVERSITY OF NICOSIA
ALL PARTNERS

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Table of Contents

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Section 1: Introduction

The INFINITE AI Literacy Toolkit is an interactive support package for Higher Education (HE) academics to advance their professional practices for integrating Artificial Intelligence (AI) tools into their professional and pedagogical practice.
The specific objectives are to:

- raise awareness about the affordances and challenges of AI for stimulating Innovative professional and pedagogical practice in HE;
- compare national/European data, results, and needs in terms of the integration of AI-based approaches in HE;
- equip HE academics with practical guidelines and best practices on how to select and integrate data- AI-based tools for professional and pedagogical practice;
- encourage HE academics to use AI tools with ethical responsibility and integrity in their professional and pedagogical practice;
- promote HE institutions' digital transformation through preparedness of the HE community, to leverage AI for professional and pedagogical practice.

The Toolkit will be a foundational guide on best practices, which can be easily adopted and adapted by HEIs. On the one hand, the research activity that is part of this WP, provides the partnership with a deep understanding and expertise on the affordances and complexities of using AI-powered tools. This will produce high-quality deliverables that meet the target audience's needs. A platform will be also given to key people in the field to express themselves freely and suggest the changes they wish to see In the HE sector.

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Section 2: Theoretical Background

This section presents the theoretical background of the Toolkit with definitions of key terms and notions related to the use of AI in HE along with the role of these advanced technologies in education, their challenges, and their benefits. Having the definitions outlined early on sets a common ground for the Toolkit use, it allows all readers and users to be on the same page and catch up regardless of their current knowledge level.

Glossary of key terms

Adaptive Learning

Adaptive learning is a pedagogical approach that utilises advanced technology, specifically machine-learning algorithms to offer personalised learning experiences tailored to individual students' needs, preferences, knowledge level and learning style. It uses data-driven algorithms and AI to dynamically adjust the content, the delivery, and the pace of instruction based on students' performance and engagement. By adapting to the specific requirements of each student, adaptive learning promotes effective and efficient learning, increases engagement, and enhances educational outcomes. (Gligorea et al., 2023)

Artificial Intelligence (AI)

Artificial Intelligence (AI) in education is a promising field that has attracted researchers' attention. AI is the machine's capacity to think like a human, learn and evolve (Limna et al., 2022). In educational practices, AI creates new opportunities, potentials, and challenges. It can support administrative tasks such as grading, teaching, and learning activities such as feedback provision. To some extent, AI can act like tutors by explaining concepts, giving feedback, and modifying teaching as in the case of adaptive systems, but also pedagogical tools, which students can use during the learning process (e.g., for cognitive tasks, scaffolding) (Hwang et al., 2020).

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Automatic grading system

An automatic grading system is a professional computer programme based on AI that simulates a teacher's behaviour to assign grades to student tasks in an educational setting. It evaluates student knowledge, analyses responses, provides feedback, and creates personalised training programmes. It is used in many AI education apps. The automatic grading systems provide the student with an evaluation score during his/her test. This method can assist teachers in better understanding their students' learning situations while students are more aware of their learning achievement and mastery of knowledge. Overall, these automatic grading systems can deal with the complexities of the teaching context and support students' learning process by giving them feedback and guidance (Limna et al., 2022; Yufeia et al., 2020).

Automation

The computer system automates tasks that typically require human intervention. By automating repetitive tasks like timetabling, attendance, and enrolment, schools and teachers can free up time for more meaningful interactions with students (European Commission, 2022).

Bias

Bias is the predisposition towards or against something that can manifest in AI systems in various ways. Data-driven AI, often built using machine learning, can inherit biases present in the training data. Logic-based AI, like rule-based systems, may reflect the biases of the knowledge engineer who defines the rules. Bias isn't always harmful; it can be beneficial in certain contexts. However, when it leads to discriminatory or unfair outcomes, it is a concern. It can arise unintentionally, due to limited exposure to diverse situations, or intentionally, if designed to favour a particular group. (European Commission, 2022)

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Chatbots

Chatbots, often referred to as dialogue systems or conversational agents, are programmes that communicate with people through text or voice commands in a way that mimics human-to-human conversation (European Commission, 2022). They are increasingly used in HE through various AI technologies. Their strength lies in their ability to engage users in a natural, conversational tone. For example, Georgia State University implemented a text-based chatbot called "Pounce" to assist students with tasks such as registration, admissions, financial aid, and other administrative processes. (Akgun & Greenhow, 2021)

Facial recognition systems

Facial recognition systems are utilised to track and analyse students' facial expressions. These systems offer valuable Insights Into student behaviour during learning activities, enabling educators to respond accordingly. This, in turn, supports teachers in adopting learner-focused approaches and enhancing student engagement. (Akgun & Greenhow, 2021)

Generative AI

Generative AI uses algorithms to produce original content like text, images, or audio. It does this by learning the patterns within existing data and then creating new data that shares those same characteristics. (Oluwagbenro, 2024)

Learning Analytics

Participants' activities and interactions are available through the digital tools implemented, which provide teachers and learning designers with vast information regarding the formers' learning progress. By collecting and analysing such data properly, education stakeholders can act to follow a practical approach (Klašnja-Milićević et al., 2020).

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Machine Learning

Machine learning (ML) is a part of artificial intelligence (AI) that lets machines learn from data without needing explicit programming. Its goal is to train machines using given data and algorithms so they can learn to make decisions. ML is adaptable, meaning it can change and improve as it gets more data. The "learning" in ML means its algorithms work to reduce errors and make their predictions as accurate as possible. Essentially, ML is a method for achieving AI. (Jakhar & Kaur, 2020)

Personal data

Information relating to an identified or identifiable natural person, either directly or indirectly, by reference to one or more elements specific to that specific person (European Commission, 2022).

Personalised learning systems

Personalised learning systems or adaptive learning platforms or intelligent tutoring systems, are typical and valuable applications of AI to support students and teachers. These platforms give students access to a range of learning materials based on their specific learning needs and subjects. (Akgun & Greenhow, 2021)

Predictive analytics

Predictive analytics refer to the use of statistical algorithms and machine learning techniques to make predictions about the future using current and historical data (European Commission, 2022). They are primarily employed to recognise and uncover patterns related to students by leveraging statistical data. For instance, these systems can be used to identify university students who may be in danger of failing or dropping out of a course. By pinpointing these individuals, educators can step in and provide the necessary support to help them succeed. (Akgun & Greenhow, 2021)

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Virtual Assistant

A virtual personal assistant is a software application that can respond to spoken commands and carry out actions like dictation, reading aloud, and calendar management (European Commission, 2022).

Virtual Reality

Virtual reality technology uses computer-generated imagery and haptic feedback to create a sense of presence in a simulated world. It provides immersive experiences that can be customised to individual needs and preferences. (European Commission, 2022)

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Section 3: AI-based tools

The ever-evolving field of AI is transforming how we approach learning, working, and even creating. This new landscape offers a plethora of AI-based tools designed to empower researchers, learners, educators, and collaborators. From automating research tasks to fostering lifelong learning, these tools hold immense potential to streamline workflows, spark creative ideas, and enhance the overall learning and assessment experience. Based on the desk research conducted in Cyprus, Greece, the Netherlands, Ireland and Belgium, we list and explain below some of these possibilities, exploring AI applications for research (like Elicit), lifelong learning (like ChatGPT), collaboration (like Bit.ai), teaching, learning, and assessment (including grading with Gradescope, student support with Adaptiv, and even creating writing assistance with AI tools like ChatGPT, Gemini and Quillbot).

The table below presents a summary of the AI-based tools. We have grouped and divided the tools based on what support they offer, i.e., which teaching and learning aspects they can augment.

Type of support	AI generative tools
Personalised Learning & Assessment • For students (adaptive learning, self-assessment) • For teachers (offer recommendations for personalised teaching and accommodations, analyses student work)	• ALEKS • Century • Comproved • Knewton Alta • Smart Sparrow • Simbound
Teaching, Learning and Assessment • For teachers (they assist teachers in the design of a course, the	• ClassVR • Cognii • Course Hero • Designs.ai • Dodona

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creation of the material, and managing coursework and grading).	• Dwengo Simulator • Gradescope
Conversational Learning & Skills Development • For teachers (they improve communication and practical skills)	• Alelo • AutoTutor • Braille AI Tutor • Dwengo Simulator • Linguineo
Research & Writing Assistance • For students & teachers (support students, teachers, and researchers with research and writing tasks)	• ASReview • Bing AI • ChatGPT • ChatPDF • Connected Papers • Consensus • Elicit • Gemini • Grammarly • NotebookLM • Quillbot • ResearchRabbit • Squire AI Learning
Collaboration & Knowledge Management For students & teachers (collaborate effectively and manage knowledge resources)	• Bit.ai • NOLEJ
Other tools For students & teachers (support content creation, accessibility, and improving the learning experience)	• Bing Image Creator • Cognii Chatbot • DALL-E • Deepl • D-ID • Ivy Chatbot • Lumen5 • Midjourney • Nuance Dragon • Quizlet • Sonix • zSpace

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This list provides a broad picture of how AI is impacting various aspects of education. The potential applications continue to evolve, offering possibilities for personalised learning, enhanced research capabilities, and improved teaching support.

Please note that we chose free or freemium tools (have a free version to use or experiment with, usually with restrictions in the available features) when we developed this toolkit. However, pricing is due to changes based on each company's needs, and the consortium is not responsible for any changes in these plans or features included.

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Section 4: Guidelines to utilise AI for professional and pedagogical practices

As the results of the desk research conducted under WP2 have revealed, AI-based tools have broad applications in HE, benefiting both teachers and students. They can streamline administrative tasks, inform data-driven decisions, and personalise learning. These tools also assist with assessment and feedback, enhancing student engagement and virtual support. This potential can significantly improve teaching quality, administrative efficiency and the overall learning experience.

While AI offers many advantages, its integration into education raises ethical, legal, technological, and implementation concerns. These challenges require clear guidelines, training, and a focus on responsible use. The study also emphasises the need for critical evaluation of AI tools due to potential reliability and effectiveness issues.

Therefore, given how AI applications could lead to harmful consequences, HE staff should ensure that the AI tools they are using are reliable, fair, safe, and trustworthy and that the data included is secure and protects the privacy of individuals.

The guidelines provided can help HE staff to understand the affordances of AI and raise awareness of the possible risks, so that all stakeholders are engaged positively, critically and ethically with AI systems to maximise their potential.

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The guidelines provided below are based on shared guidelines such as the OECD Framework for the Classification of AI systems[1], OECD's AI Principles[2], EC's Ethics Guidelines for Trustworthy AI[3], the EC's 2022 Ethical guidelines on the use of AI and data in teaching and learning for educators[4] and the recent UNESCO AI competency frameworks[5].

According to the guidelines and frameworks above, several key principles underpin the ethical use of AI and data in teaching, learning, and assessment. These can be categorised under guidelines related to understanding AI systems, ethical considerations, and guidelines related to practical implementation.

Understanding AI Systems

- **Assess Purpose:** Clearly define the intended purpose of any AI tool you plan to use. Align it with your educational objectives and the needs of your students.
- **Evaluate Autonomy:** Determine the level of autonomy the AI system has. This will help you understand the extent of human oversight required and potential risks.
- **Consider Environment:** Be aware of the social, cultural, and legal context in which the AI system operates. This will help you anticipate potential challenges and ensure appropriate use.
- **Assess AI Competency:** Evaluate your own AI literacy and consider professional development opportunities to deepen your understanding of AI applications in education.

[1] https://www.oecd.org/en/publications/oecd-framework-for-the-classification-of-ai-systems_cb6d9eca-en.html
[2] https://oecd.ai/en/ai-principles
[3] https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai
[4] https://education.ec.europa.eu/news/ethical-guidelines-on-the-use-of-artificial-intelligence-and-data-in-teaching-and-learning-for-educators
[5] https://unesdoc.unesco.org/ark:/48223/pf0000391104; https://www.unesco.org/en/articles/generation-ai-navigating-opportunities-and-risks-artificial-intelligence-education

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Ethical Considerations

- **Beneficial Use:** Ensure that AI tools are used to benefit students and enhance their learning experience. Focus on personalised learning, fostering critical thinking, and addressing inequalities.
- **Transparency:** Explain to students how AI systems work and how they are used in the learning process. Encourage students to critically evaluate AI outputs. You could also consider using open-source AI tools that are transparent and allow for customisation and modification.
- **Fairness:** Avoid using AI tools that could create biases or discrimination. Ensure all students have equal access to resources and opportunities, addressing potential gender, socioeconomic, or ability-based disparities.
- **Privacy and Data:** Respect students' privacy and handle their data responsibly. Adhere to data protection regulations and obtain informed consent when collecting or using student data.
- **Human Agency:** Maintain human oversight and allow students to have a say in their learning process. Encourage students to explore AI responsibly and creatively.
- **Democratic Values**: Ensure that AI tools are used in education In a way that aligns with democratic principles. This ensures that AI promotes and supports democratic values, such as the freedom of expression and inquiry (open discussion), equality of opportunity and access, and accountability.

Practical Implementation

- **Professional Development:** Seek training and professional development on AI to understand its capabilities and limitations. Stay updated on the latest developments in AI and adjust your practices accordingly. Embrace lifelong learning and encourage a culture of continuous learning among students.
- **Critical Evaluation:** Evaluate AI tools carefully, considering their effectiveness, reliability, alignment with your educational goals, and potential impact on student learning outcomes.

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- **Student Engagement:** Involve students in the decision-making process regarding AI use in the classroom. Encourage them to explore AI responsibly and participate in discussions about its potential benefits and risks.
- **Ethical Dilemmas:** Be prepared to address ethical dilemmas that may arise from AI use and have a plan for responding to such situations. Develop a culture of open discussion and ethical decision-making in the classroom.
- **Promote AI Literacy:** Integrate AI literacy into your curriculum, encouraging students to understand how AI works, its potential benefits and risks, and how to use it responsibly.
- **Discuss with colleagues:** Collaborate with other educators to make more informed decisions and ensure a more consistent approach to using AI and data systems across schools.
- **Collaborate with other schools:** Share experiences and best practices and learn how other schools have implemented AI systems. This can also be useful in identifying and dealing with reliable providers of AI and data systems that adhere to the key requirements for trustworthy AI.

