

Artificial Intelligence Tools for Inclusive Digital Education: Benefits and Challenges

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Inclusive (digital) education

- Inclusive digital education stands for „***using digital tools and technologies to give every learner equal access to education. It ensures that students with different needs, abilities, and backgrounds can take part fully and benefit from learning opportunities.***“
- *At the core of the European Union’s Digital Education Action Plan (2021-2027) policy initiative*
 - *which ‘offers a long-term strategic vision for high quality, inclusive and accessible European digital education’.*
- Digital transformation goes beyond applying suitably designed digital technologies in education.
 - It requires change across all levels: **learners, educators, institutions, and systems.**

AI tools for education

can be classified into (Holmes & Tuomi, 2022):

“... the utilization of AI technologies, including intelligent tutoring systems, chatbots, robots, learning analytics dashboards, adaptive learning systems and automated assessment, so as to support and enhance the educational process” (Chen et al., 2020)



Student-focused AI tools for education

Intelligent Tutoring Systems (ITS)

AI-assisted Apps (e.g., maths, text-to-speech, language learning)

AI-assisted Simulations (e.g., games-based learning, VR, AR)

Automatic Essay Writing (AEW)

Chatbots

Learning Assistants

Etc.



Teacher-focused AI tools for education

Classroom Monitoring

Automatic Summative Assessment

AI Teaching Assistant (including assessment assistant)

Plagiarism detection

Smart Curation of Learning Materials

Etc.



Institution focused AI tools for education

Admissions (e.g., student selection)

Course-planning,

Scheduling,

Timetabling

Identifying Dropouts and Students at risk

Etc.

AI for inclusive education

Equity and Access with AI

- AI-driven digital education ensures all learners, including students with special educational needs and disabilities, can participate

Global Commitments

- Global frameworks (UN/UNESCO) demand inclusion AI helps us anticipate diversity

Frameworks for Practice with AI

- UDL principles of representation, engagement, and expression provide a solid base that AI can complement

AI as Enabler

- AI supports accessibility (screen readers, transcription, translation), personalization (adaptive platforms, tutoring, multimodal content), and engagement (gamification, real-time feedback).

AI for Student Benefits

- For students, AI provides personalized tutoring, adaptive learning, and collaborative platforms—tools that foster independence and equal opportunities for diverse learners.

AI for Teacher Benefits

- For teachers, AI automates grading, detects plagiarism, supports planning, and enriches teaching—freeing time for pedagogy and student engagement.

AI for Inclusive Education

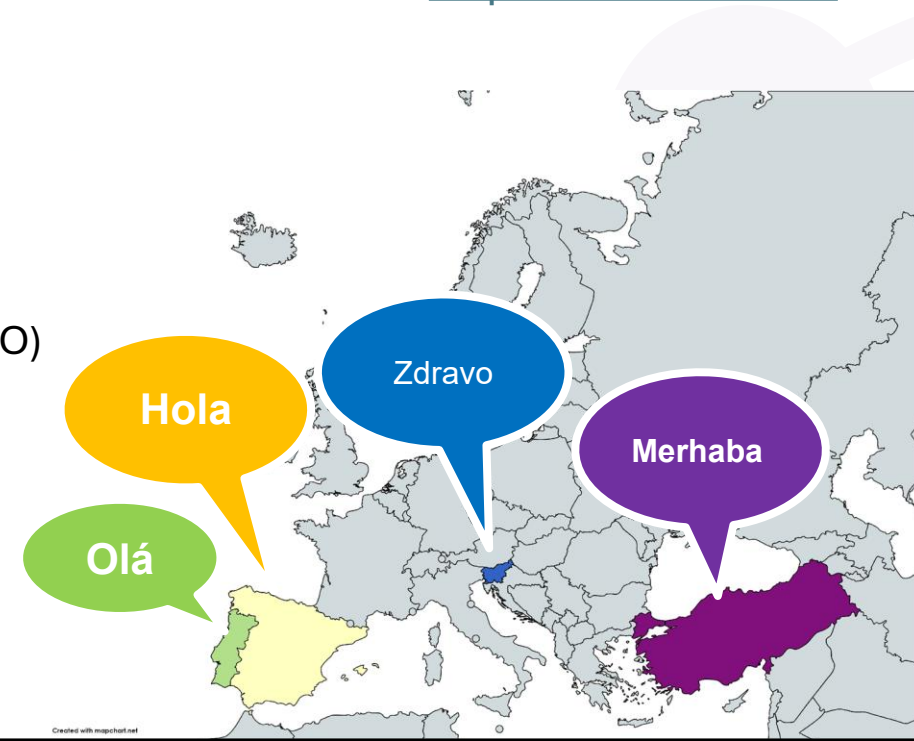
- AI tools have a great potential to revolutionize education
 - enhancing accessibility, personalization, and inclusion, especially for students with disabilities.
- The potential of AI is still only partially realized.
- Many institutions still lack training and resources, leaving AI's potential underused.

