



AI4ED

TOWARDS AN AI DRIVEN EDUCATIONAL PROCESS
INTEGRATING MODERN CAREERS IN THE EDUCATIONAL
SYSTEM

Deliverable

D2.2 - AI4Ed Ethics and Transparency

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EXECUTIVE SUMMARY / ABSTRACT

| | |
|-----------------|---|
| Abstract | <p>This report is part of the deliverables of Work Package 2 (Definition of the AI strategy in educational processes), D2.2 AI4Ed Ethics and Transparency. The report aims to ensure that AI4Ed activities comply with good practices, as well as legal aspects of ethical issues. All AI methods, tools, technologies and processes applied will follow European AI ethics standard and we will provide ethics guidelines by clarifying the scientific aims, assumptions, methods, and expected results in terms of responsible AI ethics.</p> <p>Pave the way for developing a set of concrete ethical guidelines and recommendations that apply general principles of AI ethics to the particular aims and activities of the Ai4Ed and provide effective safeguard measures for human rights' protection and, in general, for the compliance with ethical and legal standards.</p> <p>The report is divided into four main parts: a theoretical framework, ethical and transparency aspects of AI in education, AI in education, Good practices and Recommendations.</p> |
| Keywords | AI, Ethics, Transparency, Standard, Good practices, legal aspects |

1 AI Legal and Ethical Landscape

The rapidly evolving field of Artificial Intelligence (AI) has presented both significant opportunities and complex challenges, demanding a comprehensive regulatory and ethical response from various stakeholders worldwide. Recognizing these challenges, diverse global entities ranging from governmental bodies, international organizations, to industry conglomerates have strived to establish robust regulatory frameworks and ethical guidelines in order to ensure that AI technologies are developed and deployed responsibly, safely, and in a way that respects human rights, democracy, and the rule of law. This multifaceted legal and ethical landscape offers an array of principles and practices that safeguard transparency, accountability, privacy, and human oversight while promoting innovation and trust in AI systems.

One of the most significant regulatory frameworks in the AI space is the European Union's Artificial Intelligence Act (EU AI Act) (European Commission, 2021), a comprehensive legal framework that aims to ensure that AI systems used in the EU are safe and respect existing laws, fundamental rights, and values. It focuses on transparency, accountability, and human oversight, establishing a clear set of rules and obligations for AI developers and users (European Commission, 2021). According to a study by the European Parliamentary Research Service (EPRS), this act plays a crucial role in promoting trustworthy AI within the EU (Delivorias & Luchetta, 2021), demonstrating that it is a strong and worldwide-recognized framework.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has also contributed to the AI regulation landscape by developing a set of recommendations on the ethics of AI (UNESCO, 2021), providing a global normative framework to help guide the development and use of AI in a way that promotes human rights, democracy, and the rule of law (UNESCO, 2021). As Jobin, Ienca, and Vayena (2019) argue in their analysis published in *Nature Machine Intelligence*, these ethical frameworks are essential for fostering responsible AI development and deployment globally.

In the United States, the White House has proposed an AI Bill of Rights (The White House, 2021), outlining a set of guiding principles to ensure the responsible development and deployment of AI technologies while safeguarding privacy, civil rights, and civil liberties (The White House, 2021). It aligns with the General Data Protection Regulation (GDPR), a critical piece of legislation that protects personal data and privacy for individuals within the European Union (EU) (European Parliament and Council, 2016). And, as mentioned by Stalla-Bourdillon and Knight (2017) in the *International Review of Law, Computers & Technology*, the GDPR has become a cornerstone in data protection, setting a global standard for AI systems handling personal data.

Another important regulatory proposal is the Data Act EU (European Commission, 2021), which seeks to foster the sharing of non-personal data among various stakeholders in the digital economy, complementing the GDPR by focusing on the governance of non-personal data, thus ensuring a level playing field and promoting innovation in the AI sector (European Commission, 2021). Research conducted by the Oxford Internet Institute highlights the importance of such data-sharing legislation in fostering a competitive and innovative AI ecosystem (Taddeo & Floridi, 2018).

