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Smart EdTech, a global community of practice for the sociocritical development of artificial intelligence in education

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Abstract

The emergence of Generative Artificial Intelligence (genAI) necessitates a rapid evolution in university programs in educational technologies. This paper introduces a sociocritical analysis of the AI acculturation activities developed within the MSc Smart EdTech master. This program supports edTech professionals, from instructional designers to educators and entrepreneurs in edTech, to develop a critical understanding of AI and creative uses of these technologies among master students.

This paper adopts a dual perspective. Firstly, it acknowledges the dichotomy within educational technology, catering to diverse user needs encompassing both learners and educators. Secondly, it delves into the inherent prioritization of learner agency in technology design, potentially constraining teacher influence.

Keywords: Artificial Intelligence, Teachers' Agency, Educational Technology.

Introduction

Over the past years, the advancement of artificial intelligence (AI) technologies, including machine learning, computer vision, and natural language processing, has permitted the transformative uses of AI in different domains. Its application to goods and services, as well as the defense sector, is quickly emerging as a critical component of success in the global marketplace. By the end of 2022, the McKinsey Global Survey on AI revealed that the technology's use was growing, with adoption having more than doubled since 2017 (McKinsey Global Institute, 2022).

The McKinsey Global Institute conducted a study among corporate representatives from 2018 to 2022, and the results show that AI technologies are being used more and more in goods and business

operations. According to the World Economic Forum's "The Future of Jobs Report 2020," AI is expected to replace 85 million jobs worldwide by 2025 (WEF, 2020).

Thus, AI is one of the scientific and technological sectors that is advancing the fastest. The needs of the modern world, including the rise of new professions in this area such as AI expert, AI engineer, or Machine Learning Engineer, and the consequent need for qualified professionals, are tied to preparing today's students for the use of such technology.

This implies that the need for AI specialists is already quite high. In this context, it is important to explore how modern students can be involved in the creative use of AI technologies for their education as in professional activity and daily life. In education, the emergence of generative AI technologies such as ChatGPT has introduced new learner and teacher practices which require consideration of their educational potential but also their ethical implications (Septiani et al., 2023).

AI as a current trend in education

In the current trends of education, AI has become a popular topic of discussion for its impact on teaching and learning processes. Cardona et al. (2023) argue that there are several positive impacts that AI may bring that lead to the improvement of educational experiences. O'Toole and Horvát (2024) observe that one of the potentials of AI to influence is that when users' creativity is combined with using AI-based tools, it is suggested that it can lead to the possibility of users creating content more deeply and maximizing potential in the creation's process. For example, the 2023 EDUCAUSE Horizon Report shows how AI-based chatbots may improve self-learning processes in medical students because "empathetic" chatbots are capable of mimicking patients (Pelletier et al., 2023).

As AI becomes more integrated into educational settings, being aware of AI and incorporating creativity are helpful factors in supporting students and educators to navigate the use of AI (GEM Report UNESCO, 2023). It is then important to understand how AI operates and how it can be used effectively to improve teaching and learning experiences (UNESCO Digital Library, 2023).

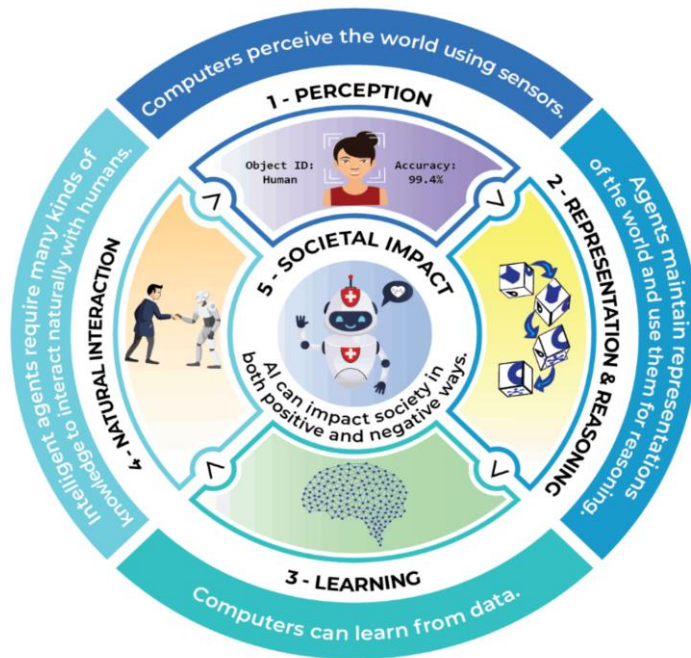
Current digital competency frameworks integrate the need to develop a certain understanding of algorithmic thinking and computational thinking. However, the need to integrate AI literacy has been only recently considered in some of them. Within the DigComp 2.2 European Framework (Vuorikari et al., 2022) there is a reflection on the critical uses of AI in education which points to a set of five objectives to integrate AI in education. The requirements are based on the following competencies:

