



AI@MEDIATORS

Ethical practices in the use of AI in Educational and Training field and how these can be adopted



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1 Introduction

1.1. Introduction

Artificial intelligence (AI) is a set of advanced technologies that can include algorithms and computer processes that enable systems to perform tasks that would normally require human intelligence. This may include capabilities such as decision making, learning from data, pattern recognition and other cognitive functions. AI can play a role in various aspects of education, from administration to teaching and learning.

The International Conference on Artificial Intelligence (AI) and Education, with participation from government officials, international representatives, and various stakeholders, aims to integrate AI into education systematically. While emphasizing the importance of human interaction in education, they advocate for leveraging AI to enhance teaching and learning while ensuring teachers' rights and roles are protected. They also highlight the need for AI literacy and foundational skills alongside personalized and adaptable education programs to address educational inequalities and facilitate lifelong learning.

Another perspective from the OECD underscores the potential of AI in education, including adaptive learning tools, social robots, and virtual reality, to improve learning outcomes and support inclusive education. However, it stresses the importance of trained teachers and transparent, ethical use of AI to ensure its effectiveness and mitigate potential risks.

Further insights discuss the necessity of transparency, explainability, and negotiation in AI-enabled education technologies. They emphasize the importance of ensuring reliability, fairness, and safety in AI systems while protecting individuals' privacy and promoting ethical AI practices.

Incorporating AI into classrooms offers personalized learning experiences, deepens understanding of AI technology, and fosters essential 21st-century skills such as problem-solving and critical thinking. This integration can lead to improved academic performance and better prepare students for the digital age.

The challenges of using AI in education include preserving human interaction, promoting AI literacy, ensuring transparency and ethics, fostering inclusion and equity, providing teacher training, and protecting data and privacy.

1.1 Several ways of using AI in schools

Emerging technologies are entering the field of education and training: through technological solutions specific to education, by being integrated invisibly into everyday IT applications, and by adapting existing technologies to educational contexts.

The use of AI in education covers a wide range of applications, from personalized teaching and learning tools to innovative assessment systems and dropout prevention measures :

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Purpose-built Educational Technology Products:

- Visible applications and deployments developed by both the EdTech industry and academia.
- These include technologies such as intelligent tutoring systems, AI learning companions, virtual teaching assistants, etc.
- These tools are used for teaching, supporting student learning, and assisting teachers in their tasks.

Use of AI to Support Teachers and Students:

- Continuous assessment and tracking tools to provide accurate and personalized feedback.
- Chatbots and virtual assistants to address student and teacher inquiries.
- Recommendations of pedagogical resources based on student preferences and progress.
- Use of AI for classroom dynamics analysis and student engagement.

Use of AI for Diagnostic and Systemic Planning:

- Utilization of educational data to allocate resources effectively and plan courses.
- Early diagnosis of learning difficulties through data analysis.
- AI-based guidance services to recommend personalized learning pathways.

Supporting Students with Special Needs with AI:

- Use of AI to help disabled students access education inclusively.
- Technologies such as augmented reality, virtual reality, and robots to support learning and engagement of students with disabilities.

Reducing Dropout Rates with AI:

- Use of AI-based early warning systems to identify students at risk of dropping out.
- Development of personalized interventions to prevent dropout using AI.

Assessing New Skill Sets with AI:

- Development of new forms of AI-based assessment to evaluate complex skills.
- Use of games and simulations to assess complex skills such as problem-solving and collaboration.

2 Examples of tools or systems already applied and tested at school

2.1 The adaptative learning system with affective and cognitive performance analysis mechanism

Reference: Hwang, G.-J., Sung, H.-Y., Chang, S.-C., & Huang, X.-C. (2020). A fuzzy expert system-based adaptive learning approach to improving students' learning performances by considering affective and cognitive factors. *Computers and Education: Artificial Intelligence*, 1, 100003. <https://doi.org/10.1016/j.caeai.2020.100003>

Country: Taiwan

Objectives:

The device must enable the creation of an adaptive learning system that takes into account cognitive and affective variables to support students in their mathematics learning.