- AI-ENABLE project explores the use of AI tools for the inclusion of students with disabilities and special needs in Higher Education Institutions.



<https://aienable.eu/>

- Partners:
 - University of Maribor (Univerza v Mariboru - UM)
 - Istanbul University (ISTANBUL UNIVERSITESI – CERRAHPASA – IUC)
 - INSTITUTO POLITÉCNICO DE PORTALEGRE (IPP)
 - UNIVERSIDAD DE LA IGLESIA DE DEUSTO ENTIDAD RELIGIOSA (DEUSTO)
 - INUK Institut za napredno upravljanje komunikacij, Maribor



AI-ENABLE: Exploring AI's potential for inclusive education

- The main aim of the project is to enhance Inclusive Education in Higher Education Institutions with Artificial Intelligence.



Framework and Guidelines for AI Integration in Inclusive Education



Collection of Good Practices of AI Integration in Inclusive Education



E-Learning Platform and Online Course for Teachers



Multiplier Events for Dissemination

Research questions



What are the benefits of using AI tools for inclusive digital education across students, teachers, and institutions?



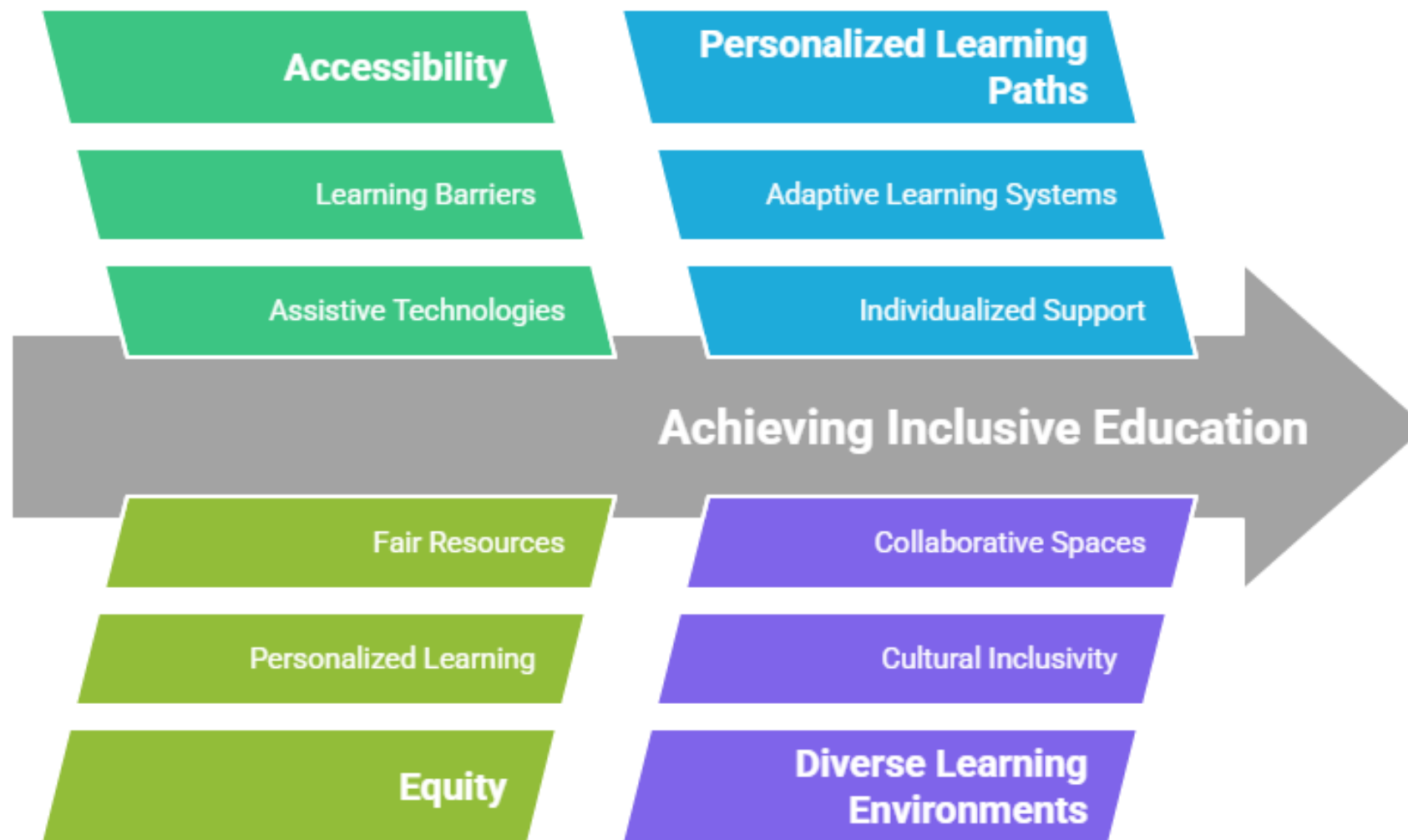
What are the key challenges (technological, pedagogical, ethical, and socio-cultural) in adopting AI for inclusive digital education?