- A. "What do AI systems do and what do they not do?" This competency necessitates an understanding of the capabilities and limitations of AI systems, enabling educators and learners to discern the scope and boundaries of AI applications.
- B. "How do AI systems work?" This competency aims to support the understanding of mechanisms and algorithms underlying AI functionality, fostering a deeper comprehension of their operation.
- C. "When interacting with AI systems". This competency focuses on developing skills for deciding the moments (when) AI could be effective for the teaching and learning process.
- D. "The challenges and ethics of AI". Addressing the challenges and ethical implications associated with AI deployment, this competency prompts critical reflection on issues such as bias, privacy, and accountability in AI systems.
- E. "Attitudes regarding human agency and control". Exploring attitudes toward human involvement and control in AI decision-making processes, this competency encourages educators to consider the balance between autonomy and oversight in AI-driven environments.

In their work on “How to Teach Artificial Intelligence”, VanderArk (2020) identifies similar objectives, aiming first to understand how AI systems work (perception, representation, machine learning, natural interaction) but also their societal impact.

Figure 1

Framework for teaching AI in education (Vander Ark, 2020).



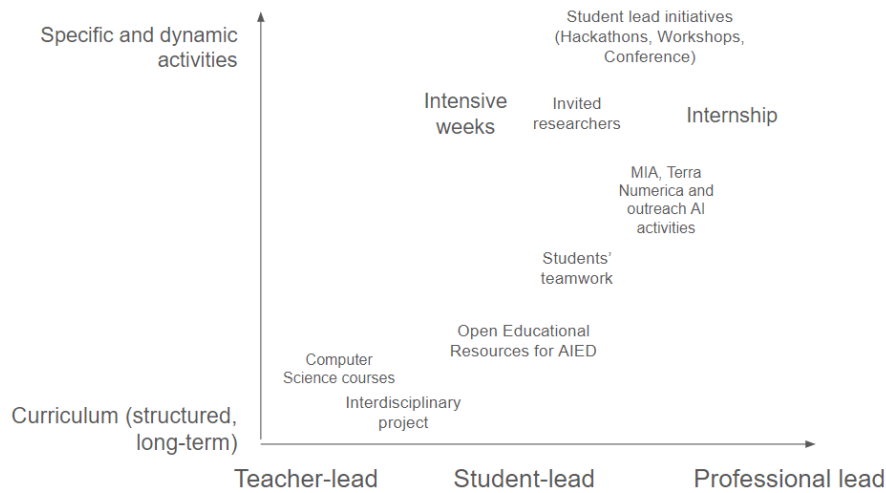
HyFlex education to acculturate edTech professionals to AIED

The Master of Sciences (MSc) SmartEdTech program is designed by using a blended learning approach that combines two intensive weeks in Nice (in October and April) with the rest of the coursework being completed online.

The goal of the MSc SmartEdTech initiative is to provide a high-quality, collaborative, and co-creative approach to digital education. For professionals (designers, engineers, ergonomists, etc.) engaged in the development of digital technologies for education (EdTechs) and the education professionals who employ them, the curriculum tackles contemporary social and economic challenges.

Figure 2

Activities developed within the MSc Smart EdTech program.