IA tools:

It consists of four modules:

- The learning module allows students to learn by watching online videos and completing learning worksheets.
- The testing model is used to conduct tests to assess each student's level of knowledge.
- The learning status recording module logs each student's learning behaviors in the system logs for later analysis.
- The expert system module is used to analyze the students' affective state and to determine the learning content for each student based on their affective state and knowledge level.

For each learning unit, there are three versions of the learning materials: "standard version", "detailed version", "advanced" version.

Moreover, 18 rules are used to determine the version of learning materials provided to individual students, based on their recent learning status (see article for more details).

Assessment:

Before the experiment, all three groups of students took a 30-minute pre-test on the area unit and completed a mathematical anxiety pre-questionnaire. They then engaged in 120 minutes of learning activities. All students used tablet computers to access the learning systems.

The first experimental group used an adaptive learning system with both affective and cognitive performance analysis mechanisms.

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The second experimental group used an adaptive learning system with only the cognitive performance analysis mechanism.

The control group used a conventional learning system without any adaptive mechanisms.

After completing the unit, students did exercises within the learning system. Following the learning activities, all students took a 40-minute post-test on the area unit, a mathematical anxiety post-questionnaire, and a cognitive load questionnaire.

Participants:

The students involved in the study were 10-year-old elementary school children.

Results:

Results of Mathematical Learning Achievement. Students who used the adaptive learning system with both affective and cognitive performance analysis mechanisms outperformed those who used the system with only cognitive performance analysis, as well as those who used the conventional learning system. This indicates that considering both affective and cognitive status simultaneously is beneficial for improving learning achievement.

Results of Mathematical Anxiety. Students using the adaptive learning system with both affective and cognitive performance analysis had significantly lower levels of mathematical anxiety compared to those using the conventional learning system. The adaptive system with only cognitive analysis or the conventional system did not significantly reduce anxiety. Thus, the system considering both affective and cognitive factors helped reduce mathematical anxiety.

Results of Cognitive Load. There was no significant difference in cognitive load among the groups. The average cognitive load scores suggested that the learning activities were of moderate difficulty and quantity, which did not overly burden the students cognitively.

Conclusion of the authors. The adaptive learning system considering both affective and cognitive performance helped maintain high achievers at a high knowledge level while also supporting low achievers in making progress.

For more information:

<https://www.sciencedirect.com/science/article/pii/S2666920X20300035?via%3Dihub#bib41>

2.2 Zebra AI: an educational app

Reference: Zhang, S., & Chen, X. (2022). Applying Artificial Intelligence into Early Childhood Math Education: Lesson Design and Course Effect. *IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, 635–638. <https://doi.org/10.1109/TALE54877.2022.00109>

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Country: India

Objectives:

This study aims to evaluate the impact of an AI-enhanced math instructional unit for children aged 3-8, delivered through the mobile app Zebra AI, developed upon Intelligent Tutoring Systems (ITS).

IA tools:

Zebra AI is an educational app designed for children aged 3-8 with three major subject streams:

- Language literacy (in English and Chinese)
- STEM
- Arts

Only the STEM major subject stream is used for the study. The STEAM program is divided into five progressive stages, each of which lasts 48 weeks.

Each weekly module contained five daily lessons:

- New knowledge was taught from Monday to Wednesday for 15 minutes. Each lessons contains four sections: video, quiz, I teach, report.
- A review lesson on Thursday
- A weekly challenge on Friday (encapsulated as virtual-reality games to solve real-life problems)

Learners' performance was used by the AI technology to provide adaptative feedback.

Assessment:

The course was delivered via the Zebra AI app over a four-week period. Prior to starting the course, students took a pretest that included items from a math cognitive test and a math attitude survey. The same scale was administered as a posttest after the course concluded.

Participants:

The study focused on Indian students aged 3 to 8 years old.

Results:

Results of Math performance. Students had a moderate improvement after learning the course.

Results of Math attitudes. Students' math attitude remained stable after the course.

For more information: <https://ieeexplore.ieee.org/document/10148189>

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3 Other proposals for non-specific tools that can be used in education, identified in Europe

The examples below illustrate the different ways in which AI is being integrated into educational tools and practices, from productivity tools such as Google Docs to more sophisticated devices such as facial recognition for classroom and campus management.