The Proposal for a Regulation of the European Parliament and of the Council on European data governance (Data Governance Act) aims to foster the availability and use of data in the EU while respecting high standards of data protection and privacy (European Commission, 2020). It creates a framework for data sharing across different sectors, hence facilitating innovation in AI and other digital technologies (European Commission, 2020). A study by the Centre for Data Innovation emphasizes the need for such data governance frameworks to promote innovation and economic growth in the digital age (Castro & McQuinn, 2015).

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In addition to the aforementioned most renowned regulations, other international efforts to address AI ethics and governance have emerged. The Organization for Economic Co-operation and Development (OECD) has adopted AI principles that provide a foundation for responsible AI stewardship (OECD, 2019), which emphasize the importance of transparency, accountability, and robustness in AI systems, in addition to the necessity of ensuring that AI respects human rights and democratic values (OECD, 2019). According to a study by the RAND Corporation, the OECD AI principles contribute to the establishment of global norms for AI governance (Nascimento et al., 2020).

Government bodies are also playing a role in promoting ethical AI development, led by the European Commission's "Ethics Guidelines for Trustworthy AI", which emphasizes the importance of human-centric AI, with a focus on principles such as accountability, transparency, and fairness (European Commission, 2019). The European Commission's white paper on artificial intelligence similarly outlines the need for a regulatory framework that ensures AI technologies are developed and deployed ethically and responsibly (European Commission, 2020). In the UK, the government's "Ethics, Transparency, and Accountability Framework for Automated Decision-Making" provides guidance for public sector organizations using AI and automated decision-making systems, focusing on ethical considerations such as transparency, fairness, and accountability (Gov.uk, 2021). Similar values, as well as a set of principles for responsible AI development and deployment, are also outlined by Australia's AI Ethics Framework (Australian Government, 2019). Another example is the U.S. National Institute of Standards and Technology (NIST), an organism that has published a draft framework for AI risk management, providing guidance on incorporating ethical considerations and addressing potential risks in the development of AI technologies (NIST, 2021).

International organizations have also contributed. The OECD's AI principles emphasize the need for AI technologies to respect human rights, democratic values, and transparency, providing a foundation for responsible AI stewardship (OECD, 2019). The Council of Europe's European Commission for the Efficiency of Justice (CEPEJ) has published an ethical charter for the use of AI in judicial systems, emphasizing principles such as transparency, fairness, and human control (CEPEJ, 2018). Similarly, the Montreal Declaration for a Responsible Development of Artificial Intelligence establishes a set of ethical guidelines for AI development, focusing on principles such as well-being, autonomy, justice, and privacy (Montreal Declaration, 2017). And 23 guidelines for the beneficial development and application of AI have been outlined by the Future of Life Institute's Asilomar AI Principles, emphasizing research for the common good, safety, and long-term robustness (Future of Life Institute, 2017).

Industry initiatives have also emerged to address AI ethics, with IEEE having developed a set of standards and considerations for an ethically aligned design that aims to ensure AI systems prioritize human well-being and values throughout their life cycle (IEEE, 2019). The Turing Institute's report on understanding AI ethics and safety highlights the importance of transparency, accountability, and robustness in AI development (Turing Institute, 2020). Major technology companies such as Google, Microsoft, and Amazon have developed their own AI ethics guidelines and principles, emphasizing aspects such as fairness, transparency, and accountability (Google, 2018; Microsoft, n.d.; Amazon, n.d.). And it's also noteworthy to mention that these companies are also investing in research and initiatives to promote responsible AI development and deployment.

AI presents an exciting frontier in the realm of education, offering promising advancements in personalized learning, student assessment, and learning management systems. Yet, for a successful integration of AI into the educational landscape, it is critical to adhere to relevant ethical considerations, ensuring transparency, accountability, and fairness in AI-informed decision-making.

Intelligent tutoring systems (ITS) are emerging as revolutionary tools for personalizing learning experiences and enhancing educational outcomes (Yang & Zhang, 2018; Mousavinasab et al., 2019). These systems utilize AI algorithms to analyse student performance, identify learning gaps, and offer tailored feedback.



Figure 1. Key Laws & Ethics guidelines

A systematic review by Mousavinasab et al. (2019) reveals a myriad of applications and evaluation methods, and Yang & Zhang (2018) provide design guidelines for intelligent tutoring robots, emphasizing the potential for personalization, adaptability, and motivation.