The MSc Smart EdTech program has a high flexibility of learning activities as represented in Figure 2. The pedagogical structure of the program is conceived as a continuum, extending from traditional, teacher-led instruction to dynamic, professionally-driven experiences. The MSc Smart EdTech program develops a triple perspective in computer science, learning sciences, and applied cognitive sciences. The program also integrates instructional design, innovative pedagogies, and interdisciplinary projects (Romero et al., 2020). Within computer science education, students are engaged in game development with AI-supported tools like Unity, the Digital Expertise course immerses students in the realm of AI. Collaborations with esteemed partners like Cocolab and AI for Emotion Recognition expand horizons, while intensive week activities and workshops are spearheaded by entities like MIA and Terra Numerica. Since 2023, the program integrates open educational resources and practical activities with Maison de l'Intelligence Artificielle (MIA) and Terra Numerica for AI in Education (AIED). This allows us to prepare students for the challenges and use of AI in their future professional activities. It will also give them an advantage in their job search, as according to the Resume Builder (2023) 96% of companies hiring in 2024 will prefer candidates with AI skills. This student-centric phase of the curriculum is complemented by opportunities for students to lead initiatives such as hackathons, workshops, and conferences in technology-enhanced learning (TEL), but also entrepreneurial activities. Moreover, internships ensure that theoretical knowledge is seamlessly integrated with practical, professional experience. Such activities not only bridge the gap between academia and industry but also enable students to actively shape their learning journey, aligning with the needs of the educational technology (EdTech) sector. Collaboration among the diverse profiles of MSc Smart EdTech students plays a crucial role in fostering the assimilation of AI and the integration of educational practices in the field of education. Some students have already gained experience in implementing AI in education, whereas others rely solely on their personal experiences. These students' collaboration supports knowledge transfer and the emergence of new creative uses of AI in education while considering the ethical implications related to data representativity in the bias of AI technologies. The co-design activities developed at the MIA offer a playful context to experience different types of activities (image recognition, AI-supported drones, AI-based social robotics), which allows students from different backgrounds and AI competencies to have a concrete experience and be able to co-design creative activities supported by AI.

Figure 3

MSc Smart EdTech students at Maison de l'Intelligence Artificielle (MIA).



The specific MSc Smart EdTech objectives for integrating AI tools and the pedagogical potential of AI for education (AIED) have been defined into five areas as shown in Figure 4.

Figure 4

MSc Smart EdTech objectives in relation to AIED.



Understand AI fundamentals and potential for AIED in order to improve decision-making

Creation of digital content supported by AI

Use of AI tools for (co)creative problem solving

Use of AI to support personalised learning (chatbots, ITS, gamification, etc)

Develop sociocritical assessment of media for quality information

The first objective is to comprehend the fundamental principles of AI and its potential in the field of AIED to improve decision-making processes in teaching and learning processes. Acquiring this fundamental information enables students to analyze and utilize AI capabilities in educational environments with a critical mindset.

The second objective aims to support the development of digital content facilitated by artificial intelligence (Ossiannilsson et al., 2024). This involves utilizing artificial intelligence to create cutting-edge and engaging learning materials, therefore enhancing the educational environment with technologically advanced resources.

The third objective of the MSc Smart EdTech curriculum encourages the utilization of artificial intelligence tools to facilitate collaborative and innovative problem-solving. This purpose emphasizes the significance of utilizing AI in both individual and group learning activities, encouraging students to employ AI in manners that cultivate creativity and collective intelligence.

The fourth objective, the program acknowledges the importance of customization in education, promoting the utilization of artificial intelligence to facilitate personalized learning experiences. The program utilizes AI-driven mechanisms, including chatbots, Intelligent Tutoring Systems (ITS), and gamification, to accommodate individual learning styles, preferences, and speeds. This approach enhances learner engagement and effectiveness.

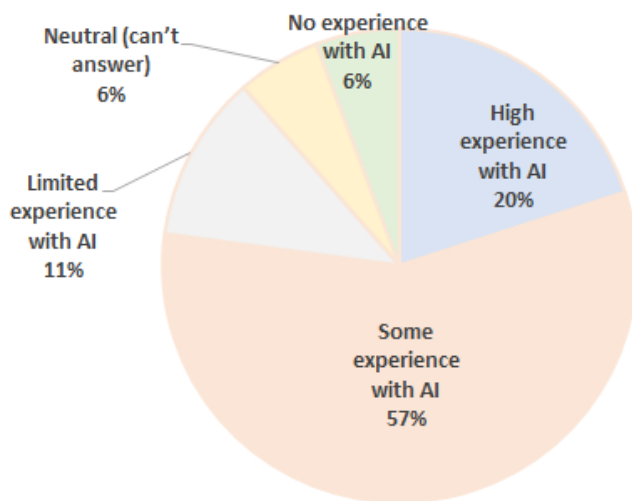
Finally, the fifth objective of the MSc Smart EdTech program involves the creation of a sociocritical evaluation of media to determine the quality of information. This section focuses on the ethical aspect of AIED, highlighting the importance of students critically assessing media material and the impact of AI on the quality and spread of information. This objective is in line with the goal of promoting responsible utilization of technology in educational settings.

Study of creative uses and practices of AI in education for MSc Smart EdTech students

To analyze what is the level of engagement of MSc Smart EdTech students in using AI tools and how they understand AI in general we conducted the survey using Google Forms (during April 2024 intensive week). This target group consisted of 35 participants (51.5% - MSc Smart EdTech students, 36.9% - educators and 11.6% - others (instructional designer, NGO leader, manager in the field of online education)). Responses of self-evaluation of the survey participants' experience with AI ("How can you rate your experience with AI?") are shown in Figure 5.