Figure 1 below presents a visualised proposed framework that outlines the key principles for ethical and effective AI use in HE. A strong foundation in understanding AI systems is crucial, as it enables educators to assess the purpose, autonomy, and environmental context of AI tools. Building upon this foundation, ethical considerations, such as ensuring beneficial use, transparency, fairness, privacy, and human agency, must guide the implementation of AI. Finally, practical guidelines, including professional development, critical evaluation, student engagement, addressing ethical dilemmas, promoting AI

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literacy, and fostering collaboration, provide a roadmap for educators to successfully integrate AI into their classrooms while upholding ethical standards and maximising its benefits for students.

Practical Example: Using AI-powered Adaptive Learning for Personalised Instruction

Scenario:

A primary school wants to personalise maths instruction for students using an Intelligent Tutoring System (ITS). The school implements an ITS that adapts maths problems to each student's individual learning pace and style. The system uses data on student performance, engagement, and errors to predict their knowledge level and tailor subsequent problems accordingly.

Implementation following the Framework:

Understanding AI Systems

Purpose: The school clearly defines the purpose - to provide personalised maths instruction and track student progress.

Autonomy: The ITS has a degree of autonomy in adapting problems, but human teachers still oversee the learning process and provide guidance.

Environment: The school considers the age and developmental level of students, ensuring the ITS is appropriate for their cognitive abilities.

AI Competency: Teachers receive training on the ITS to understand its capabilities and limitations, as well as how to interpret student data.

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Ethical Considerations

Beneficial Use: The ITS is used to help students achieve their maths learning goals and close any knowledge gaps.

Transparency: Teachers explain to students how the ITS works and how it adapts to their individual needs. The system provides clear feedback on student progress.

Fairness: The ITS is designed to avoid bias in its recommendations, ensuring all students have equal access to resources and support.

Privacy and Data: The school ensures that student data is handled securely and in compliance with privacy regulations.

Practical Implementation

Professional Development: Teachers receive ongoing training on the ITS to stay updated on its features and best practices.

Critical Evaluation: The school regularly evaluates the effectiveness of the ITS in improving student learning outcomes and addresses any issues or concerns.

Student Engagement: The ITS is designed to be engaging and interactive, with features like gamification and real-time feedback to motivate students.

Ethical Dilemmas: The school has a plan to address ethical dilemmas that may arise, such as concerns about overreliance on AI or potential biases in the system.

Promote AI Literacy: Students are taught about how AI works and how it is used in the ITS, fostering understanding and critical thinking.

Discuss with colleagues: Teachers collaborate with each other to share experiences and best practices in using the ITS.

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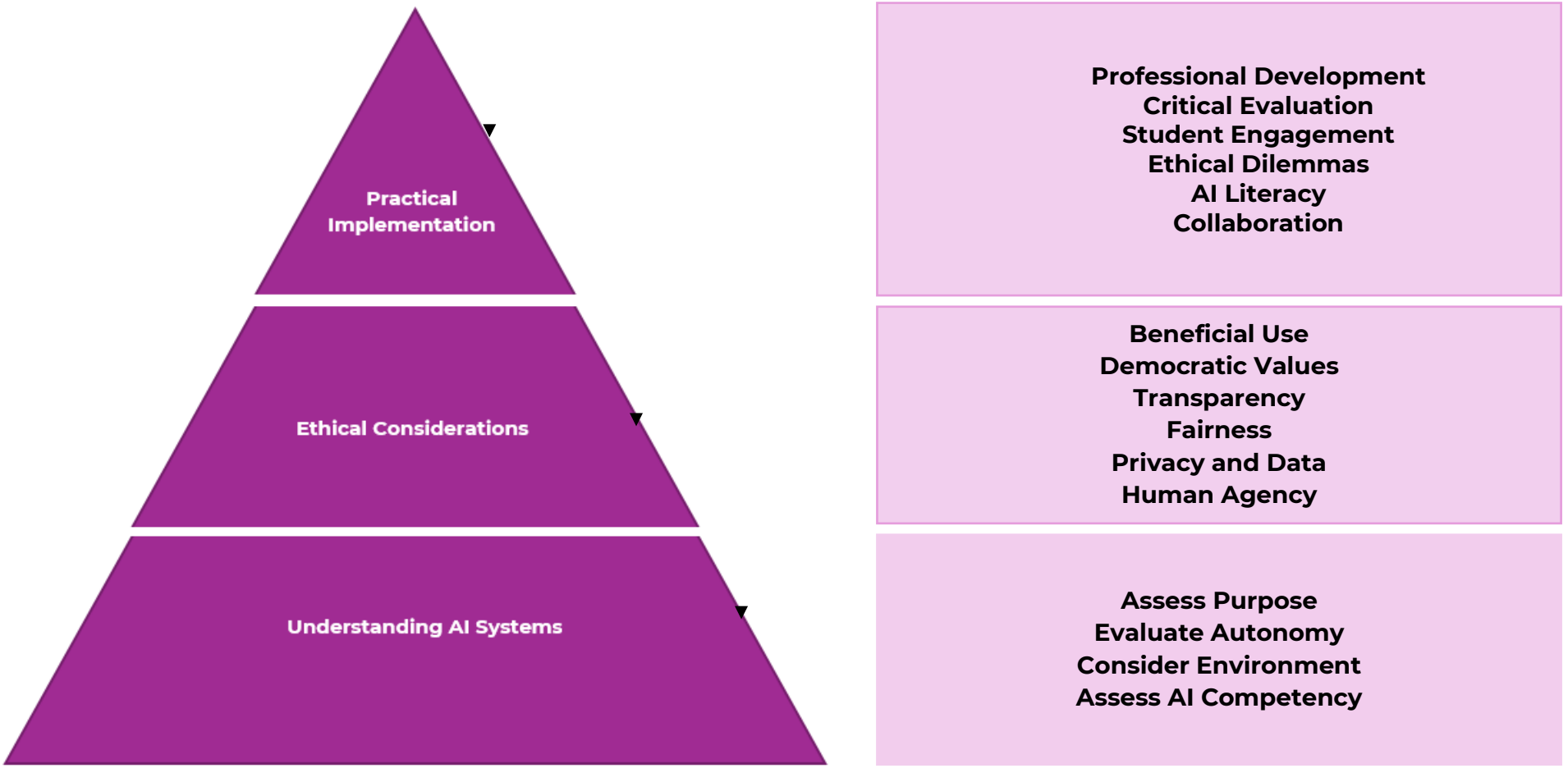

Figure 1: Visualised Framework

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Section 5: AI Readiness Checklist

This section provides a comprehensive checklist design to help HE academics to assess their level of readiness in using AI for professional and pedagogical practices. Based on existing tools such as the Readiness Assessment for Faculty Members by the National Science Foundation and Association of Computing Machinery, and the AI Readiness Self-Assessment Tool, by the AI Education Project at Harvard University, this checklist aims to provide a comprehensive framework for educators to evaluate their understanding, skills, and preparedness to effectively Integrate AI Into their teaching, learning, and assessment processes.

AI Readiness Checklist			
1. AI Awareness and Understanding			
Criteria	**Yes**	**No**	**Comments**
Are you familiar with key AI concepts (e.g., machine learning, neural networks)?			
Do you understand how AI is influencing HE and your discipline?			
Have you explored AI-enhanced tools for teaching, assessment and learning?			
Do you recognise the ethical implications of AI in educational contexts (e.g., bias, fairness)?			
Are you aware of how AI can assist in research workflows (e.g., data analysis, automation)?			
Are you aware of the potential benefits and challenges of using AI In education?			
Can you identify examples of AI-powered educational tools and applications?			

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2. Pedagogical Integration of AI			
Criteria	**Yes**	**No**	**Comments**
Have you considered how AI tools can enhance your teaching methods (e.g., project-based learning)?			
Do you use AI to personalise learning experiences for students?			
Have you used or explored AI-driven educational tools like Intelligent tutoring systems or virtual assistants?			
Can AI tools you use provide adaptive learning pathways for students based on their progress?			
Are you integrating AI-related content into your curriculum to improve student AI literacy?			
Do the AI tools align with your specific learning objectives and outcomes?			
Does the AI tool provide formative feedback and learning analytics to assess student performance?			
Are AI-based insights being used to improve student engagement and success rates?			
3. Professional Development in AI			
Criteria	**Yes**	**No**	**Comments**
Have you participated in professional development workshops or courses on AI in education?			
Do you engage with AI research communities or attend AI-related academic conferences?			
Are you actively seeking AI-focused educational resources or collaborations with AI experts?			
Are you prepared to integrate new AI technologies into your teaching practice?			

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Criteria	Yes	No	Comments
Have you considered how AI can enhance your research methodologies or teaching strategies?			
Do you collaborate with other faculty members or industry experts on AI-related projects?			
Are you committed to staying up-to-date on the latest developments in AI and its applications in education?			
4. Ethical Use of AI in Education and Research			
Are you aware of the ethical implications of using AI in education?			
Do you consider data privacy when using AI tools in education?			
Are the AI tools you use compliant with data protection regulations (e.g., GDPR)?			
Are there clear policies on how student data is handled, stored, and anonymised by AI tools?			
Can students and educators control the AI tool's data collection and usage?			
Are you aware of any biases that may exist in the AI algorithms used in your classroom?			
Does the AI tool promote fairness, diversity, and inclusivity?			
Is there transparency in how AI decisions are made (e.g., in grading, feedback)?			
Are ethical implications considered when integrating AI into research (e.g., automation of analysis, bias)?			

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5. Institutional Support and AI Ecosystem			
Criteria	**Yes**	**No**	**Comments**
Does your institution provide resources for AI education (e.g., funding, infrastructure, training)?			
Is there institutional support for integrating AI into teaching (e.g., LMS integration, AI tool licences)?			
Are there policies and frameworks in place to support AI ethics and responsible use?			
Are faculty members encouraged to engage with AI-related research or curriculum development?			
Does your institution offer collaborative opportunities to work on AI-related projects?			
Is there administrative support for developing and funding AI-driven teaching initiatives?			
Does your institution have partnerships with AI companies or research Institutions?			

After completing the AI Readiness Checklist, it is essential to reflect on your responses to identify areas of strength and areas where further development is needed. Consider questions such as: In which areas of AI do you feel most confident? Where do you see opportunities for growth? What kind of support, whether institutional, technical, or pedagogical, do you require to advance your AI readiness? Additionally, it is crucial to reflect on the ethical implications of AI in education, the potential benefits and risks, collaboration opportunities, and ensuring AI accessibility and inclusivity for all students. This self-reflection will help you tailor your professional development and AI integration efforts to meet your specific needs and goals.

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AI Readiness Checklist: Scoring System and Benchmarks

This section provides an interpretation of your AI readiness across the five thematic areas included in the checklist (a. AI Awareness and Understanding, b. Pedagogical Integration of AI, c. Professional Development in AI, d. Ethical Use of AI in Education and Research, e. Institutional Support and AI Ecosystem). By calculating your score, you can see your strengths and identify certain areas for improvement.

I. Scoring System

For each question included in each thematic area of the checklist, assign yourself points according to your responses:

- Yes: 1 Point (This shows that you meet relevant criterion and you possess the specific understanding/skill.)
- No: 0 Points (This shows that you do not meet the relevant criterion or you need further development in this area.)

Calculate your score for each thematic area based on your answers and then sum them up for your total score. For example, to find your score in a thematic area, simply calculate the number of “Yes” that you have given in each question.

Thematic Areas	Number of Questions	Max Score per Thematic Area	Your Score
1. AI Awareness and Understanding	7	7	
2. Pedagogical Integration of AI	8	8	
3. Professional Development in AI	7	7	
4. Ethical Use of AI in Education and Research	9	9	
5. Institutional Support and AI Ecosystem	7	7	
Total Possible Score	**38**	**38**	

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II. Interpreting your Overall AI Readiness Score

Based on your final score as per the previous analysis, you may refer below to corresponding levels to understand your general AI readiness level.

Level 1: AI Basic User (Total Score: 0-9 points)

- **Interpretation**: You have limited knowledge and understanding of AI as well as limited practical experience and awareness of AI's implications in education and professional settings. This score suggests that significant learning and exploration is needed.
- **Suggested Actions**:
  - Prioritise **learning** by attending some introductory courses, workshops, and focusing on readings/articles related to AI topics, its applications, and ethical principles.
  - **Experiment** with simple AI tools to grasp their functionality and consider how these can be used in your professional and pedagogical practices.
  - **Engage** in discussions about AI with your colleagues.

Level 2: AI Developing User (Total Score: 10-19 points)

- **Interpretation**: You have more than basic awareness of AI's potential and you have begun experimenting with some AI tools and their applications. However, you are still developing deeper practical skills, and critical understanding.
- **Suggested Actions**:
  - Deepen your knowledge by looking for more **specialised AI courses** or **certifications** relevant to your discipline and pedagogical interests.
  - Seek **concrete opportunities** to integrate AI tools into your daily professional tasks or simple pedagogical activities (e.g., using AI for designing interactive presentations).
  - Check and utilise available AI-related resources or training offered by your institutions.

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Level 3: AI Proficient User (Total Score: 20-29 points)

- **Interpretation**: You are confident and competent in using AI for both professional and pedagogical purposes. You have a solid understanding of AI concepts, are skilled in using various AI tools and consistently consider ethical implications. You are also actively integrating AI into your professional and pedagogical practices.
- **Suggested Actions**:
  - Move **beyond basic use** to more **strategic integration** of AI into core professional processes or pedagogical design knowledge.
  - Start **sharing** your own **best practices** for AI use based on your experience. Regularly **evaluate** the **effectiveness** and **impact** of your AI integration and explore ways of **enhancing** your **knowledge**.
  - Proactively participate in discussions on AI ethics with your colleagues within your department or institution.
  - Stay **up to date** with emerging AI technologies and developments. Explore more **advanced AI applications** relevant to your field.