The utilization of AI in student assessment can automate the evaluation process, enabling more accurate and efficient feedback to learners (Gonzalez-Calatayud et al., 2021). In higher education settings, the role of educators remains indispensable in ensuring the successful integration of AI technologies (Zawacki-Richter et al., 2019).

Learning management systems (LMS), that leverage AI, support online learning and teaching, as recognized globally by numerous educational institutions (Gamage et al., 2021). Such AI-enhanced LMS offer personalized learning experiences and support educators in managing and evaluating student progress (Xu & Ouyang, 2021).

2 Ethical and Transparency Aspects of AI in Education

The ethical aspects of AI in education have been given due attention by the research community (Angerschmid et al., 2021; Giovanola & Tiribelli, 2021; Toth et al., 2022). A commitment to fairness, accountability, and transparency is essential when making AI-informed decisions. To this end, guidelines published by the European Commission (2021) seek to ensure responsible AI use in teaching and learning.

AI literacy programs, like the one developed by Zhang et al. (2022), integrate ethics and career futures with technical learning, preparing middle school students for a future increasingly influenced by AI. Likewise, initiatives supported by the Erasmus+ program foster collaboration and exchange of best practices in the field, with their project database providing a resourceful pool of information on various AI-integrated projects across Europe (European Commission, n.d.).

Moreover, the DigComp 2.2 framework offers a comprehensive overview of digital competencies required for lifelong learning, a guide for educators and policymakers in developing AI-incorporating curricula (European Commission, n.d.).

In a bid to enhance the role of AI in education, a significant body of research has emphasized the development of intelligent tutoring systems (ITS) (Mousavinasab et al., 2021). These systems, adaptable to individual learners' needs, have the potential to revolutionize educational content interaction.

The integration of AI in education brings along ethical challenges and potential risks (Mikalef et al., 2021). Transparency and accountability need to be ensured when deploying AI technologies in educational settings. This aligns with the proposed framework for AI robot accountability by Toth et al. (2021), focusing on the ethical implications of AI robots in education. As AI-powered robots become more common in classrooms, guidelines for their responsible use need to be established.

The significance of AI ethics in education is further reinforced by Angerschmid et al. (2022), advocating for fairness and explanation in AI-informed decision-making. Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators, developed by the Australian Government (2019), stress the importance of human rights, fairness, and transparency.

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Another avenue for exploration is the use of Moodle, an open-source LMS, for teaching and learning. Gamage et al. (2021) highlight the benefits of integrating AI technologies into LMS platforms. At the same time, educators need to be empowered with AI technologies to understand student needs, streamline administrative tasks, and personalize instruction (Lameras & Arnab, 2019).

To ensure transparency, IBM (2021) has taken initiatives and developed tools to elucidate the inner workings of AI systems and ensure they are developed and deployed responsibly.

Finally, SELFIE for schools and teachers offer a supportive framework for educators to implement digital technologies (European Commission, n.d.). This self-assessment tool allows teachers to identify their strengths and weaknesses in digital competencies, preparing them for AI integration. In addition, educators need to adapt to the changing educational landscape, develop new skills and strategies, and incorporate AI effectively into their teaching practices (Popovic et al., 2021).

As we contemplate the vast opportunities offered by AI in education, the Assessment List for Trustworthy Artificial Intelligence (ALTAI) provides a framework for self-assessment, reinforcing the importance of trustworthiness in AI (European Commission, n.d.). Together, these perspectives shed light on the intricate balancing act of integrating AI in education while prioritizing ethical considerations, transparency, and accountability.

Fostering AI literacy is another important facet of integrating AI in education. Zhang et al. (2021) underscore the need to include ethics, career planning, and technical learning in education for middle school students, in preparation for a future where AI holds significant sway.

In terms of ethical considerations, the Organisation for Economic Co-operation and Development (OECD) has recognized the need for clear guidelines in AI development and deployment. The AI Principles published by the OECD (2019) serve as a comprehensive framework for the development of responsible and trustworthy AI policies and practices across various sectors, including education.

The Australian Government (2019) has been proactive in this regard, developing an AI ethics framework that emphasizes the importance of human rights, fairness, and transparency. This guideline is essential in directing the responsible development and deployment of AI technologies in different sectors, including education.

As part of AI transparency, there's a need for clearly communicating the inner workings of AI systems. Cossins (2019) discusses the challenge of overcoming the so-called "transparency paradox" in an article published in Forbes. Such transparency promotes understanding among stakeholders in education, aiding informed decision-making about AI implementation.