Figure 5

The self-evaluation of the participants' experience with AI.

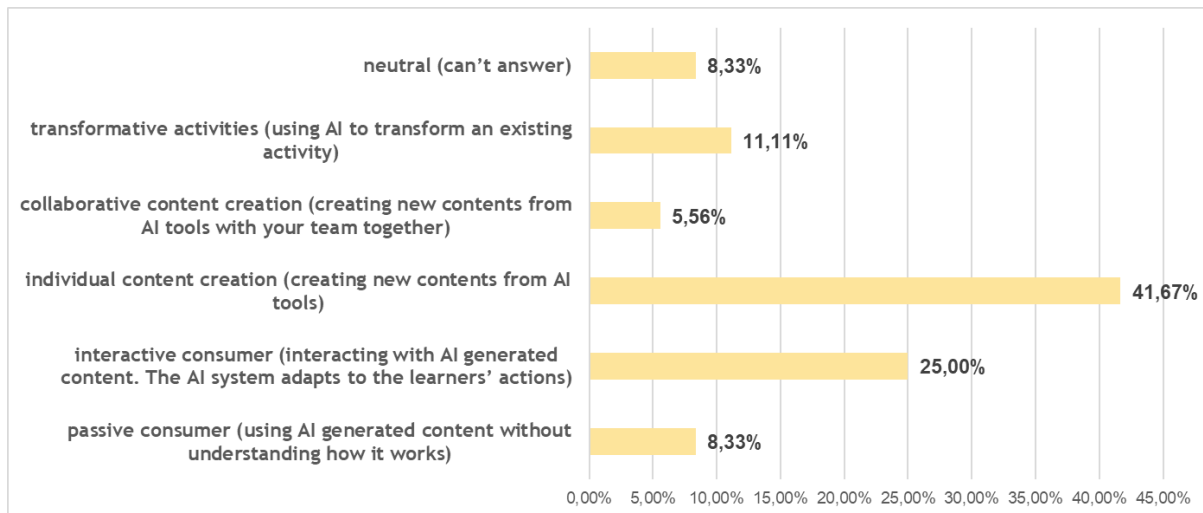


Responses on Figure 5 show that most participants need to improve their experience with AI (11% of respondents have limited experience with AI and 12% can't answer or don't have any experience with AI at all). For this purpose, students take part in different activities and practicing tasks related to the use of AI tools in education, professional activities, and creative problem-solving during their studying. The example of such an activity proposed is shown below.

We consider also the different levels of creative engagement in the use of AI in education based on the #PPAI6 model in which the learner can either be a passive consumer of AI content or be a co-creator with AI technologies (Romero et al., 2023). Responses of self-evaluation of the survey participants' level of creative engagement with AI ("How can you evaluate your level of engagement with AI?") are shown in Figure 6.

Figure 6

The self-evaluation of the participants' level of creative engagement with AI.



The results on Figure 6 show that only 11% of the participants can use AI in transformative activities in education. That means that we need to propose such study cases that can develop students' skills on using AI.

For deeper engagement MSc Smart EdTech students in creative problem-solving with AI tools we designed practicing tasks "Missions with using AI" and proposed them during the April 2024 intensive week. For finding the solutions of problems students should had to choose appropriate AI tools for every mission.

The example of the task is shown below in Figure 7. Students need to find AI tools for solving ecological problems after destroying the Kakhovka Dam during the wartime in Ukraine (finding people and animals, delivering the food etc.).

Figure 7

The creative problem-solving practicing task with AI (Mission 1).

Mission 1

In 2023, an environmental disaster occurred in Ukraine as a result of Russia's attack on the Kakhovka Dam. Large areas of land with villages and fields were flooded. Many people and animals died. Video of flooding after the dam was blown up: <https://www.youtube.com/watch?v=G65iif4WPGA>

Ukrainian drone operators launched drones to search for living creatures.

Imagine that you are drone operators with a built-in camera. You need to upload data to the drone's memory to help it search animals (e.g. dogs, cats, cows etc.) after saving the people.

What AI tools would be appropriate for this mission? Train the appropriate AI models.

Fill in the slide(s) with explanation of your solutions in shared presentation

In Figure 8 we can see the gained results after solving this problem with AI tools.

Figure 8

Solving problem task (Mission 1) with AI tools presented by 2 groups of MSc Smart EdTech students.