Level 4: AI Master User (Total Score: 30-39 points)

- **Interpretation**: You are an expert in AI integration in your professional and pedagogical practices and competent in using AI for both professional and pedagogical purposes. You can responsibly use AI and innovate with it.
- **Suggested Actions**:
  - Lead **new AI initiatives** and conduct **research** on AI's impact.
  - Actively contribute to the **development** of **guidelines**, and **ethical frameworks**.
  - Share your **expertise** and **best practices** with a broader audience.

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III. Interpreting each thematic area's score

While your total score provides you with a general idea of your AI readiness level, examining your score in each individual thematic area can highlight certain strengths and weaknesses.

For each thematic area included in the AI Readiness Checklist, think about the relevance of your score to the maximum possible score (please refer to the table above).

- **High Score in a thematic area** (e.g. all or nearly all "Yes" in your answers): This demonstrates a strong area of readiness for you. You most likely possess significant knowledge, skills, or resources in this area. Think about how you can enhance this strength.
    - ***Example*** *(AI Awareness thematic area)*: If your score is 6 or 7 out of 7, you have a very strong understanding of AI concepts.
- **Moderate Score in a thematic area** (e.g., roughly half to two-thirds of "Yes" answers): This suggests you have a **good knowledge** in this area, but there is room for significant improvement. Focus on targeted learning, practical application, or seeking out specific resources to improve.
    - ***Example*** *(Pedagogical Integration):* If your score is 4 or 5 out of 8, you are starting to integrate AI, but you can explore more diverse applications and deepen your knowledge.
- **Low Score in a thematic area** (e.g., fewer than half of "Yes" answers): This thematic area indicates a **key area for immediate focus** and **improvement**. Allocate specific time and resources to enhance your knowledge, skills, or addressing gaps in this area.
    - ***Example*** *(Ethical Use):* If your score is 3 or less out of 9, you need to prioritise learning about AI ethics and responsible use in your professional and pedagogical practices.

By combining your overall readiness level with a detailed analysis of your scores on each thematic area included on the AI Readiness Checklist, you will gain a comprehensive understanding of your AI readiness and a clear roadmap for your ongoing development.

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Section 6: Case Studies

This section provides thirty-six (36) national/EU case studies that offer evidence-based paradigms of AI tools integrations in HEIs, their affordances and challenges for professional and pedagogical practice. These case studies are categorised by their primary focus.

Category 1: AI for Assessment, Feedback, and Performance Monitoring

Case Study 1: An integrated framework for developing and evaluating an automated lecture style assessment system

General information
Dimitriadou, E., & Lanitis, A. (2023). An integrated framework for developing and evaluating an automated lecture style assessment system. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2312.00201 The study aims to develop and evaluate an integrated system that provides an **automated evaluation** of an instructor's lecture style. This system aims to help teachers by giving instant feedback on their lecturing style, to improve quality and enhance student learning experiences.
Description of case
The proposed application analysed and extracted measurable biometric characteristics from video cameras and audio sensors using machine learning. These characteristics included facial expressions, body activity, speech rate and tone, hand movements, and facial pose. These features, in combination, provided a score reflecting the quality of the lecture style. The system's performance was evaluated by comparing its assessments with human evaluations and through feedback from education officers, teachers, and students.
Lessons learned
The results indicated that the system effectively provided automated feedback that participants received well. It performed comparably to humans and, in some cases, even outperformed them. Participants appreciated the application's utility in enhancing lecture delivery through immediate feedback.
Implications for practice
With similar or even fewer differences between AI-driven and human evaluation of lecture quality, the system can be used in natural settings (e.g., a university classroom) to support teachers in improving their lecturing and increasing student engagement. The researchers aim to further improve the system by refining the biometric metrics used in the automated lecture-style evaluation system, expanding its capabilities to include additional and wearable cameras and conducting real-time testing in classroom settings.

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Case Study 2: Student action recognition for improving teacher feedback during tele-education

General information
Dimitriadou, E., & Lanitis, A. (2024). Student action recognition for improving teacher feedback during tele-education. IEEE Transactions on Learning Technologies, 17, 569–584. https://doi.org/10.1109/tlt.2023.3301094 The aim of the research was to develop and evaluate a **student action recognition system**, reviewing students' behaviour participation and disaffection, intended to support teacher feedback during distance education. This system was designed to monitor student actions in online courses while protecting student privacy and providing real-time feedback to educators about student engagement without direct visual contact.
Description of case
An AI system was developed to recognise specific student actions using deep neural network architectures like GoogleNet, Inception-v3, and Faster R-CNN. The system used videos of student actions, processed locally on student devices, to train these networks. The effectiveness of the system was assessed through a comprehensive user evaluation involving students, parents, and educators, who provided feedback via online questionnaires and interviews.
Lessons learned
The results indicated that the system was effective in recognising student actions and was well-received by all stakeholders. Educators, in particular, found it useful for improving interaction and engagement in online settings. The system was well accepted due to the personal data protection measures applied.
Implications for practice
The AI system could enhance the effectiveness of online learning and distance education by providing insights into student behaviour, thus facilitating better educational outcomes.

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Case Study 3: Ensuring academic integrity and trust in online learning environments: A longitudinal study of an AI-Centered proctoring system in tertiary educational institutions

General information

Fidas, C., Belk, M., Constantinides, A., Portugal, D., Martins, P., Pietron, A. M., Pitsillides, A., & Avouris, N. (2023). Ensuring academic integrity and trust in online learning environments: A longitudinal study of an AI-Centered proctoring system in tertiary educational institutions. *Education Sciences*, *13*(6), 566. https://doi.org/10.3390/educsci13060566

The research aimed to enhance the credibility of **online examinations** in HE by identifying scenarios/cases that threaten the credibility of online exams and proposing AI-driven solutions to address these threats. A longitudinal study involving stakeholders from three European HE institutions was conducted.

Description of case

The researchers designed and implemented an intelligent system titled **TRUSTID**. The system incorporates advanced biometric technologies for identity verification and continuous monitoring. Students first register their biometric data, such as facial and vocal characteristics, which TRUSTID continuously uses to verify the student's identity throughout the exam. The system is privacy-friendly, allowing students to securely control their personal biometric information. Additionally, TRUSTID monitors behavioural patterns and physical examination contexts, detecting unusual activities that may be related to cheating. This integrated system ensures that the same student remains throughout the test and supports examiners by offering real-time alerts and a secure, user-friendly interface for data security.

Lessons learned

The TRUSTID system, evaluated by stakeholders, showed resilience against impersonation attacks and received positive feedback in terms of usability and user experience. The system was robust in monitoring student behaviours and identifying anomalies, receiving positive feedback from students and instructors for its usability and ease of use. Privacy concerns were addressed with a privacy-preserving biometric wallet, allowing secure control and sharing of biometric data. Overall, the TRUSTID system was well-received across various stakeholder groups, showing its potential applicability and effectiveness in maintaining academic integrity in online educational settings.

Implications for practice

The system has the potential to enhance the integrity of online examinations by using advanced biometric verification methods to prevent common threats such as impersonation and cheating.

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Case Study 4: Automated Feedback to Students in Data Science Assignments: Improved Implementation and Results

General information

Alessandra Galassi & Pierpaolo Vittorini, CHItaly 2021: 14th Biannual Conference of the Italian SIGCHI Chapter, July 11–13, 2021, Bolzano, Italy, Association for Computing Machinery (ACM), New York, NY, USA, 8 pages.

The research discusses the development and implementation of an **automated feedback system for assignments** in data science. This system focuses on grading assignments that involve language commands, their outputs, and natural language comments. The primary objective is to change students' learning experiences by providing fast and detailed feedback that can identify mistakes and offer improvement suggestions. The study evaluated the effectiveness of this system using student feedback collected through standardised and custom questionnaires.

Description of case

The research presents a case study on the development, implementation, and evaluation of an automated feedback system for data science assignments at the University of L'Aquila, Italy. The system was specifically designed to grade assignments involving R language commands, their outputs, and accompanying natural language comments. It used static code analysis and machine learning techniques to evaluate the correctness and quality of the R code and the associated comments. The system provided feedback with explanations for grading decisions, identification of errors, and suggestions for improvements. This feedback was intended to be detailed and instructive to help students learn from their mistakes.

Lessons learned

The study observed an increased engagement of students in the process. The **automated feedback system** led to higher levels of student engagement, as students could receive immediate feedback and make corrections quickly.

Perceived Usefulness: Students found the feedback to be useful in understanding their mistakes and learning how to correct them.

Clear Error Identification: The system was effective in clearly identifying errors and providing impactful suggestions for improvement.

Impact: The results show that the automatic feedback provided by the system was useful to students to understand their mistakes, to understand the correct statistical method to solve the problem, and to verify the preparation for the final exam. Furthermore, most of the students used the tool iteratively to improve their solutions. Only a few of them used the tool before submitting the solution or just to see the exercises.

Implications for practice

These findings highlight the AI system's potential in accurately grading student work in data science courses, with slight improvements observed when combining sentence embeddings with distance-based features.

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Case Study 5: An AI-Based System for Formative and Summative Assessment in Data Science Courses

General information

Amelio, A., & De Medio, C. (2021). An AI-Based System for Formative and Summative Assessment in Data Science Courses, *International Journal of Artificial Intelligence in Education, 31*, 159–185 https://doi.org/10.1007/s40593-020-00230-2

The paper discusses an AI-based system designed for **formative** and **summative assessments** in data science courses. This system automates the grading process and provides feedback to both students and professors. This study's aim is to evaluate the system's effectiveness by comparing the time taken for grading, the accuracy of the grading, and the impact on student learning outcomes.

Description of case

The study evaluated time efficiency on grading manually versus grading with the AI tool, the grading accuracy by comparing the AI tool's accuracy to the manual grading's accuracy, the learning outcomes (the impact of automated feedback of student performance in final exams and the usability of the tool, which was based on the students' feedback on the system's usability.

Lessons learned

The system was expected to enhance student learning by offering timely and accurate feedback. The Model performance showed that only a slight improvement in performance when distance-based features were included along with sentence embeddings, which suggests that sentence embeddings alone were effective in representing the semantic content of the answers, especially when the answers and correct solutions had high lexical overlap. It was useful for both formative and summative assessments. In formative assessments, students used the tool for homework and received automated feedback, which was later compared to manual feedback. In summative assessments, exams were corrected either manually or through the AI system, allowing for a comparison of performance between human and AI grading.

Implications for practice

Efficiency in Grading, since the AI system reduces grading time, allowing instructors to focus on other educational tasks, and ensures consistent, unbiased evaluations, enhanced, Student Feedback, since it provides immediate, detailed feedback, helping students learn and improve continuously, Scalability, since it facilitates handling large classes, making it ideal for MOOCs and large enrolment courses, and Focus on Learning, since it frees up instructor time to offer personalised support and improve teaching strategies.

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Case Study 6: Enhancing Authentic Assessment in Higher Education: leveraging Digital Transformation and Artificial Intelligence

General information

Perla, L., & Vinci, V. (2023). Enhancing Authentic Assessment in Higher Education: Leveraging Digital Transformation and Artificial Intelligence. In AIxIA 2023 - 1st International Workshop on High-performance Artificial Intelligence Systems in Education (pp. 1-15). CEUR Workshop Proceedings. http://ceur-ws.org/Vol-XXXX/paperXXX.pdf

The study focuses on implementing **authentic assessment** in HE through digital transformation and AI. It explores the integration of AI-based tools to improve the authenticity, personalisation, and flexibility of assessment methods, emphasising the shift towards hybrid teaching and online learning.

Description of case

The study explores the integration of digital transformation and AI to enhance authentic assessment in HE. The research focuses on leveraging AI to improve assessment methods, making them more aligned with real-world tasks and challenges. The authors propose that AI can be used to create more dynamic, personalised, and effective evaluation tools that better reflect students' learning progress and skills. This approach aims to move beyond traditional assessment techniques and incorporate digital technologies to support both students and educators in achieving more meaningful educational outcomes.

Lessons learned

The hybridisation of assessment, combining traditional and AI-based methods, improves the authenticity and personalisation of evaluations. AI tools facilitate more flexible and adaptive assessment practices, but there have been challenges in implementation, such as the fact that cultural and organisational differences between universities can impact the effectiveness of AI-based systems, and the need for trust in online assessment technologies, addressing concerns about privacy, data handling, and equitable treatment. This study has shown an impact on Learning and Teaching through AI-supported low-stakes tests, because they help in retaining information and identifying comprehension gaps, since the use of continuous assessment forms promotes active learning and student engagement. Critical Perspectives are also indicated, since the integration of AI in education must address potential risks such as biases, privacy issues, and instructional disruptions; balancing technological advancements with humanistic educational values is crucial.

Implications for practice

The study underscores the transformative potential of AI and digital tools in higher education assessment and highlights the importance of cautious implementation and ongoing evaluation to address challenges and critical perspectives that could emerge.

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Case Study 7: Future Proofing a ChatGPT-Proof Portfolio Evidence-Based Formative Assessment

General information

Pirozzi, M., Mariani, M., & Moriggi, S. (2023). Future proofing a ChatGPT-proof portfolio evidence-based formative assessment. LUISS Business School.

The study focuses on developing a resilient assessment method in educational contexts that can withstand the challenges posed by AI tools like ChatGPT. This approach emphasises continuous assessment and the creation of individual portfolios to capture students' learning experiences in a comprehensive way. The primary purpose of the study was to test the hypothesis that traditional assessment methods such as quizzes and essays are becoming inadequate for capturing the creative and iterative learning processes in experiential and inquiry-based courses. The study aimed to implement and evaluate a portfolio-based formative assessment that reflects students' active participation, strategic thinking, and ability to ask quality questions.