The aforementioned SELFIE tools for schools and teachers developed by the European Commission (n.d.) prove instrumental in guiding educators on the path to AI integration. These resources aid in self-assessment of digital competencies, helping teachers improve their strategies and readiness for implementing AI technologies.

In a similar vein, the report titled "Artificial Intelligence (AI) and the Future of Teaching and Learning: Insights and Recommendations" by the U.S. Department of Education's Office of Educational Technology shines a spotlight on the opportunities and risks associated with AI in education. This report emphasizes that AI can facilitate novel interactions between educators and students, aid educators in managing variability in student learning, and offer innovative approaches to teaching, learning, research, and assessment.

Finally, the crucial role of educators in the evolving AI-augmented educational landscape cannot be overstated. As AI transforms traditional roles and responsibilities, educators must adapt and acquire new skills to effectively incorporate AI into their teaching practices (Popovic et al., 2021).

The integration of AI into education is a multifaceted endeavour, requiring a careful balance between technological innovation and ethical considerations. By harnessing these advancements responsibly, we can welcome a new era of personalized and effective learning experiences.



Figure 2. Harnessing AI in Education.

3 AI in Education

AI has the potential to revolutionize the field of education by offering personalized learning experiences, automating administrative tasks, and providing new insights into teaching and learning processes. AI in education (so-called AIEd in most publications) can support adaptive learning systems that tailor instruction to individual students' needs and learning styles, helping to improve student engagement and learning outcomes. In addition, AI-driven assessment and evaluation tools can help educators and administrators monitor student progress more efficiently and effectively, freeing up valuable time for other important tasks.

AI technologies can also be used to support instructors and administrators by providing insights into student performance, facilitating collaboration, and streamlining administrative processes. For instance, AI-driven learning analytics can identify trends and patterns in student data, thus helping educators identify at-risk students in order to intervene early. Similarly, AI-powered recommendation systems can help connect students with relevant learning resources, fostering collaboration and knowledge sharing among learners.

The application of AI in education has shown promising potential in revolutionizing teaching and learning experiences. The growing body of research on AI in education encompasses various aspects, such as intelligent tutoring systems, student assessment, learning management systems, and ethical considerations (Yang & Zhang, 2018; Zawacki-Richter et al., 2019; Tahiru, 2018; Gonzalez-Calatayud et al., 2021; Mousavinasab et al., 2019; Xu & Ouyang, 2021).

Intelligent tutoring systems (ITS) have been gaining attention for their ability to provide personalized learning experiences and enhance educational outcomes. By incorporating AI algorithms to analyse students' performance, these systems identify learning gaps, and offer tailored feedback (Yang & Zhang, 2018; Mousavinasab et al., 2019). A systematic review of ITS by Mousavinasab et al. (2019) highlights various applications and evaluation methods, while Yang and Zhang (2018) provide design guidelines for intelligent tutoring robots.

AI has also been employed in student assessment, automating the evaluation process and providing more accurate and efficient feedback to learners (Gonzalez-Calatayud et al., 2021). In higher education, AI applications are being explored to enhance teaching and learning experiences, yet the role of educators remains crucial in ensuring successful integration (Zawacki-Richter et al., 2019).

AI-driven learning management systems, such as Moodle, have been widely adopted by educational institutions worldwide to support online learning and teaching (Gamage et al., 2021). In addition, AI in education research has addressed various ethical concerns, including fairness, accountability, and transparency in AI-informed decision-making (Angerschmid et al., 2021; Giovanola & Tiribelli, 2021; Toth et al., 2022).

To prepare students for a future dominated by AI, programs such as the one developed by Zhang et al. (2022) focus on integrating ethics and career futures with technical learning to promote AI literacy for middle school students. In the context of AI and education, ethical guidelines have been published by the European Commission (2021) to ensure responsible AI use in teaching and learning. Furthermore, tools like SELFIE for

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schools (n.d.) and SELFIE for teachers (n.d.) have been developed to support educators in implementing digital technologies in their teaching practices.