1. **Google Docs and G Suite:** these tools are increasingly used in an educational context, although users are often unaware that many of the assistive features are AI-powered.
2. **Learning analytics tools:** Tools such as predictive and data-driven dashboards and planning tools used by educational institutions rely on AI in the background.

Example: Classdojo: A communication and motivation tool used from nursery school through to compulsory education. Educators can reward pupils' desired behaviour by awarding them points, and provide parents with real-time reports on their children's behaviour and performance at school.

3. **Smart speakers:** These devices are used in university halls of residence, for example, allowing students to ask questions ranging from the opening hours of the university library to the location of the registrar's office.
4. **Facial recognition for student authentication:** Facial recognition technology is used to verify student attendance.

3.1 Two applications aimed at improving the well-being of pupils have been identified in Europe

These applications demonstrate how AI can be used to create more inclusive learning environments that promote student wellbeing, while also supporting teachers and educational staff in fostering non-cognitive skills such as empathy, conflict resolution, and collaboration.

Empathy Programme with AI-based Peace Technologies

This application aims to promote empathy and conflict resolution skills among students to prevent cyberbullying and other forms of violence. The application uses artificial intelligence technologies to detect violent words and tones in online discussions and messages, intervening before an incident occurs. If an incident does occur, the application facilitates guided conversations between the involved students, with mediation from teachers and educational counselors. Students are encouraged to

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support the victim, fostering socially responsible behavior. Teachers can intervene and monitor the application's behavior, ensuring its ethical use.

Main user/actor: Teacher; other educational staff; school counselor, school medical staff, learner; parents

Type: A hybrid between an education system-facing technology and teacher-facing technology: socio-emotional teaching/learning

Application: Integrated into interfaces of existing systems, for example, chat interfaces, learning management system

End-use: Compulsory education, secondary education, higher education, VET and/or work-based learning, emotional, ethical, and cultural development to reduce violence, oppression, and destructive conflicts: <https://peacemachine.net/>

- Existing applications and research on similar issues:

- AI-assisted legal service for victims of social media harassment and cyberbullying: <https://ec.europa.eu/eipp/desktop/en/projects/project-11762.html>

- A research project to create a virtual companion to guide teenagers in using social media: https://www.upf.edu/web/e-noticies/home/-/asset_publisher/wEpPxsVRD6Vt/content/id/225844405/maximized#.XnkBNHt7nIU

- Enhancing Security And Privacy In The Social Web: <https://encase.socialcomputing.eu/>

- Existing non-technology related work:

- KivaSchool is an antibullying program schools can participate in: <http://www.kivaprogram.net/>

- In Danish schools, empathy is part of a compulsory subject of study: <https://www.morningfuture.com/en/article/2019/04/26/empathy-happiness-school-denmark/601/>

Schoolday Wellbeing Model

This application focuses on students' overall wellbeing at school and the role school leadership can play in it. It helps school staff make pedagogical decisions based on insights into students' wellbeing, including aspects such as the learning environment and social-emotional skills. The application is used to gather real-time information on students' wellbeing and support decisions made by teachers and educational staff. It is currently being piloted in the municipality of Kuopio, Finland, with 2400 students and 150 teachers.

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Existing applications and research on social and emotional learning: — “Schoolday” provides educators and school leaders with real-time insights into their students’ well-being daily: <https://schoolday.fi/en/solutions> — “Panorama Student Success” helps educators monitor students across academics, attendance and social-emotional learning: <https://www.panoramaed.com/social-emotional-learning-sel> — A method to capture, track and develop socio-emotional skills through observation and feedback: <https://pentabilities.com/>

- A digital assistant designed to help students navigate and organise their tertiary experience at Deakin University: <https://www.deakin.edu.au/about-deakin/media-releases/articles/deakin-genie-digital-student-assistant-wins-major-global-business-award> and <https://www.youtube.com/watch?v=ml0gdSCjGQ8>
- Existing non-technology related work: — Schools for Health in Europe (SHE) is a non-profit making foundation overseeing the progress and functioning of SHE: <https://www.schoolsforhealth.org/>

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