Description of case

It explores how to design portfolio-based assessments that are resilient against misuse of AI tools like ChatGPT. It emphasises the need for authentic, personalised assessments that focus on evidence of student learning and critical thinking. The study presents strategies for maintaining academic integrity in an era of AI-generated content, ensuring that assessments reflect students' true abilities and effort.

Lessons learned

The study demonstrated that portfolio-based formative assessment can effectively capture the depth and breadth of students' learning experiences, particularly in creative and experiential courses.

It highlighted the importance of integrating AI tools to enhance learning while maintaining the integrity of human cognitive skills. There was a focus on Higher-Order Skills, emphasising higher-order cognitive skills and meta-cognitive abilities is crucial in the age of AI, as it helps students develop critical thinking and discernment.

Implications for practice

The approach encourages educators to continue evolving their teaching methodologies to stay ahead of technological advancements, ensuring that learning outcomes remain robust and relevant.

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Case Study 8: Integration of Artificial Intelligence on Teaching the Course of Didactic Methodology: A Case Study

General information
Mavropoulou, E., Koutsoukos, M., & Oikonomou, A. (2023). Integration of Artificial Intelligence on Teaching the Course of Didactic Methodology: A Case Study. European Journal of Social Science Education and Research, 10(3), 36-51. https://revistia.com/index.php/ejser/article/view/6992 **University/ HEI**: School of Pedagogical and Technological Education (ASPAITE) **Course and subject domain**: Didactic Methodology **Aim**: Examine the use of AI in teaching the course of Didactic Methodology as part of the pedagogical education of Secondary school teachers **Target group**: AI was used to support teachers
Description of case
AI tool used: Anthropic Claude AI and ChatGPT **A detailed description of what happened**: AI was asked to create learning materials for a whole lesson within the course. Based on the course needs, learning materials were collected and structured. After generating the learning material, it was analysed and studied accordingly. This short study examined (1) how a teacher of the course "didactic methodology" communicates or collaborates with an AI Chatbot and (2) how well an AI chatbot responds to the intended goals of the experienced foreign language teacher.
Lessons learned
ChatGPT gave the definition of the context - framework of the course "Didactic Methodology", prepared a 13-week laboratory course, each week separately, 2 hours per week, provided detailed instructions about the topic and the sessions, composed the theory to teach for week 9", provided the key concepts outlined in the theory of integrating technology in teaching, provided activity description and learning outcomes, created a "fill in the blanks" exercise for week 9 and provided the correct answers, created a multiple-choice exercise with 10 items for week 9 and provided the correct answers, provided 10 open-ended questions followed by the instructions the correct answers, provided existing references.
Implications for practice
ChatGPT is useful for helping teachers design and organise their lesson plans and material, reducing design time.

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Case Study 9: La Tecnologia como eje del Cambio Metodologico

General information

Reference/Source: Magaña, C., Rivas, S., Palmero, R., & Rodríguez, S. (2020). La Tecnologia como eje del Cambio Metodologico. www.uma.es/servicio-publicaciones-y-divulgacion-cientifica

Institution: Universidad de las Palmas de GC.

Course/Subject: Tratamiento Jurídico de las relaciones comerciales: de Roma al Derecho moderno.

Aim: The primary aim of the paper is to investigate the potential of chatbots, powered by AI, to enhance the teaching and learning process in legal education. The authors specifically focus on the use of a chatbot in the "Tratamiento Jurídico de las relaciones comerciales: de Roma al Derecho moderno" course.

Target group: Undergraduate students.

Description of case

AI integration:

- A chatbot was developed and integrated into the "Tratamiento Jurídico de las relaciones comerciales: de Roma al Derecho moderno" course.

- The chatbot was designed to interact with students using natural language processing (NLP) and provide them with information, explanations, and motivational messages.

Students could access the chatbot 24/7 through their mobile devices or computers.

AI role:

- The chatbot served as a virtual tutor or assistant, providing students with: 1) Answers to their questions about the course material; 2) Explanations of concepts and problem-solving examples; 3) Motivational messages and encouragement to continue learning; 4) Links to additional resources and learning materials.

Student Interaction:

- Students interacted with the chatbot through text-based conversations.

- They could ask questions, seek clarification, and receive feedback from the chatbot.

- The chatbot also provided students with opportunities to practice their knowledge and skills.

Lessons learned

Outcomes:

- The use of the chatbot resulted in a positive impact on student engagement and motivation.

- Students reported feeling more supported and involved in their learning.

- The chatbot also helped students to better understand the course material.

Benefits:

- Increased student engagement and motivation.

- Improved student understanding of the course material.

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- Enhanced student autonomy and self-directed learning.

Challenges:

- Some students initially had difficulty interacting with the chatbot due to unfamiliarity with the technology.

- The chatbot's response accuracy and effectiveness depended on the quality of the training data.

- Maintaining and updating the chatbot required ongoing effort from the instructors.

Implications for practice

Chatbots are a useful tool in motivating and engaging students. They also help students in understanding the courses much easier.

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Case Study 10: Digital Assessment: A Survey of Romanian Higher Education Teachers' Practices and Needs

General information

Arora, S., Yadav, D., & Goyal, P. (2021). Assessing English Writing Skills with Generative Language Models. https://www.mdpi.com/2227-7102/14/1/32

The study analyses how the 60 respondents from Romanian universities evaluate their own digital competence and how they are using digital assessment, but also what training needs they have in these regards. This study, carried out in May–June 2022, therefore attempts to identify the main concerns, challenges and obstacles HE teachers encounter when designing and using digital assessment. The findings indicate the importance of empowering teachers through continuous learning, embracing flexible hybrid models and reimagining assessment strategies for digital literacy. Responsible knowledge- sharing, AI literacy and adaptive curriculum design emerged as critical imperatives. The study advocates for a transformative shift towards AI-based pedagogy, emphasising personalised learning that aligns with teachers' competencies and specific assessment needs while adhering to fundamental teaching principles.

Description of case

The study focuses on educators who employ digital technologies in assessing students' learning, learning outcomes and practical skills. The research aims to analyse the use of digital assessment tools, while also identifying the training requirements essential for proficient implementation. Thus, the study sought answers for questions, such as: What are the digital assessment practices employed by HE teachers, how do educators utilise digital technologies in assessing students' learning, learning outcomes and practical skills, what are the specific digital assessment tools commonly used in HE settings, what are the perceived benefits and challenges of using digital assessment tools in the evaluation process and more.

Lessons learned

Digital Tools are Widespread: Teachers are embracing various digital assessment methods like 3D environments, Open Educational Resources, and discussion forums. Generative AI Offers Potential: AI models like ChatGPT can automate grading, personalise feedback, and adapt assessments based on student responses.

Implications for practice

Overall, the study emphasises the need for a comprehensive approach to digital assessment that combines technological advancement with effective teacher training and a focus on fostering academic integrity. Recommendations for improvement were:
1. Teacher Training: Provide training on digital assessment methods and ethical considerations

2. Assessment Redesign: Move beyond traditional tests and embrace multimodal formats that promote critical thinking

3. Technology Investment: Invest in infrastructure for computer-assisted assessments

4. Academic Integrity Contracts: Encourage ethical behaviour through signed contracts
5. Personalised Training: Tailor training to individual teacher needs using online resources and self-assessment platforms.

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Category 2: AI for Academic Writing and Content Generation

Case Study 11: GENERATIVE ARTIFICIAL INTELLIGENCE AND ACADEMIC WRITING: THE USE OF CHATGPT

General information

Pereira, R., Reis, I. W., Ulbricht, V. R., & Santos, N. (2023). Generative Artificial Intelligence and Academic Writing: The Use of ChatGPT. Universidade Federal de Santa Catarina, Universidad Técnica Particular de Loja. https://www.researchgate.net/publication/378129238_GENERATIVE_ARTIFICIAL_INTELLIGENCE_AND_ACADEMIC_WRITING_THE_USE_OF_CHATGPT

The purpose of this article is to analyse the relationship between **academic writing** and **generative AI**, considering the perceptions of potential users of language models like ChatGPT, in order to explore the benefits and challenges of its use in academic writing.

Description of case

The paper explores how generative AI, specifically ChatGPT, impacts academic writing. It analyses ChatGPT's potential as a tool for enhancing research, drafting, and editing processes in academic contexts. The paper also addresses ethical concerns, such as originality, plagiarism risks, and the evolving role of AI in education. It advocates for integrating AI responsibly, balancing its benefits with maintaining academic integrity and critical thinking skills.

Lessons learned

The study delved into how academics perceive the use of ChatGPT in their writing.

ChatGPT as a Supportive Tool: While participants acknowledged ChatGPT's potential, they emphasised its role as an aid for academic writing, not a substitute for human creativity and critical thinking. The focus remained on human researchers utilising their expertise to guide the writing process.

Strengths of ChatGPT: The study highlighted ChatGPT's strengths in handling repetitive tasks. These include grammar and proofreading, data analysis, and structuring arguments within a text. Additionally, participants found it helpful for presenting information in a clear manner, organising ideas, and even interpreting research data.

Implications for practice

The study emphasises the need for responsible and transparent use of ChatGPT in academic writing. Transparency is Paramount, since researchers must be clear and upfront about the extent to which ChatGPT was of a contribution to their work. This could involve disclosing the use of the tool in the methodology section or footnotes of a paper.

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Co-funded by the European Union

Case Study 12: Incorporating ChatGPT in Medical Informatics Education: Mixed Methods Study on Student Perceptions and Experiential Integration Proposals

General information

Magalhães Araujo, J., & Cruz-Correia, R. (2024). Incorporating ChatGPT in medical informatics education: Mixed methods study on student perceptions and experiential integration proposals. *JMIR Medical Education*, *10*(1), e51151. https://mededu.jmir.org/2024/1/e51151

The study focuses on the integration of AI technologies, such as ChatGPT, in the educational landscape having the potential to enhance the learning experience of medical informatics students and prepare them for using AI in professional settings. The incorporation of AI in classes aims to develop critical thinking by encouraging students to interact with ChatGPT and critically analyse the responses generated by the chatbot. This approach also helps students develop important skills in the field of biomedical and health informatics to enhance their interaction with AI tools.

Description of case

The study investigates how ChatGPT can be integrated into medical informatics education. The research uses mixed methods to gather student feedback and proposes ways to incorporate ChatGPT into medical and informatics courses. It highlights that students generally found ChatGPT helpful for generating content, brainstorming, and rewriting tasks, despite some concerns about biases. The study suggests its use can enhance the educational experience by simplifying complex topics, aiding in clinical simulations, and supporting technical tasks like programming and exam preparation.

Lessons learned

In terms of the use of ChatGPT or other AI bots in the future, the majority of responses indicate that participants find it extremely useful, especially for medical writers who are not proficient in English, as it aids in restructuring and correcting texts.

However, there are also ethical concerns and apprehensions regarding the potential impact on the employability of programming professionals. Moreover, participants emphasise the importance of informed use.

Building on the proposal to integrate AI into medical programmes to prepare students for their future use of such tools in professional contexts, the implementation of ChatGPT has emerged as a potentially transformative force in medical education, offering support to students in their learning journey. The questionnaire administered to medical faculty students provided valuable insights into their perspectives and experiences with ChatGPT, shedding light on their attitudes, preferences, and intentions regarding the incorporation of AI chatbots in educational environments. Remarkably, a majority of students used ChatGPT regularly for diverse purposes, including report writing, idea brainstorming, and text rewriting.

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Implications for practice
The findings of this study highlight ChatGPT's promising role in enhancing medical informatics education by equipping students and faculty with a transformative AI-driven approach. The insights gained from this research effort provide valuable prompt examples for harnessing the power of AI to create innovative educational experiences in the ever-evolving landscape of medical informatics.

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Co-funded by the European Union

Case Study 13: Writing, creativity, and artificial intelligence. ChatGPT in the university context

General information

Reference/Source: de Vicente-Yagüe-Jara, M. I., López-Martínez, O., Navarro-Navarro, V., & Cuéllar-Santiago, F. (2023). Writing, creativity, and artificial intelligence. ChatGPT in the university context. *Comunicar*, *31*(77), 47–57. https://doi.org/10.3916/C77-2023-04

Institution: Research conducted at multiple universities in Spain, including the University of Murcia, the University of Salamanca, and Miguel Hernández University of Elche

Course/Subject: The specific courses or subject areas are not defined, but the research focuses on the potential of AI for the development of writing skills. This suggests application across disciplines and could inform language arts, creative writing, and technical writing courses.

Aim: 1) To explore the creative potential of AI systems, such as ChatGPT, for the development of writing in educational contexts; 2) To investigate how AI can be used as a supportive tool for students when performing writing tasks.

Target group: The research involved both AI systems and university students as participants.

Description of case

Overview: Creativity assessment tool: They chose the Test of Creative Imagination for Adults (PIC-A) to evaluate creative abilities.

AI participants: The research focused on Large Language Models (LLMs) built on OpenAI's GPT-3 technology. The authors analysed the responses of 20 different AI tools, including well-known ones like ChatGPT and Dupla.ai.

Human participants: University students participated alongside the AI systems. They completed the same PIC-A tasks, allowing for a direct comparison of human and AI creativity.

Impact of AI on student writing: The researchers assessed student writing abilities in two phases: Pre-test: Students completed the PIC-A tasks without any assistance from AI tools. This established a baseline for their writing skills; Post-test: Students tackled the PIC-A tasks again, but this time, they were allowed to use ChatGPT to brainstorm ideas and improve their writing.

Analysis: The authors compared the creative outputs from the AI systems and the human participants on the PIC-A test. They also analysed how using ChatGPT in the post-test impacted student writing compared to the pre-test results.