Research Methodology

- Review of literature
- Survey
- Structured inventory of AI tools
- Focus: students, teachers, institutions



Benefits of AI for Inclusive Digital Education (Overview)



AI for accessibility

Assistive tools

- AI empowers students with visual, motor, or communication challenges.

Captioning & translation

- With AI, real-time tools support inclusion for deaf and non-native speakers.

Language barriers

- AI conversation tools break language barriers.

Alternative formats

- AI simplifies complex concepts for all learners.

Inclusive access

- AI enhances participation through access and clarity.

AI for Student Personalized Learning Paths

Adaptive platforms

- Dynamically adjust content difficulty based on student performance, ensuring personalized progression.

Writing & research tools

- Support brainstorming, essay structuring, and content refinement, helping students develop coherent arguments.

AI tutoring systems

- AI strengthens problem-solving skills

Self-paced learning

- AI enhances self-paced study

AI-supported research

- AI suggests alternative approaches

Inclusive and Diverse Learning Environments

AI multilingual support

- AI opens resources to all languages

AI-generated cultural relevance

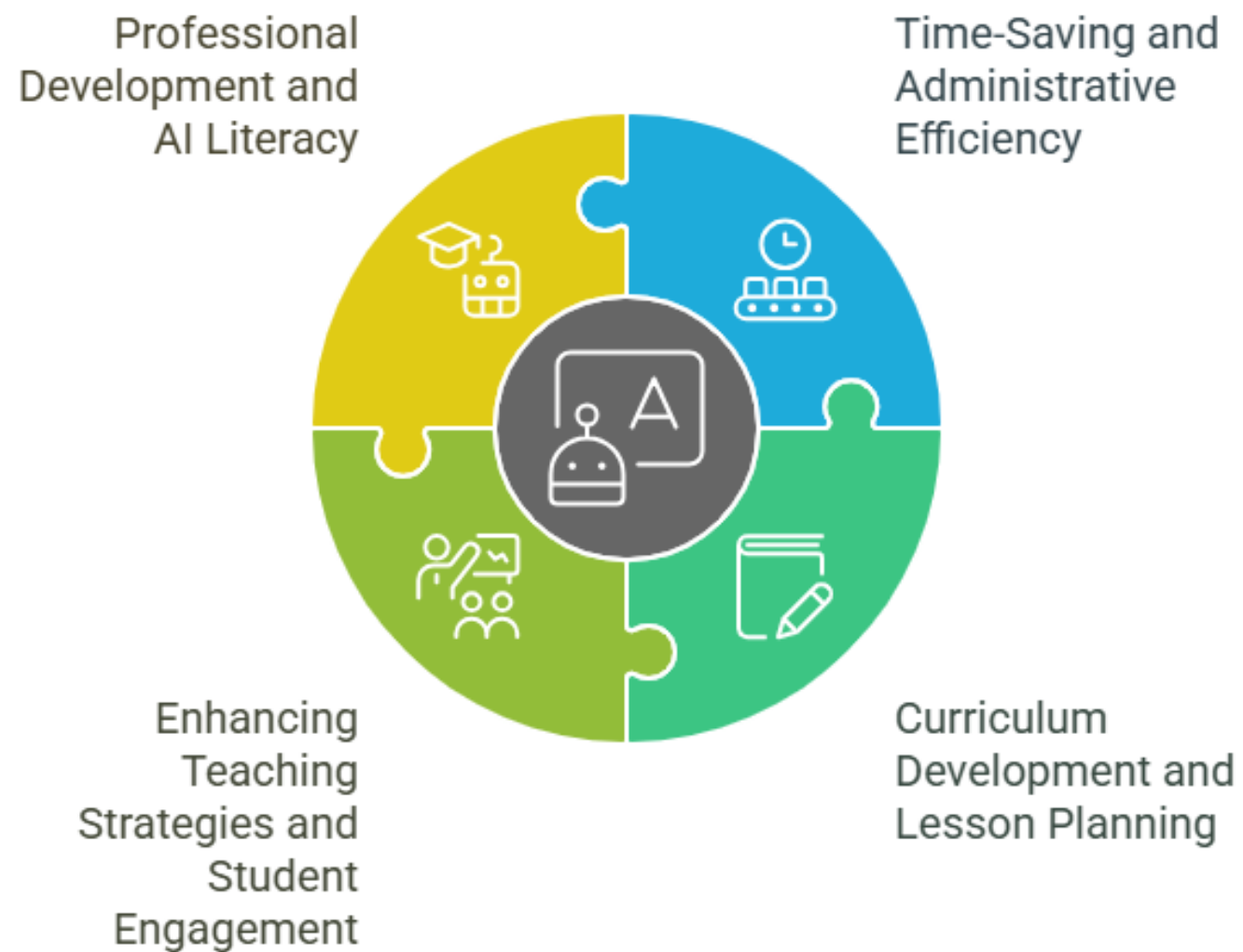
- AI strengthens cultural inclusivity

AI-enabled participation

- AI fosters inclusive engagement



Benefits for Teachers (overview)



AI for Time-Saving and Administrative Efficiency

Automated grading