Mission 1: In class

The purpose of mission:

To find and save people and animals after the destruction of the dam

AI tools you used for solving the mission:

LIVING / NON-LIVING - sub-categ - manmade / nature made

Heat Signature Analysis - Infrared Cameras. Inc FM640+ and FMX 640 programmed with temperature references for animals:

<https://infraredcameras.com/news-center/5-reasons-to-use-infrared-cameras-to-detect-elevated-body-temperature#:~:text=The%20most%20accurate%20cameras%20for,temperature%20using%20an%20AI%20algorithm.>

Machine Learning for Search Patterns: Teachable Machine

<https://teachablemachine.withgoogle.com/train>

Natural Language Processing (NLP) but AUDIO Processing - dog barking and general animal sounds

Bioacoustic AI <https://bioacousticai.eu/> - understanding animal sounds with machine learning

Link for results (if appropriate)

Photos and/or tips (if appropriate):

General conclusion:

Mission 1 Online team

The purpose of mission: (online group)

To find and save people and animals after the destruction of the dam

AI tools you used for solving the mission:

Computer Vision

Object Detection

Heat Signature Analysis

Machine Learning for Search Patterns

Natural Language Processing (NLP)

Data Fusion and Integration

Autonomous Navigation

Predictive Analytics

Link for results (if appropriate):

Photos and/or tips (if appropriate): Techniques: CNNs, YOLO, SSD, Faster R-CNN

General conclusion:

As we can see from Figure 8, students proposed creative ideas to use AI applications and tools for solving this problem, such as machine learning tools for search patterns (i.e., teachable machines with Google), infrared cameras for heat signature analysis, and computer vision (i.e., built-in drones with AI), audio processing tools for understanding animal sounds with machine learning (dog barking and general animal sounds, for example, with the Bioacoustic AI tool), natural language processing (NLP) for recognizing people's sounds (i.e., teachable machines with Google), object detection, autonomous navigation, predictive analytics, and others.

According to the Vander Ark model (2020), these activities enhance students' comprehension of how AI systems function. These activities include the perception and analysis of problems that AI tools can solve, the use of machine learning tools to train suitable AI models using images, audio, or poses, the natural interaction of students with AI tools, the representation of acquired data, and the impact of AI on society, particularly in positive ways. The solution to such problems also corresponds to the MSc Smart EdTech objectives for AIED (see Figure 4). In addition, creative problem-solving activities with AI tools can also lead to developing competencies in critical uses of AI in education (according to the DigComp 2.2 European Framework):

- Students interact with AI systems during the assignment (competence “When interacting with AI systems”).

- Students analyze capabilities and limitations of AI systems while they are choosing appropriate AI tools for problem-solving (competence “What do AI systems do and what do they not do?”).
- Students are developing an understanding of how AI mechanisms and algorithms work while they are training for example machine learning models (competence “How do AI systems work?”).
- The capabilities of AI systems and tools can also show students negative ways of using AI, i.e. training of AI models on biased data, misinformation that can be caused by the use of Natural Language Processing (NLP) such as ChatGPT, generative AI tools, etc. This knowledge and experience allow students to develop such competencies as “The challenges and ethics of AI” and “Attitudes regarding human agency and control”.

We are confident that such tasks will lead to a better understanding for students of what AI is and what capabilities of its use in education and for creative problem-solving, as well as promote understanding and skills of rational use of AI systems and technologies as a whole.

Discussion

The impact of AI on professional and educational practices shows a significant potential for co-creative uses through a hybrid intelligence approach (Järvelä et al., 2023; Romero et al., 2023). While AI has the potential to revolutionize how people work, communicate, and interact with technology, it also raises issues related to job displacement, biases, and discrimination, as well as the potential for misuse or abuse. The AI acculturation of students, such as the formative interventions developed within the MSc Smart EdTech, allows us to consider how AI literacy and acculturation can be developed in relation to the educational objectives set by edTech professionals. In this context, we need to consider AI acculturation of edTech professionals, but also human values, including equity, freedom, privacy, security, and responsibility. At the moment, no other technology poses a more thorough and direct question for us to consider when deciding how and if we need to incorporate this technology into the larger social context. Human guidance in the AI acculturation is essential to support the critical and ethical perspectives that can be developed in the process of AI integration in education. In order to have a broader impact, the acculturation and co-design activities within the MSc Smart EdTech program are also shared with the public education system in the French Riviera region and Terra Numerica. The learning materials are shared as Open Educational Resources (OER). Empowering future EdTech professionals, teachers, and parents through AI acculturation and co-design activities is essential for fostering agency, ensuring that the integration of AI in education is guided by ethical standards and human values, ultimately leading to a more responsible and inclusive technological future.

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