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Lessons learned

AI's strengths:

-The study demonstrated AI's prowess in idea generation and its ability to enhance writing quality.

-Its effectiveness was particularly noticeable in tasks requiring practical solutions or applications.

Human vs. AI creativity:

- Both AI and humans demonstrated specific strengths in creativity.

- AI systems excel when processing and utilising vast amounts of data.

- Humans proved superior in navigating abstract concepts, imaginative thinking, and handling scenarios that are more theoretical.

AI as a tool for students:

- Utilising ChatGPT resulted in a significant improvement in the writing abilities of the student participants.

- This suggests the potential value of AI as a supportive tool capable of idea generation and assistance within writing tasks.

Implications for practice

AI-Human Collaboration:

- To successfully and responsibly integrate AI into educational settings, emphasis must be placed on developing students' critical thinking skills and judgement.

- This highlights the need for a collaborative model where AI serves as a powerful tool under human guidance and direction, rather than replacing human creativity.

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Category 3: AI for Teacher and Student Support & Competence

Case Study 14: Unveiling the impact of AI chatbots on higher education: Insights from students

General information

Bjelland, Camilla & Ludvigsen, Kristine & Mogelvang, Anja. (2024). Unveiling the impact of AI chatbots on higher education: Insights from students. Proceedings of INTED2024 Conference 4th-6th March 2024, Valencia, Spain. https://www.researchgate.net/publication/378942626_Unveiling_the_impact_of_AI_chatbots_on_higher_education_Insights_from_students

University/ HEI: Western Norway University of Applied Sciences (HVL), in Norway

Course and subject domain: Institutional-wide research, not on specific course

Aim: Explore the extent of students' engagement with AI chatbots in higher education and investigate students' use and perception of AI chatbots in higher education

Target group: 2822 HVL students

Description of case

AI tool used: ChatGPT-3.5

A detailed description of what happened: To investigate the students' attitudes, and use of AI and AI chatbots to support teaching and learning in HE, an anonymous survey was conducted with closed-ended and open-ended questions, based on a previous survey on student AI usage in Norway. The survey was conducted digitally at one of the major university colleges in Norway and was available throughout September 2023, on the learning platform, info boards, campus posters, and on various social media. Using the SurveyXact programme, 2822 students participated. The data collection followed the regulation of the General Data Protection Regulation (GDPR). The participants were informed of the purpose of the study, that their participation was voluntary, and that no personal sensitive, nor identifiable data was collected.

Lessons learned

Results revealed three main areas of interest: AI as feedback or academic writing assistant, AI as personalisation and adaptation mechanism and AI as a matter of ethical consideration. Students employ AI-chatbots as guides throughout their writing processes. This includes the initial stages of idea generation, problem formulation, outlining and structuring, as well as feedback on form and content during the process, and language correction in the editing phase. Also, students use AI-chatbots as learning partners and teaching assistants, especially for simpler explanations of complex topics to align with their pre-understanding.

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Implications for practice

Use of AI chatbots in educational settings requires digital competence among educators as well as students. This competence involves a combination of technical, pedagogical, and didactic skills, as well as knowledge related to the content and methods of the subjects and ethical and responsible use. In addition, educators' digital competence is linked to developing students' digital competence. To enhance competence and contribute to the development of pedagogical practices related to the use of AI chatbots in teaching and learning, a research-oriented approach is recommended. This involves systematically developing and testing activities, investigating them using various methods, and sharing and discussing experiences within a collegial community.

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Case Study 15: Exploring the Potential of Artificial Intelligence in Addressing Pedagogical Challenges and Improving Group Work Quality in Higher Education

General information

Sarkheyli, A. (2023). Exploring the Potential of Artificial Intelligence in Addressing Pedagogical Challenges and Improving Group Work Quality in Higher Education. Proc. of the 4th International Conference on Electrical, Communication and Computer Engineering (ICECCE) 30-31 December 2023, Dubai, UAE. https://doi.org/10.1109/ICECCE61019.2023.10442360

University/ HEI: School of Information and Engineering, Dalarna University, Sweden

Course and subject domain: No specific, HEI-wide

Aim: Demonstrate the immense potential of AI in improving the quality of group work in higher education institutions

Target group: HEI teachers and students

Description of case

AI tool used: None specific, only AI as a generic framework to support collaborative and group-work among students and teachers. The researchers proposed ITS, ALP, XR, chatbots and Virtual Assistants, AGS, NLP, DA-LA.

A detailed description of what happened: In this study, various models were examined in order to propose a framework of AI-based group work in HEIs. Students group-work models, IS, AI, BCN TPB were presented accordingly.

Lessons learned

A model based on AI has been proposed to improve collaborative learning, techniques, methods, and assessment tools. The model emphasises how the TPB, one of the IS theories, can be employed in AI-driven group work in higher education, enabling the monitoring, comparison, and management of group activities.

Implications for practice

AI-based tools can enhance collaboration, communication, problem-solving abilities, and learning outcomes, thereby preparing students for the collaborative demands of the modern workforce. However, ethical apprehensions such as data privacy and bias must be addressed.

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Case Study 16: Designing Educational Escape Rooms With Generative AI: A Framework and ChatGPT Prompt Engineering Guide

General information

Fotaris, P., Mastoras, T., and lameras, P. (2017). Designing Educational Escape Rooms with Generative AI: A Framework and ChatGPT Prompt Engineering Guide. Vol. 17 No. 1 (2023): Proceedings of the 17th European Conference on Games Based Learning. https://doi.org/10.34190/ecgbl.17.1.1870

University/ HEI: University of Macedonia, Thessaloniki, Greece

Course and subject domain: No specific course or domain, applies to all

Aim: To explore the dynamic synergy between Room2Educ8, a framework rooted in Design Thinking principles, and the publicly accessible AI tool ChatGPT.

Target group: First-year undergraduate chemistry students

Description of case

AI tool used: ChatGPT

A detailed description of what happened: This study delves into a deliberate exploration of how ChatGPT's functionalities can be strategically harnessed during the development of EERs to offer time-saving, idea-generating, and customisable assistance, thus allowing designers to create more engaging and effective educational escape rooms. This is accomplished through the integration of Room2Educ8, a user-centred conceptual framework that derives its foundation from design thinking principles. Notably, Room2Educ8 offers a versatile structure that can be flexibly tailored to various subjects, learning goals, and class sizes. The core focus of this article revolves around a description of each stage of Room2Educ8, subsequently enabling straightforward application, followed by the provision of specialised prompts designed for employment alongside ChatGPT. These prompts are curated to elicit content generation corresponding to each unique stage encapsulated within the Room2Educ8 framework, including learner personas, learning objectives, S.M.A.R.T. goals, stories, puzzles, clues, hints, game rules and instructions, briefing and debriefing scripts, surveys, interview questions, and evaluation plans.

Lessons learned

To ensure ChatGPT's ability to assist in the creation of an EER, a set of prompts was crafted, aligning with each phase of the Room2Educ8 framework. The AI-generated responses informed the design of a digital EER about the periodic table of elements, specifically designed to captivate the interest of first-year undergraduate chemistry students. Presented below are a few selected prompts that were employed during the Contextualise and Design stages, presented in this study. All prompts were crafted following a foundational set of prompt engineering principles. Foremost among them was the emphasis on clarity and specificity, ensuring that each instruction was initiated with a clear and precise directive. To personalise responses, the persona of an EER designer was designated for ChatGPT to embody, tailoring its interactions accordingly. Furthermore, maintaining alignment with the EER's learning objectives was essential to

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ensure that the prompts effectively supported the educational goals. The active use of feedback loops allowed for prompt refinement, resulting in iterative improvements. Contextual clarity was incorporated when needed to guide the AI's output effectively. Additionally, real-life scenarios were utilised for certain prompts, grounding them in practical and relatable situations.

Implications for practice

Room2Educ8 simplifies the process of aligning learning objectives with puzzles and narratives, resulting in a cohesive and immersive interactive story that enhances learning experiences. The decision to integrate this framework with ChatGPT stemmed from the goal of making EER design more accessible to educators, especially those lacking prior experience with escape room formats or facing time constraints. ChatGPT's user-friendly interface requires no specialised technical skills, ensuring educators with varying levels of tech proficiency can benefit. Additionally, ChatGPT's quick content generation reduces the time educators spend on content creation, allowing them to focus on essential aspects of teaching and learning. The included prompt engineering principles provide a valuable reference for crafting effective prompts, while the sample prompts can be easily adapted to various subjects, significantly improving the efficiency and effectiveness of the EER development process.

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Case Study 17: Possibilities of Artificial Intelligence in Education An Assessment of the role of AI chatbots as a communication medium in higher education

General information

Slepankova, M. (2021). Possibilities of Artificial Intelligence in Education An Assessment of the role of AI chatbots as a communication medium in higher education. Master Thesis, Linnaeus University. https://doi.org/10.1109/ICECCE61019.2023.10442360

University/ HEI: Linnaeus University, Sweden

Course and subject domain: No specific

Aim: Investigate the factors that influence the acceptability of AI chatbots by university students in HE which might point subsequently to the lack of usage. The study also suggests the most appropriate communication areas of AI chatbot application in HE suggested by students. The thesis utilises the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model to find the predictors of AI chatbots acceptability in HEIs.

Target group: Students

Description of case

AI tool used: No specific

A detailed description of what happened: A mixed-mode survey-research among students.

Lessons learned

Non-judgmental expectancy, Performance expectancy, and Effort expectancy have been concluded as the main predictors of acceptability. These constructs can positively influence the AI chatbot acceptability by providing an easy-to-use, unbiased, 24/7 available solution for simple educational, informative, and assistance tasks. Further, fast information provision positively impacts students' inner well-being by eliminating negative feelings associated with waiting. Students suggested that most possible applications of AI chatbots are in communication areas concerning recap of course material, study material recommendation and exam and requirements information.

Implications for practice

This master's thesis can then be used as a base for the framework for AI chatbot application in HE, part of the digital strategy proposal of some universities or policymakers, or as an inspiration for proof of concept to justify if the concept has practical potential. For instance, the study could be used when an educational institution decides to implement rule-based or AI-based chatbots, alternatively, whether the AI designers would like to address specific consumers' intent, such as not being judged.

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Case Study 18: ChatGPT (GPT-3.5) as an assistant tool in microbial pathogenesis studies in Sweden: a cross-sectional comparative study

General information

Hultgren, C., Lindkvist, C. A., Özenci, C. A. V., Curbo, C. A. V. S. (2023). ChatGPT (GPT-3.5) as an assistant tool in microbial pathogenesis studies in Sweden: a cross-sectional comparative study. Journal of Educational Evaluation for Health Professions, 20, 32. https://doi.org/10.3352/jeehp.2023.20.32

University/ HEI: Division of Clinical Microbiology, Department of Laboratory Medicine, ANA Futura, Karolinska Institutet, Huddinge, Sweden
Course and subject domain: Microbial pathogenesis for dental students
Aim: To compare the ability of GPT-3.5 and teachers to answer questions from dental students and construct detailed intended learning outcomes.
Target group: Students during their third semester at Karolinska Institutet, Sweden in September 2022.

Description of case

AI tool used: ChatGPT 3.5

A detailed description of what happened: The questions from the students and replies from the teachers were obtained from an online discussion forum during the course. The teachers were at the time unaware that their answers would be used in the current study. The same questions were administered to GPT-3.5 in May 2023. The 7 different intended learning outcomes were individually supplied to GPT-3.5, with a prompt to create new detailed intended learning outcomes for each individual intended learning outcome. The intended learning outcomes created by GPT-3.5 were subsequently compared to the detailed intended learning outcomes created for the course in 2022 by teachers. The questions were asked by 22 dental students who took the course on microbial pathogenesis in September 2022. The questions were mainly of the second-order category. One teacher replied to all questions initially, and 2 other teachers retrospectively reviewed the initial teacher's responses during March/April 2023. There were 7 intended learning outcomes in the microbial pathogenesis course. There were no exclusion criteria; thus, all questions and intended learning outcomes were included. The same questions and intended learning outcomes were asked to GPT-3.5 in May 2023.

Lessons learned

GPT-3.5 had the ability to interpret questions from students and give concise and correct facts in response, and in most of the replies (73%), the answers were longer than the teacher's reply. Furthermore, GPT-3.5 was able to construct detailed intended learning outcomes although these were very extensive and, in some cases, even misleading.

Implications for practice

GPT-3.5's knowledge, interpretation, and ability to answer students' questions in microbiology were found to be comparable to those of a teacher. However, GPT-3.5 is hampered by its instructions to be pleasant to the reader and it requires knowledge to really know if a given answer is correct. GPT-3.5 lacks knowledge in constructing detailed intended learning outcomes, but has the potential to become a useful tool to assist in teaching and education in general.

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Case Study 19: Supporting Collaborative Online Science Education with a Transferable and Configurable Conversational Agent

General information

Reference/Source: Araujo, A. De, Papadopoulos, P. M., McKenney, S., & Jong, T. De. (2023). Supporting Collaborative Online Science Education with a Transferable and Configurable Conversational Agent. Computer-Supported Collaborative Learning Conference, CSCL, 2023-June, 416–419. https://doi.org/10.22318/cscl2023.469853

Institution: University of Twente (Netherlands)

Course/Subject: Science, photosynthesis

Aim: To develop and pilot a transferable and configurable conversational agent (Clair) designed to facilitate productive talk in collaborative online learning environments.

Target group: Students in pairs within collaborative online learning settings (AI developed to support students learning process)

Description of case

Overview: Researchers designed a conversational agent named Clair to foster productive talk in collaborative online learning environments. Clair is intended to be transferable to different topics and languages and allow for a degree of teacher configuration.

Intervention: The pilot study used a within-subjects experiment. Students worked in pairs on a Go-Lab activity about photosynthesis. After an initial phase without Clair, dyads were assigned to 'control' or 'treatment' groups, with the treatment group receiving Clair's interventions.