As AI continues to influence education, projects supported by the Erasmus+ program aim to foster collaboration and exchange of best practices in the field (Erasmus+ Project Database, n.d.). The DigComp 2.2 framework (n.d.) provides a comprehensive overview of digital competencies for lifelong learning, aiding educators and policymakers in developing curricula that incorporate AI and digital technologies.

In conclusion, AI's impact on education is multidimensional, with numerous potential benefits and challenges. By leveraging existing research and guidelines, educators, policymakers, and AI developers can work together to ensure that AI is integrated responsibly and effectively in educational settings.

The role of AI in education has expanded significantly in recent years, with the development of intelligent tutoring systems (ITS) becoming a significant focus of research. Mousavinasab et al. (2021) conducted a systematic review of ITS, highlighting their potential for personalization, adaptability, and fostering motivation among learners. These systems, which are designed to adapt to individual learners' needs, have the potential to revolutionize the way students learn and interact with educational content.

Another promising application of AI in education is the development of AI-enhanced learning management systems (LMS). Xu and Ouyang (2021) proposed a conceptual framework to explore the role of AI in the educational system, emphasizing the importance of LMS in promoting personalized learning experiences and supporting educators in managing and evaluating student progress.

The integration of AI in education has also spurred interest in the development of AI-driven assessment methods. Gonzalez-Calatayud et al. (2020) conducted a systematic review of AI for student assessment, revealing a trend towards more efficient, personalized, and adaptive evaluation methods, which has the potential to provide educators with valuable insights into student performance and inform the development of targeted interventions.

As AI becomes more prevalent in education, it is essential to consider the potential risks and challenges that may arise. Mikalef et al. (2021) discuss the "dark side" of AI, emphasizing the importance of ethical considerations, transparency, and accountability when deploying AI technologies in educational settings.

Toth et al. (2021) propose a new framework for AI robot accountability, focusing on the ethical implications and responsibilities of AI robots in various contexts, including education. As AI-powered robots become more common in classrooms, it is crucial to establish guidelines for their responsible use and to ensure they align with the values and objectives of educational institutions.

The importance of AI ethics in education is further emphasized by Angerschmid et al. (2022), who argue for fairness and explanation in AI-informed decision-making. By adopting a responsible approach to AI use, educators can create learning environments that promote equity, transparency, and ethical decision-making.

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Gamage et al. (2021) conducted a systematic review of trends in using Moodle, an open-source LMS, for teaching and learning, highlighting in their research the benefits of integrating AI technologies into LMS platforms to enhance personalization, feedback, and analytics.

Lameras and Arnab (2019) explored the potential of AI in empowering teachers, arguing that AI technologies can help educators better understand student needs, streamline administrative tasks, and personalize instruction. Therefore, by embracing AI as a tool to support their work, educators can drive innovation and improve learning outcomes.

In Australia, the government has developed an AI ethics framework - emphasizing the importance of human rights, fairness, and transparency in the development and application of AI - to guide the responsible development and deployment of AI technologies across various sectors, including education (Australian Government, 2019).

In a Forbes article, Cossins (2019) discusses the challenge of overcoming AI's transparency paradox, emphasizing the importance of clearly communicating the inner workings of AI systems to users. By promoting transparency, stakeholders can better understand the implications of AI in education and make informed decisions about its implementation.

IBM is also at the forefront of promoting AI transparency. As a leader in AI technology, IBM has developed initiatives and tools to accelerate the path towards AI transparency and ensure that AI is developed and deployed responsibly (IBM, 2021). By emphasizing the importance of transparency in AI, IBM is helping to foster trust and understanding among stakeholders in various sectors, including education.

Zhang et al. (2021) conducted an exploratory study on integrating ethics and career futures with technical learning to promote AI literacy for middle school students. Their research highlights the importance of preparing students for a future where AI plays a significant role in various fields, emphasizing the need for ethical education and career planning alongside technical learning.

The Organisation for Economic Co-operation and Development (OECD) has also recognized the need for ethical guidelines in AI development and deployment. The OECD has published its AI Principles, which provide a framework for governments and organizations to develop responsible and trustworthy AI policies and practices (OECD, 2019) and are applicable to various sectors, including education, and can help guide ethical decision-making in AI integration.

The Erasmus+ project database is a valuable resource for exploring how AI is being integrated into education across Europe (European Commission, n.d.). With a database that provides information on various projects funded by the Erasmus+ program, researchers and educators can learn from the experiences and best practices of others in the field.

The European Commission's SELFIE for Teachers initiative is another valuable resource for educators seeking to integrate AI into their classrooms (European Commission, n.d.). This self-assessment tool helps teachers identify their strengths and weaknesses in digital competencies, enabling them to develop targeted strategies for improvement and better prepare for the integration of AI technologies.

Another perspective on the integration of AI in education comes from Popovic et al. (2021), who discuss the impact of AI on the roles and responsibilities of educators. They emphasize the importance of recognizing and adapting to the changing educational landscape and the need for educators to develop new skills and strategies to effectively incorporate AI into their teaching practices.

In addition to the aforementioned sources, the AI and Ethics Research Group at UC Berkeley conducts research on the ethical implications of AI in various sectors, including education (UC Berkeley, n.d.). Their work helps to further our understanding of the ethical challenges and opportunities presented by AI integration in educational settings.

4 Good Practices of AI use in Education

Taking into account the information presented above, and based on the synthesis elaborated by UNESCO (2021), it can be affirmed that, in order to improve education, AI is being integrated in 3 broad areas:

- a) education management and delivery,
- b) learning and assessment, and
- c) to empower teachers and enhance teachings.

Some good practices that this document highlights are:

- The Open University's OU Analyse, which predicts student outcomes and identifies students at risk of failing by analysing big data from the university's EMIS: <https://analyse.kmi.open.ac.uk>
- The CoWriter: Learning to write with a robot, developed by CHILI (Computer-Human Interaction in Learning and Instruction), EPFL Technical University, Switzerland: <https://www.epfl.ch/labs/chili/index-html/research/cowriter;>
https://www.youtube.com/watch?v=E_iozVysl5g
- Resources on AI in K-12 education, International Society for Technology in Education (ISTE) <https://www.iste.org/es/areas-of-focus/AI-in-education>
- The Wekinator, a free, open-source software created by Rebecca Fiebrink, with which one may use machine learning to build new musical instruments, gestural game controllers, and computer vision and listening systems <http://www.wekinator.org>
- ITalk2Learn, a three-year collaborative European project (Nov 2012 – Oct 2015) that aimed to develop an open-source intelligent tutoring platform that supports maths learning for students aged 5 to 11: <https://www.italk2learn.com/>

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- FractionsLab, UK, an exploratory learning environment to teach fractions with AI-driven feedback: <http://fractionslab.lkl.ac.uk>
- Squirrel AI Learning, developed by China's Yixue Group, an adaptive learning engine based on the pattern recognition algorithm: <http://squirrelai.com/>
<https://www.technologyreview.com/s/614057/china-squirrel-has-started-a-grand-experiment-in-ai-education-it-could-reshape-how-the/>
- SmartMusic, a web-based suite of music education tools that support musicians' practice and development: <https://www.smartmusic.com/>
- AIArtists.org, which provides creative tools to generate AI art: <https://aiartists.org/ai-generated-art-tools>

It has also initiated a line of best practices that invest in the education and training of local talent and build an appetite for AI start-up ecosystems to be formed locally. This is the case of IBM Research–Africa. It is IBM's 12th global research lab and the continent's first industrial research facility. It is driving innovation by developing commercially viable solutions to transform lives and spark new business opportunities in key areas including education: <https://www.research.ibm.com/labs/africa>.

Also, it is important to show the OECD Observatory on Digital technologies in Career guidance for Youth (ODiCY) (n.d) is an open-access repository on the use of digital technologies in career education and guidance by primary and secondary schools. To date, this repository has two best practices in the field of IA:

- Prospela: E-mentoring. Prospela is an award-winning EdTech start-up and social enterprise that exists to give underserved young people all the benefits of the professional networks they typically don't have access to yet so badly need. The resource connects students with mentors from the world of work. Through a data-driven online experience, students get access (for free) to: shared knowledge from real employees, new opportunities (such as jobs in out-of-reach industries), building of long-lasting relationships, confidence building and support, and upskilling opportunities with the ability to raise their profile in the right circles.
- BECOME Education: Career exploration. BECOME engages students to learn about themselves and the wide world of work. The BECOME program includes teacher-led lessons and a student-facing app showcasing over 50,000 careers. An intensive learning process facilitated by teachers, throughout BECOME students explore their motivations, interests and aspirations, and learn about the many ways people engage with work. Students from age 10 up examine their personal context and assumptions, learn to define aspirations for themselves and are prompted to seek out wide-ranging career ideas. They practice taking agency within an "experiment" based on an idea that excites them right now, learning valuable skills for shaping their future life.