Clair's design: Clair used talk moves (e.g., Add-on, Rephrasing, Expand Reasoning) to stimulate discussion based on a combination of dialogue variables (focus, intent, topic similarity, etc.) and fuzzy logic rules.

Lessons learned

Limited impact: While Clair showed some potential in increasing explicit reasoning and decreasing participation imbalance, the overall effect wasn't statistically significant.

Design issues: Clair's interventions were perceived as repetitive and robotic. The triggering mechanisms and rules could be improved.

Unrealistic expectations: Students expected Clair to provide more direct content support, which isn't its intended function.

Key takeaways: Designing an effective conversational agent for collaborative learning is complex. Future iterations should focus on more nuanced interventions, better rule design, and managing student expectations about the CA's capabilities.

Implications for practice

Practitioners must explicitly define the AI's role as a social facilitator rather than a content expert, while diversifying its "talk moves" to prevent student disengagement from repetitive or robotic interactions.

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Case Study 20: Exploring new frontiers of education using humanoid robots – a case study of patient centred innovation in digital health education

General information

Reference/Source: Connolly, C., Walsh, J. C., Worlikar, H., Ryan, L., Murray, A., O'Connor, S., Kelly, J., Coleman, S., Vyas Vadhira, V., Newell, E., & O'Keeffe, D. T. (2022). Exploring new frontiers of education using humanoid robots – A case study of patient centred innovation in Digital Health Education. *Irish Educational Studies*, *41*(1), 107–115. https://doi.org/10.1080/03323315.2021.2022514

University/HE institution: University Hospital Galway

Course and subject domain: digital health education; specifically, self-management of hypoglycaemia in people with type 1 diabetes. The case study explored how humanoid robots could be used to enhance the education of patients on managing their condition.

Aim: to evaluate the effectiveness of humanoid robots in enhancing the education provided to patients with type 1 diabetes regarding the self-management of hypoglycaemia. The study aimed to investigate whether the use of humanoid robots can provide a more engaging and effective way of educating patients in the management of their condition, compared to traditional educational approaches.

Target group: patients with type 1 diabetes. The purpose of the study was to investigate the use of humanoid robots as a tool to enhance the education provided to these patients on the self-management of hypoglycaemia.

Description of case

AI tool used: DAVE is a humanoid robot that was used as a tool in the case study. It was programmed with an AI-based audio-visual interactive framework that was capable of visually recognising human features and beginning an interaction with the patient through the patient's audio feedback to questions.

https://www.youtube.com/watch?v=YFpqdpLAGqA

https://emea.softbankrobotics.com/

A detailed description of what happened: The robot was used to deliver an interactive Q&A session format that explained aspects of diabetes disease and condition management, with particular emphasis on the self-management of hypoglycaemia.

Lessons learned

Participants reported feeling engaged and satisfied with the effectiveness of the education delivered through DAVE. However, the study identified challenges in ensuring the digital literacy of participants, collecting feedback data in a meaningful way, and designing appropriate pedagogical considerations for robot teaching.

Implications for practice

The study concluded that the use of DAVE could be a successful tool in facilitating knowledge transfer and engaging patients in the learning process. Recommendations for future applications include stakeholder engagement in design and development and extending the results in larger-scale trials.

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Case Study 21: Insights into Student Perceptions: Investigating Artificial Intelligence (AI) Tool Usability in Irish Higher Education at the University of Limerick

General information

Reference/Source: Irfan, M., Murray, L. I. A. M., & Ali, S. (2023). Insights into Student Perceptions: Investigating Artificial Intelligence (AI) Tool Usability in Irish Higher Education at the University of Limerick. Global Digital & Print Media Review, VI, 48-63. https://dx.doi.org/10.31703/gdpmr.2023(VI-II).05

University/HE institution: University of Limerick

Course and subject domain: N/A

Aim: To provide valuable insights into student perceptions of AI utilities in education using a quantitative methodological approach.

Target group: Diverse set of students from different departments and faculties at the University of Limerick, Republic of Ireland

Description of case

AI tool used: ChatGPT https://chat.openai.com/

A detailed description of what happened: The study investigated students' perceptions and experiences with the ChatGPT AI tool integrated into the educational context at the University of Limerick using a quantitative research approach. The researchers formulated research questions, designed a survey questionnaire, and collected data from a sample of 120 students.

Lessons learned

The participants of the study had various perceptions and experiences with the ChatGPT AI tool. The perceived benefits of the tool include improving productivity and efficiency, while potential concerns include ethical and privacy issues.

Implications for practice

The study concludes that the study provided a comprehensive understanding of students' perception of AI utilities in education, contributing significantly to the application of AI utilities in the educational context.

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Co-funded by the European Union

Case Study 22: Integrating chatbots in education: insights from the Chatbot-Human Interaction Satisfaction Model (CHISM)

General information

Reference/Source: Belda-Medina, J., & Kokošková, V. (2023). Integrating chatbots in education: insights from the Chatbot-Human Interaction Satisfaction Model (CHISM). International Journal of Educational Technology in Higher Education, 20(1). https://doi.org/10.1186/s41239-023-00432-3

Institutions: University of Alicante, Spain (public, large) and University of West Bohemia, Czech Republic (public)

Course/Subject: Applied Linguistics courses within Teacher Education programs

Aim:

- To explore teacher candidates' understanding and perceptions of App-Integrated Chatbots (AICs) for language learning.

- To assess AIC effectiveness in supporting language education.

Target group: College students enrolled as English language teacher candidates.

Description of case

Overview:

-Intervention: Participants interacted with four AICs (Mondly, Andy, John Bot, Buddy.ai) over one month. Selection prioritised AICs with diverse features like varied language levels and tech integration.

-Evaluation:

- Pre/post surveys for prior knowledge and post-interaction satisfaction.

- Chatbot-Human Interaction Satisfaction Model (CHISM) to assess linguistic elements, design, and user experience.

- Qualitative analysis of student reports for insights on AIC benefits and drawbacks.

Lessons learned

AIC potential:

- Can offer immediate feedback and a supportive learning environment.

- Need improvement in speech technologies (recognition and synthesis).

- Must better adapt to different learner proficiency levels.

Design significance: User-friendly interfaces, multimedia, and the potential of emerging tech (AR/VR) are crucial for engagement.

CHISM's value: The model provides a comprehensive framework for AIC assessment within language learning contexts.

Implications for practice

Personalisation is key: AICs need to tailor experiences more effectively to sustain learner interest.

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Case Study 23: Experiences in the use of an adaptive intelligent system to enhance online learners' performance: a case study in Economics and Business courses

General information

Reference/Source: Guerrero-Roldán, A. E., Rodríguez-González, M. E., Bañeres, D., Elasri-Ejjaberi, A., & Cortadas, P. (2021). Experiences in the use of an adaptive intelligent system to enhance online learners' performance: a case study in Economics and Business courses. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00271-0

Institution: Universitat Oberta de Catalunya, Spain (fully online, public institution).

Course/subject: Two first-year courses in the BSc of Economics and Business program: Introduction to Enterprise and Markets and Behavior

Aim: Researchers are developing an Early Warning System (EWS) called the Learning Intelligent System (LIS) to address the issue of student dropout and improve overall performance in online courses.

Target group: Undergraduate students enrolled in the specified courses.

Description of case

Overview:

- Problem: Universities, especially ones that are fully online, often see students struggle and drop out of courses. This can happen for many reasons – maybe the student is new and overwhelmed, or the workload is unexpectedly heavy.

- Possible solution: The Universitat Oberta de Catalunya in Spain is developing a special computer system called the Learning Intelligent System (LIS) to address this problem. The LIS is designed to help students stay on track and succeed in their courses.

- How LIS Works:

- It watches how students are doing throughout the course.

- It uses past student data to predict if someone might be struggling.

- It shows students and teachers how things are going with a simple "traffic light" system.

- It sends personalised messages to students who may need some extra help.

Research:

- Researchers tested the LIS in two economics courses over two semesters.

- Researchers compared students' grades and how many dropped out when the LIS was used to a semester when it wasn't.

- Researchers also asked students what they thought of the LIS system in a survey.

Lessons learned

Performance impact:

- The LIS system can improve student outcomes: The data demonstrates that the LIS is associated with improved grades and reduced dropout rates, suggesting the system's potential to positively impact student success.

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- Early intervention is crucial: The strong link between early learning activity (ALA) performance and overall course success highlights the importance of timely feedback and support – areas where the LIS system excels.

Student perception:

- Students value the LIS system: The positive student feedback indicates that learners perceive the LIS as effective, useful, and supportive of their learning process.

- Younger learners may derive greater benefit: The LIS system seems especially well-received by younger learners, possibly due to its role in aiding self-regulation and managing the demands of online learning.

Benefits for Teachers:

- The LIS augments teacher support: The system's data-driven insights enhance teachers' ability to identify struggling students early on. This allows for more proactive and focused interventions to keep students on track.

Implications for practice

Universities should use early data to provide students with “traffic light” progress visuals and personalised messages, as this simple feedback helps them stay on track and reduces the risk of dropping out.

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Category 4: Ethical Considerations and Policy Implications of AI

Case Study 24: THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON EDUCATION BALANCING ADVANCEMENTS AND ETHICAL CONSIDERATIONS ON HUMAN RIGHTS

General information
Stosic, L., & Jankovic, A. (2023). The Impact of Artificial Intelligence (AI) on Education - Balancing Advancements and Ethical Considerations on Human Rights. *Law - Theory and Practice*, *40*(4), 58-72. https://casopis.pravni-fakultet.edu.rs/index.php/ltp/article/view/763/667 This study explores the increasing influence of AI in the educational sector. It delves into both the advantages and ethical concerns associated with AI technologies, particularly focusing on models like Generative Pre-trained Transformer (GPT). The research examines the implementation of AI in education, highlighting its potential to enhance learning experiences and improve the acquisition of knowledge. It also discusses the challenges posed by AI, such as issues related to transparency, ethics, and the protection of human rights.
Description of case
The primary purpose of the study is to provide a comprehensive overview of how AI can be integrated into educational practices while addressing the associated ethical dilemmas. The target groups for this study include educators, policymakers, AI developers, and human rights advocates. Ethical Considerations: There are significant concerns regarding the ethical use of AI in education, particularly in maintaining transparency and protecting user data. The potential for AI to infringe on human rights, including issues of bias and fairness, is examined. Challenges: The study highlights the need for robust ethical guidelines and legal frameworks to govern the use of AI in education. It underscores the importance of involving multiple stakeholders in developing these frameworks to ensure they are comprehensive and inclusive.
Lessons learned
Benefits of AI in Education: AI can personalise learning experiences, making education more accessible and tailored to individual needs. Tools like GPT can assist in teaching complex subjects, providing students with interactive learning opportunities.
Implications for practice
The study concludes that while AI holds great promise for transforming education, it must be implemented with careful consideration of ethical standards and human rights. The implications for practice include the need for ongoing training for educators in AI technologies, the development of clear ethical guidelines, and the establishment of regulatory bodies to oversee AI use in education. This research provides valuable insights into the dual nature of AI in education—its potential to revolutionise learning and the ethical challenges it poses.

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Case Study 25: ENAI Recommendations on the ethical use of Artificial Intelligence in Education

General information

Reference/Source: Foltynek, T., Bjelobaba, S., Glendinning, I. et al. (2023) ENAI Recommendations on the ethical use of Artificial Intelligence in Education. *Int J Educ Integr*, *19*(12). https://doi.org/10.1007/s40979-023-00133-4

The European Network for Academic Integrity is an association gathering educational institutions and individuals interested in maintaining and promoting academic integrity.

Description of case

AI tools are constantly being released into the public domain. As with all new technological innovations, this brings a range of opportunities and challenges for education: primarily for educators and learners. There is an increasing interest in the academic community and beyond to use AI in Education (AIED) to generate content. This presents opportunities and challenges for academic and research integrity.

ENAI presents a set of recommendations with the aim of supporting academics, researchers and other educational stakeholders, including students' organisations, on the ethical use of AI tools. The recommendations focus on the importance of equipping stakeholders with the skills and knowledge to use AI tools ethically and the need to develop and implement relevant educational policies addressing the opportunities and challenges posed by AIED.

Lessons learned

All persons, sources, and tools that influence the ideas or generate the content should be properly acknowledged. Consequently, when an AI tool is used, it should be acknowledged. The acknowledgement may be done in different ways, according to the context, the institutional policies or other requirements. When possible, the input given to the AI tool should be specified.

Appropriate use of services, sources, and tools that only influence the form is generally acceptable (e.g. proof-readers, proofreading tools, spelling checkers, thesaurus).

An AI tool cannot be listed as a co-author in a publication as it cannot take responsibility for the content and findings reported. The person (human being or legal entity) is always accountable for the content, whether or not it was generated by AI (see COPE Guidelines for Authorship and AI by Levene 2023).

The outputs of AI tools can include biassed, inaccurate, or incorrect content that users should be aware of. This may be caused by bias in training data, algorithms, filters, etc.

It is important to include information about AI in education for all students and in training for teachers. If students do not have the opportunity to learn about the ethical use of AI, they will be more susceptible to engaging in inappropriate use of AI, which may constitute academic misconduct.

Students should be included and educated on the following:

The purpose of all activities related to learning and assessment and why they should develop (e.g. write) their individual/group work assignments.

How to develop their ethical writing and content production skills.

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Teachers should receive training on ethical use of AI including development of relevant learning outcomes, learning activities, and assessment strategies. National guidance and institutional-level policies should be developed and/or reframed to include AI. National guidance should provide overarching advice on what institutions should include in their policies.
Implications for practice
Institutional policies should: Define default rules on when and how the students, teachers, researchers and other educational stakeholders are allowed to use different kinds of AI tools. There should be space for specific rules at course level. The policy and the rules should be clearly communicated to all stakeholders. Guide the users on how to correctly and transparently acknowledge the use of AI tools in an assignment, dissertation, thesis, paper, article, book chapter, computer programme, graphic, artwork and other types of artefact.

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Case Study 26: Will ChatGPT pass the online quizzes? Adapting an assessment strategy in the age of generative AI

General information
Reference/Source: Raftery, D. (2023). Will ChatGPT pass the online quizzes? Adapting an assessment strategy in the age of generative AI. *Irish Journal of Technology Enhanced Learning*, *7*(1). https://doi.org/10.22554/ijtel.v7i1.114 **University/HE institution:** South East Technological University **Course and subject domain:** Quantitative techniques modules for first-year business students. **Aim:** To investigate the accuracy of using ChatGPT to answer online quiz questions and explore students' attitudes and experiences with online quizzes. **Target group:** First-year business students who are taking quantitative techniques modules
Description of case
AI tool used: ChatGPT versions 3.5 and 4 : https://chat.openai.com/ **A detailed description of what happened:** Researchers copied and pasted each question from the quizzes into ChatGPT, and then pasted the response back into the virtual learning environment (VLE). This was done initially for each of the quizzes using ChatGPT-3.5 and then later with updated versions of ChatGPT.
Lessons learned
ChatGPT has the potential to answer multiple-choice questions, attaining correct answers on average for 50% of the attempted questions using ChatGPT-4 compared to 43% with ChatGPT-3.5.
Implications for practice
Future research is recommended to focus on improving ChatGPT's reliability and accuracy while maintaining the academic integrity of students.

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Case Study 27: The Role of AI in Shaping Europe's Higher Education Landscape: Policy Implications and Guidelines with a Focus on Ireland

General information

Reference/Source: Irfan, M., Murray, L., & Ali, S. (2023). The Role of AI in Shaping Europe's Higher Education Landscape: Policy Implications and Guidelines with a Focus on Ireland. *Research Journal of Social Sciences and Economics Review*, *4*(2), 231-243. https://ojs.rjsser.org.pk/index.php/rjsser/article/view/646

University/HE institution: University of Limerick

Course and subject domain: History, Music and Dance, Law, Politics and Public Administration, Modern Languages and Applied Linguistics, English Literature, Journalism, Mass Communication and Technical Communication, Sociology, and Administrative Staff.

Aim: To investigate the policy considerations for integrating Artificial Intelligence (AI) across various academic departments at the University of Limerick.

Target group: Academic and administrative staff across diverse departments at the University of Limerick

Description of case

AI tool used: N/A - This study applied to real students via questionnaires

A detailed description of what happened: Participants were provided with an open-ended questionnaire that asked for their views on AI integration and solicited recommendations on key policy considerations for dealing with the ethical and social implications of AI usage.

Lessons learned

The findings suggest a collective need for comprehensive AI ethics frameworks, transparent and accountable AI algorithms, robust data protection measures, and rigorous interdisciplinary dialogue to chart out the unique implications of AI for different subject domains in HE.

Implications for practice

Future research which examines the complexity and diversity of AI adoption and implementation within and across different institutions of higher learning is needed. The aim should be to foster a culture of interdisciplinary inquiry into the specific applications of AI in the context of diverse academic domains.

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Case Study 28: Personalised learning within teacher education: A framework and guidelines

General information

Reference/Source: Alisauskiene, S., Guðjónsdóttir, H., Kristinsdóttir, J. V., Connolly, T., O'Mahony, C., Lee, L., ... & Wozniczka, A. K. (2020). Personalised learning within teacher education: A framework and guidelines. https://hdl.handle.net/10468/11841

University/HE institution: University College Cork

Course and subject domain: N/A

Aim: To introduce a framework of personalised learning within teacher education, which will support teachers to implement personalised learning in their classrooms.

Target group: Teachers and teacher educators.

Description of case

AI tool used: N/A - This is a personalised learning article.

A detailed description of what happened: A workshop in Iceland where participants were grouped into ten groups and given rotating roles to map out personal resources and funds of knowledge each participant brought into the group. The study also provided a framework for personalised learning within teacher education that included a variety of methods, such as Walk & Talk and personalised project work.

Lessons learned

Different groups of participants can use the personalised learning framework to support their understanding and evaluation of their practice but the success of personalised learning depends on the context, quality of the dialogue, and the willingness of individuals to engage with the framework.

Implications for practice

The study highlights the importance of personalised learning in teacher education and offers multiple methods and strategies for implementing it effectively.

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Case Study 29: Generative Artificial Intelligence: Implications and Considerations for Higher Education Practice

General information

Reference/Source: Farrelly, T., & Baker, N. (2023). Generative artificial intelligence: Implications and considerations for higher education practice. *Education Sciences*, *13*(11), 1109. https://doi.org/10.3390/educsci13111109

University/HE institution: Munster Technological University

Course and subject domain: N/A

Aim: To explore the potential impact of generative artificial intelligence on international students and provide recommendations and strategies for educators and policymakers to prioritise ethical AI usage and cultivate AI literacy.

Target group: Primarily educators, policymakers, and institutions in Western HE who work with international students and those for whom English is an additional language.

Description of case

AI tool used: N/A

Ng et al.'s AI literacy framework:

https://doi.org/10.1016/j.caeai.2021.100041

Hillier's AI literacy framework:

https://teche.mq.edu.au/2023/03/a-proposed-ai-literacy-framework/

A detailed description of what happened: A comprehensive review of academic articles, books, and reports focused on the use of AI in HE, analysing the opportunities and challenges of integrating AI approaches in the classroom, and identifying potential solutions to ensure ethical and inclusive AI practices.

Lessons learned

The case study shows that instead of trying to “catch” students using AI with unreliable tools, universities should teach AI literacy and use the technology as a support tool to help international students overcome language barriers.

Implications for practice

The study highlights the potential benefits and limitations of current AI approaches in the classroom, including the ethical implications, linguistic, and cultural contexts. It is recommended that future research should prioritise promoting AI literacy, developing ethical AI guidelines and policies, and identifying and addressing biases in AI algorithms and models for equitable and responsible AI practices in higher education institutions.

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Case Study 30: KU Leuven empowers HE staff and students for responsible use of GenAI rather than banning it

General information

Reference/Source: KU Leuven website: https://www.kuleuven.be/english/education/leuvenlearninglab/support/highlighted/generative-artificial-intelligence

- As of 2022-2023, KU Leuven has over 65 000 students (bachelor, masters, PhD, exchange, postgraduate).

- As of 2023, KU Leuven employs 15 421 people, of which 1915 tenured academic staff, 2127 postdoctoral staff, 311 teaching staff and 4989 administrative and logistic staff.

- KU Leuven is an autonomous, research-intensive and internationally oriented university that carries out both fundamental and applied research.

- KU Leuven has decided to promote a responsible use of Generative AI (GenAI) in education instead of banning it.

- The university is open to the use of generative AI (GenAI)-technology concerning education and research and encourages its students, teaching staff and researchers to handle this technology in a responsible and critical way. GenAI-tools have found their way into the university and it is of importance that everyone understands how GenAI works, to ensure that the academic standards are upheld and users maintain ownership over their written text.

- The target audience: HE teaching staff, students, researchers

- There is a specific portal to provide guidance on the responsible use of GenAI in the university: https://www.kuleuven.be/english/genai

Description of case

- Generative Artificial Intelligence (GenAI) is a type of machine learning. It's the umbrella term for a group of algorithms that can create new content. This content can take different formats: text, code, images, videos, and music, or a combination of all of these. GenAI generates output in response to a query/prompt using generative models such as Large Language Models (LLMs), relying on large datasets to achieve this. Some well-known examples are text generators such as ChatGPT, ChatGPT's integration into Microsoft Bing, and image generators such as DALL-E and Midjourney.

- Basic principles: Transparency about the use of GenAI depending on the type of use. Verification of the correctness of the generated output, with attention for correct sources. Respect for copyrighted material, personal data and confidential information (including unprotected IP) by not importing them on platforms managed by external parties (non-KU Leuven servers). This is only possible with explicit approval of the owners of the copyrighted data, information or material. Responsibility for the correct usage of GenAI (primarily as help and support) and for the output you publish (concerning research) or submit as a student (concerning education).

- Tips and tricks for the use of GenAI: https://www.kuleuven.be/english/genai/tips

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- Guidelines per target group:

Students

https://www.kuleuven.be/english/education/student/educational-tools/generative-artificial-intelligence

Teaching Staff

https://www.kuleuven.be/english/education/leuvenlearninglab/support/highlighted/generative-artificial-intelligence

Researchers

https://research.kuleuven.be/en/integrity-ethics/integrity/practices/genai/genAI

Reference styles when using GenAI:

https://bib.kuleuven.be/english/training-and-tutorials/citation/refering-to-genai

Lessons learned

The primary lesson from KU Leuven is that large, research-intensive universities should embrace rather than ban GenAI, shifting the focus toward “responsible and critical use” by all members of the academic community.

Implications for practice

The guidelines and resources offered by this case study can be taken as a model for the use of GenAI tools in higher education (as an alternative of banning the GenAI tools).

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Case Study 31: Literacy in Artificial Intelligence as a Challenge for Teaching in Higher Education: A Case Study at Portalegre Polytechnic University

General information

Reference/Source: Lérias, E., Guerra, C., & Ferreira, P. (2024). Literacy in artificial intelligence as a challenge for teaching in higher education: A case study at portalegre polytechnic university. *Information*, *15*(4), 205.

The present study seeks to assess the level of AI literacy and knowledge among teachers at Portalegre Polytechnic University (PPU), aiming to identify gaps, find the main opportunities for innovation and development, and seek the degree of relationship between the dimensions of an AI questionnaire, as well as identifying the predictive variables in this matter.

As a measuring instrument, a validated questionnaire based on three dimensions (AI Literacy, AI Self-Efficacy, and AI Self-Management) was applied to a sample of 75 teachers in the various schools of PPU. The results also demonstrate that the first dimension is highly significant for the total dimensions, i.e., for AI Literacy, and no factor characterising the sample is a predictor, but finding a below-average result in the learning factor indicates a pressing need to focus on developing these skills.

Description of case

For the purposes of the study a measuring instrument was developed that builds on the existing literature on AI literacy. The questionnaire presented is modular, is easily applicable to professional life, meets psychometric requirements, and includes other psychological skills besides the classic facets of AI literacy, having been tested for its factorial structure. Therefore, the questionnaire that was applied in this study, adapted to the Portuguese language. It consists of 29 questions, based on three dimensions—AI Literacy, AI Self-Efficacy, and AI Self-Management—measured using a 5-point Likert scale.

In the first dimension (AI Literacy), using and applying AI, means applying knowledge, concepts, and applications of AI in different scenarios and implies understanding the applications of AI and how it can affect one's life. The second dimension (AI Self-Efficacy) integrates the Problem Resolution factor. This means voluntary behaviour aimed at solving problems, based on belief in the advantages of behavioural success, external approval, and the level of control of internal and external factors. The learning factor means understanding how AI learns and can be affected by data, that is, having a basic understanding of how AI and machine learning work, as well as knowledge of the implications of data quality, feedback, and one's own data of interaction.

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Lessons learned

This study delves into the AI literacy of teachers at Portalegre Polytechnic University (PPU), Portugal.

AI Literacy- This gauges teachers' knowledge (understanding AI functionalities), application (using AI in various scenarios), detection (identifying AI in use), and ethical considerations (bias, fairness, transparency), AI Self-Efficacy- This assesses teachers' confidence in handling challenges and problems related to AI, with a specific focus on "learning" as a sub-factor, AI Self-Management-. This evaluates teachers' ability to manage their emotions regarding AI and their awareness of AI's influence on their daily work.

Key Findings involve that PPU teachers show an overall average level of AI literacy, teachers excel in using and applying AI tools and understanding the ethical implications of AI in education, which indicates a comfort level with practical implementation and a commendable awareness of responsible AI use.

The challenges of the study identified a knowledge gap in how AI functions and its accessibility for educational purposes. Teachers reported lower scores in this area, suggesting a need for training on the technical aspects of AI and how to leverage it for teaching and learning.

Implications for practice

The need to develop training programmes to improve teachers' understanding of AI functionalities and its use in education emerged from the study, the necessity to implement awareness campaigns on ethical considerations of AI in education and to encourage teachers to explore and experiment with AI tools for teaching and learning, as well as to conduct similar studies with students and other institutions to understand AI literacy across academia.

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Category 5: AI in Specialised Educational Contexts / Tools

Case Study 32: Dodona Docs - Learn to code for secondary and higher education

General information

Reference/Source: Van Petegem, C., Maertens, R., Strijbol, N., Van Renterghem, J., Van der Jeugt, F., De Wever, B., Dawyndt, P., Mesuere, B., 2023b. Dodona: Learn to cope with a virtual co-teacher that supports active learning. *SoftwareX*, *24*, 101578. https://doi.org/10.1016/j.softx.2023.101578

Ghent University is a public research university located in Ghent, Belgium. Located in Flanders, Ghent University is one of the largest Belgian universities, consisting of 50,000 students and 9,000 staff members.

Dodona is an AI-based tool for teachers and students of secondary and HE: 17 499 579 Submitted solutions, 68 267 Students, 16 738 Exercises, 1 756 Schools

The tool is being developed by Jorg Van Renterghem, Charlotte Van Petegem, Niko Strijbol, Rien Maertens, Peter Dawyndt, and Bart Mesuere from the Applied Mathematics and Statistics department at Ghent University. The platform is completely open source: all code is available on GitHub. At the moment, Dodona supports the programming languages Python, JavaScript, Java, Kotlin, C#, bash, Prolog, Haskell and R. Dodona is free to use and has more than 50 thousand registered users across many educational and research institutions, including 15 thousand new users in 2022.

There is also scientific research related to Dodona:

https://dodona.be/nl/publications/

Description of case

Dodona (dodona.ugent.be) is a free online practice platform to learn programming. It aims to teach students to programme in the most meaningful and effective way possible by using different computer technologies to apply the benefits of personalised guidance in contexts where students would otherwise only have access to classroom guidance (e.g. lectures and tutorials) or not even direct guidance (e.g. independent work and homework).