5 Recommendations for our Case of Study

In this project, an attempt will be made to use artificial intelligence to create an educational model that accompanies students from the enrolment process, going through the intermediate phases of the course and ending with final grades.

The system will try to use the best KPIs that allow us to see the evolution of the students, incorporate suggestions, assess aspects such as possible dropout, etc. All this, with the intention of personalizing the courses and the follow-up so that it focuses on the student. The adaptivity that AI can give to educational and learning processes supporting both teachers and students has to be explored in the development of courses.

For this, all the recommendations of the different acts and regulations at the European and international level will be respected, so that the generated system complies with the standards of transparency and ethics. In particular, following criteria set by the document Artificial Intelligence and the Future of Teaching and Learning (Office of Educational Technology, 2023) will be followed and implemented, when possible, in our system:

1. Leverage automation to advance learning outcomes while protecting human decision making and judgment;
2. Interrogate the underlying data quality in AI models to ensure fair and unbiased pattern recognition and decision making in educational applications, based on accurate information appropriate to the pedagogical situation;
3. Enable examination of how particular AI technologies, as part of larger EdTech or educational systems, may increase or undermine equity for students; and
4. Take steps to safeguard and advance equity, including providing for human checks and balances and limiting any AI systems and tools that undermine equity.

The definition of our model will take into account all the knowledge of the project partners, trying to reflect on it all the best features of their particular systems (“traditional” ones). Moreover, the system will adapt contents and recommendations not only for the path of study but also for inclusion aligning the curricula with the special needs of students. This objective is itself a great challenge for the system and also for teachers.

At the same time, we cannot forget teachers in the process of design of the tool. Teachers must be a crucial part, as they have to manage the system, interpreting results and being capable of suggest actions. This kind of system must allow them to be centred in the process of teaching and learning, decreasing time dedicated to administrative task and surveillance, for example and giving the option of providing real time feedback, full accessibility, objective measure of competencies, among others.

Of course, this will not an easy process, as some aspects have to be controlled all time: transparency, use of data, diversity of contents, training of teachers, training of students, etc.

Finally, for conclude this section, we enumerate some basic points expected in our system:

- a) Clear definition of objectives.
- b) Centred in students and teachers.
- c) Transparency, use responsible.
- d) Privacy and data security.
- e) Involve teachers.
- f) Inclusivity.

6 Conclusions

One primary area of AI application is adaptive learning systems. These tools utilize machine learning algorithms to identify the unique learning style and pace of each student. Based on students' performance on various tasks and tests, the system can customize course content and assignments to ensure optimal learning. Over time, the AI can detect patterns and trends, making accurate predictions about the student's future performance and suggesting course recommendations that align with the student's academic progression and interests.

AI can also be used to track students' progress throughout a course. Using advanced data analysis, it can identify areas where a student may be struggling and provide targeted resources to assist them. By continuously monitoring students' performance and engagement, AI can give teachers valuable insights to adjust their teaching approach, if necessary, or provide additional support to students. This system of tracking can make the educational process more efficient, and ensure every student gets the individual attention they need.

For course recommendation, AI can analyse a wealth of data including a student's past academic records, their strengths and weaknesses, career aspirations, vocational options, and even their extracurricular interests. This can result in a much more personalized and targeted recommendation, which can guide students towards the courses where they are likely to excel and enjoy.

Moreover, AI can foster a more collaborative learning environment. By analysing student interactions within collaborative platforms, AI can provide insights into group dynamics and individual contributions. This can help educators ensure that collaborative tasks are distributed equitably and that all students are actively participating.

In conclusion, the use of AI for tracking and course recommendation for students has the potential to transform the education system. It can make learning more personalized and effective, help educators tailor their teaching approaches to individual student needs, and assist students in making informed decisions about their educational pathways. However, as with all technology, it's essential to use AI ethically and responsibly, respecting student data privacy and ensuring the technology is accessible to all students.

Our system will try to cover all the necessary aspects, recommendations and features to be a good tool for teaching and learning and overcome barriers.

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