Dodona acts like an online co-teacher designed to give every student access to high-quality education. The focus is on automatically improving and providing meaningful feedback on student solutions submitted.

Teachers can create their own course, consisting of different series of exercises. They can rely on existing courses and exercises but can also choose to get started themselves and draw up their own exercises and teaching materials. Thanks to the built-in learning analytics and data visualisations, it is also easy to measure student progress. Here you will find some manuals, mainly aimed at teachers.

The Dodona learning environment contains thousands of programming exercises that can be used to master various programming languages. All exercises are provided with automatic feedback on correctness, speed and/or programming style. Bugs or suggestions can always be reported via the contact form.

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Lessons learned
Dodona is an intelligent tutoring system for learning computer programming, statistics and data science. It bridges the gap between assessment and learning by providing real-time data and feedback to help students learn better, teachers teach better and educational technology become more effective. Dodona can be used as a virtual co-teacher to stimulate active learning and support challenge-based education in open and collaborative learning environments.
Implications for practice
Practitioners should use automated platforms like Dodona as “virtual co-teachers” to provide students with immediate, high-quality feedback during independent work while using real-time learning analytics to identify and address common student struggle points.

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Case Study 33: Online training on AI in Education

General information

Reference/Source: Online training on AI in Education https://itec.kuleuven-kulak.be/online-training-on-ai-in-education

- Itec is an interdisciplinary research group of KU Leuven and imec. KU Leuven is an autonomous, research-intensive and internationally oriented university that carries out both fundamental and applied research. Imec is a nano- and digital technology innovation hub.

- Itec's research focus lies in the design, development and evaluation of personalised and adaptive digital solutions. Itec's primary application domains include education, training and health.

- Itec offers an Online training on AI in education: https://itec.kuleuven-kulak.be/online-training-on-ai-in-education

Description of case

- Highlights a few AI tools used in education developed in Europe such as NOLEJ (France), a decentralised skills platform powered by an AI engine, that automatically generates interactive courseware & global knowledge and Tessa launched by Prowise in the Netherlands to be an AI-driven teaching assistant.

https://nolej.io/connect

https://www.prowise.com/en/product/prowise-presenter/tessa-teachassist

- Mentions creative AI applications such as Adibe, DALL-E, Bing Image Creator, Midjourney, Blob Opera, SingSong, Boomy, lalal.ai, Lyrical Labs, Musicfy, Magic Switch, HeyGen and Gen-2 Runway.

- Refers to an article on 10 best AI tools for educators mentioning the following tools - Course Hero, Gradescope, Fetchy, ChatGPTPro, Nuance Dragon Speech Recognition, Cognii, Century Tech, Carnegie Learning's tools such as MATHia software and Fast ForWord, Ivy Chatbot, Knowji: https://www.unite.ai/10-best-ai-tools-for-education/#:~:text=10%20Best%20AI%20Tools%20for%20Education%201%201.,Plaito%20...%208%208.%20Queirum%20...%20Éléments%20supplémentaires

- Leuven.AI: Education and training programmes: https://ai.kuleuven.be/education-and-training/education-and-training

Lessons learned

This case study provides practical guidelines and insights for a responsible and meaningful integration of AI in education.

Implications for practice

The main implication for practice is that educators should move beyond general-purpose tools to adopt domain-specific AI ecosystems—such as AI teaching assistants for lesson planning and specialised courseware generators—to automate administrative tasks and enhance creative learning.

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Case Study 34: Large Language Models to create a virtual client for psychology students at Howest to practice their conversational skills

General information

Reference/Source: Space 2.0 https://daeresearch.be/space2/

SPACE 2.0 is a cooperation between the research team of Digital Arts and Entertainment, and Applied Psychology at HOWEST. https://daeresearch.be/space2/

HOWEST – University of Applied Sciences

howest.be

Hogeschool West-Vlaanderen, almost always shortened to "Howest", is a university of applied sciences in West Flanders, a province of Belgium with five campuses situated in Bruges and Kortrijk. Howest is an entrepreneurial University of Applied Sciences known for its innovative and interdisciplinary approach to education and research, and its close collaboration with industry, business and the social profit sector. Howest is a member of Ghent University Association and is fully accredited by NVAO, the Dutch-Flemish Accreditation Organisation. It offers 24 Bachelors, 10 Associate Degrees and many Postgraduate Certificate programmes, all with a strong practical focus, in the areas of Business & Management, Industrial Sciences & Technology, Digital Design, Architecture, Healthcare, Education and Social Sciences.

Digital Arts & Entertainment

digitalartsandentertainment.be

Digital Arts and Entertainment (DAE) has been crowned best game design and development school in the world three times in the last five years (2021-2018-2017) by The Rookies World School Rankings®, making DAE a top international player in game design and art education. Howest DAE is ranked #25 in the 2022 Princeton (USA) Review's Top 50 of Game Design Undergraduate programmes.

DAE grew from 180 students and 1 major to 1500 students and 6 majors, in 17 years' time.

Description of case

During the Applied Psychology degree at Howest, students are taught various conversational strategies. To practise this skill, students take part in role-playing exercises. These exercises require a lot of teacher commitment, are difficult to evaluate, give limited feedback to each student, give limited flexibility in the learning process, and are heavily dependent on peer effort.

The focus of the project is to replace these role-playing exercises with an AI agent which takes on the client role, and allows the students to talk to a virtual character instead of one of the other students.

To accomplish this, the team makes use of Large Language Models, a recent advancement in AI technology known widely from OpenAI's ChatGPT. Leveraging this new tech allows the virtual persona to be creative, and answer questions correctly, while still sticking to present backstory information and personal characteristics. Some personas might be open, willing to share, looking for a solution, others might be more closed-off, requiring specific questions and strategies to disclose more information.

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Aside from the Large Language Model, the tool also uses speech-to-text and text-to-speech to allow the user to speak with the virtual client, as well as using Metahumans and speech-to-animation to create a virtual character that embodies the client, giving the users a more natural feeling as if they were speaking to a real person, instead of feeling like they are talking to a computer.

In addition to the persona, the goal is to also build an observer which will evaluate the student's conversation with the virtual client based on the application of the strategies they are taught. This might give the students some initial feedback they can use to improve, or at the very least might give the lecturer a quick overview of what elements the students should focus on more.

Lessons learned

Virtual training conversations allow for efficient hands-on experience without the need for the physical presence of a real client. This saves time and costs compared to traditional training involving live actors or real patients. Virtual training is also available anywhere, anytime, allowing students to improve their conversational skills whenever best suits them. This increases accessibility to training, especially for those who are geographically limited or have busy schedules.

Training with a virtual client also provides a safe environment in which students can experiment, make mistakes and learn without risk to real patients. We expect that this will contribute to the students' self-assurance and improve their performance in real clinical situations. Programs can also be tailored to individual needs and skill levels, allowing for more focused and effective training as students can focus on specific aspects of their conversational skills.

Implications for practice

Replace high-stress peer role-plays with AI "virtual clients" to let students practice counselling skills anytime in a safe, private environment. This allows for instant, automated feedback on their conversation techniques while freeing up teachers' time.

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Case Study 35: Learning, teaching & training in the era of Artificial Intelligence: Challenges and opportunities for evidence-based educational research

General information

Reference/Source: Itec (2024). Learning, teaching & training in the era of Artificial Intelligence: Challenges and opportunities for evidence-based educational research. [Positioning paper: coordinated by Rani Van Schoors and Ann Fastré]. Kortrijk: itec, an imec research group at KU Leuven. https://itec.kuleuven-kulak.be/wp-content/uploads/2024/03/Positioning-paper-itec.pdf

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Itec's research focus lies in the design, development and evaluation of personalised and adaptive digital solutions. Itec's primary application domains include education, training and health.

Itec published a position paper to provide a comprehensive insight into how AI in education is researched in their organisation: https://itec.kuleuven-kulak.be/wp-content/uploads/2024/03/Positioning-paper-itec.pdf

Description of case

The report provides insight into how AI in education is being researched at itec, an imec research group at KU Leuven, thereby contributing to the accelerating research domain of Artificial Intelligence in Education (AIED). This report is referred to as a 'positioning paper'. Its purpose is to illuminate the perspectives and efforts of the Itec research group regarding the main subject of AI in education and training.

In part one, the report begins with an overview of the status, challenges and perspectives of AI in learning, teaching and training. summarising findings and conclusions from the already wide-ranging field of AIED.

In part two, the different research expertise within itec are outlined to describe our current AI related research projects as well as the concrete use cases we are working on.

The implications, recommendations and challenges for the future are brought together in an overall conclusion that can inspire future research and design efforts.

The contents of this first report of 2024 are not static, but can – and will – be dynamically updated over time, in tandem with the rapid revolutions within AI, new initiatives within the itec research group and shifts within the broader educational landscape.

Updates regarding subsequent reports can be found on the website: www.kuleuven.be/itec

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Lessons learned

Teachers/ trainers and researchers both play essential roles by offering valuable insights and contributing to the collaborative design of AI tools as developed by EdTech companies, aiming to enhance their user-friendliness and utility.

Furthermore, when teachers/trainers, researchers and software providers collaborate, it enhances the validity of their findings, especially when innovations are evaluated by teachers/trainers within the authentic context of a classroom. This in vivo approach allows for a deeper understanding of the impact of AI tools on teaching and learning, considering the rich and complex dynamics of the classroom environment.

Additionally, government-led initiatives can provide essential support to provide guidelines and professionalisation opportunities with regard to design, development and implementation.

In sum, the collaboration between educational stakeholders holds significant value and is highly regarded: by sharing knowledge, designing interventions together, and engaging in ongoing dialogue, more evidence-based AI-tools can be developed which are relevant, applicable and valorised in real-world educational settings.

Fostering collaboration between schools, companies, researchers and policymakers will become increasingly important for sustainable growth.

Only within a shared vision and constructive dialogue about responsible AI use, teachers/ trainers and learners can be empowered to actively shape their educational paths in education and training contexts.

Above all, a realistic approach is needed with regards to AIED. Neither naivety nor scepticism will futureproof our attitude towards innovation. AI is here to stay, with every risk and opportunity in full effect immediately upon release. The only truly impactful way will be forward!

Moving ahead, we need to raise awareness and empowerment about privacy and ethics concerning the use of AI, demand main actors' agency within the teaching/training and learning environment (i.e. teachers/trainers and learners) and incentivise explain ability within artificially intelligent systems that can be used in both formal and informal educational settings. Only then will we be able to go digital while simultaneously staying human.

Implications for practice

Institutions should move away from isolated tool adoption and instead form collaborative partnerships between teachers, researchers, and tech developers to ensure AI tools are tested and validated in real classrooms.

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Case Study 36: Attention to diversity from artificial intelligence

General information
Reference/Source: Domínguez-González, M. de los Á., Hervás-Gómez, C., Díaz-Noguera, M. D., & Reina-Parrado, M. (2023). Attention to diversity from artificial intelligence. *The European Educational Researcher*, *6*(3), 101–115. https://doi.org/10.31757/euer.633 **Institution**: University of Seville, Spain (public institution) **Course/subject**: Information and Communication Technology applied to Education, within the Degree in Primary Education **Aim**: - To explore how teachers in training design prompts (i.e., questions or instructions used with AI) that align with Bloom's Taxonomy and address the needs of students with Special Educational Needs (SEN). - Analyse teachers-in-training's understanding and application of Bloom's Taxonomy and their ability to create effective AI prompts for inclusive learning. Target group: Pre-service teachers enrolled in an undergraduate education course.
Description of case
Overview: - Students were asked to write an AI prompt focusing on students with SEN before and after receiving AI training sessions. - Prompts were classified according to Bloom's Taxonomy levels (remember, understand, apply, analyse, evaluate, create). - Researchers analysed the distribution of prompts across different taxonomy levels, as well as patterns and trends.
Lessons learned
- Emphasis on AI prompts: The study highlights the importance of well-designed AI prompts for inclusive learning. Teachers-in-training demonstrated the ability to craft prompts that stimulate higher-order thinking skills (apply, analyse, create) which aligns with effective AI tool usage. - Areas for development in prompt design: While a focus on application and creation is promising, the study suggests the need to strengthen prompts that target the 'understand', 'analyse', and 'evaluate' levels of Bloom's Taxonomy. This would help pre-service teachers maximise AI tools to foster deeper understanding and critical thinking.
Implications for practice
Implications for AI integration in teacher training: The results offer insights into how pre-service teachers conceptualise using AI in the classroom. Teacher training programs could leverage these findings to emphasise the following: 1) Designing AI prompts that span the full range of Bloom's Taxonomy for multifaceted learning experiences; 2) Teaching students to critically analyse AI output, focusing on 'understanding', 'analysing, and 'evaluating' the information provided by AI tools

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This section has provided a rich overview of the diverse applications and implications of AI tools in HEIs. Through thirty-six case studies, we explored how AI is transforming various aspects of teaching and learning, from automated assessment systems to fostering student engagement and critical thinking skills. The case studies highlight the potential of AI to:

- Enhance personalised learning experiences through real-time feedback and adaptive learning platforms.
- Improve assessment practices by automating tasks and providing objective evaluations.
- Streamline administrative processes, freeing up faculty time for more focused interactions with students.
- Equip students with essential skills for the future workforce, including data analysis and critical thinking.

However, the case studies also acknowledge the challenges associated with AI integration in HEIs, including:

- Ensuring data privacy and security of student information.
- Mitigating potential biases inherent in AI algorithms.
- Maintaining academic integrity in an era of advanced content generation tools.
- Upskilling educators to effectively leverage AI technologies.

Overall, this section underscores the transformative potential of AI in HE. As AI continues to evolve, HEIs have a crucial role to play in harnessing its power to create a more effective, engaging, and equitable learning environment for all students.

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