- AI reduces teacher workload.

Virtual support

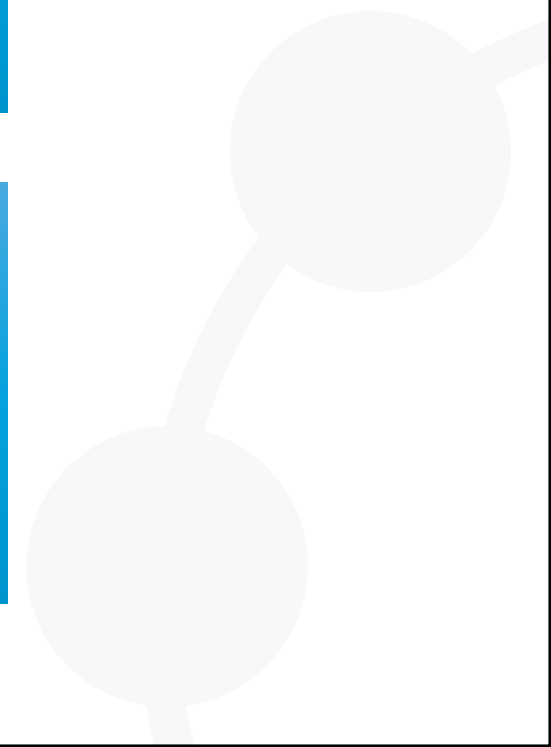
- AI chatbots handle repetitive student queries, ensuring continuous assistance without extra teacher time.

Learning analytics

- AI detect at-risk students early, enabling timely interventions and reducing long-term challenges.

Workflow optimization

- AI streamlines routine administrative tasks, allowing educators to focus on teaching and mentoring.



AI for Curriculum Development and Lesson Planning

Content suggestions

- AI generates diverse instructional materials that enrich lesson plans.

Classroom interaction

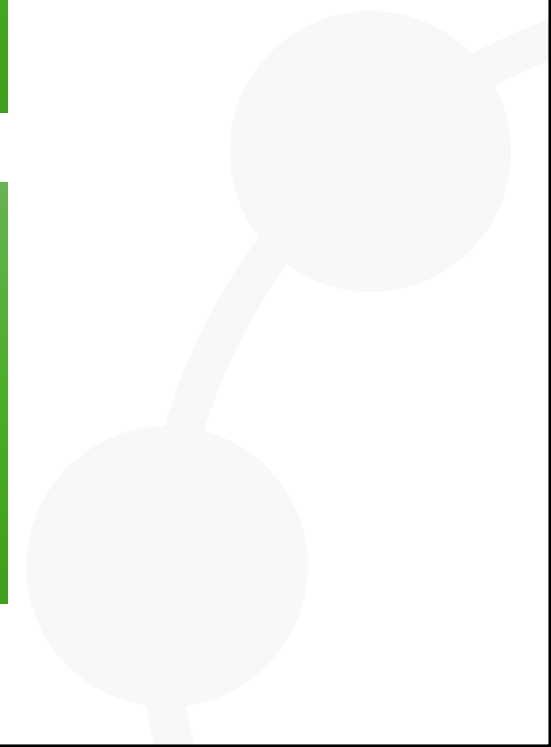
- AI supports preparation of discussion topics and debates, fostering engagement.

Real-time updates

- AI keeps lesson materials current and relevant.

Adaptive planning

- AI personalizes instruction by aligning lessons with diverse learning needs.



AI for Enhancing Teaching Strategies and Student Engagement

Dynamic methodologies

- AI generates interactive quizzes, case studies, and other active learning tools.

Enhanced engagement

- AI integrates new digital tools into classroom discussions, making learning more participatory.

Personalized support

- Al-assisted learning helps teachers tailor guidance to individual needs, improving outcomes.



AI for Professional Development and AI Literacy

AI literacy

- AI offers professional development opportunities that enhance teachers' understanding of AI tools and practices.

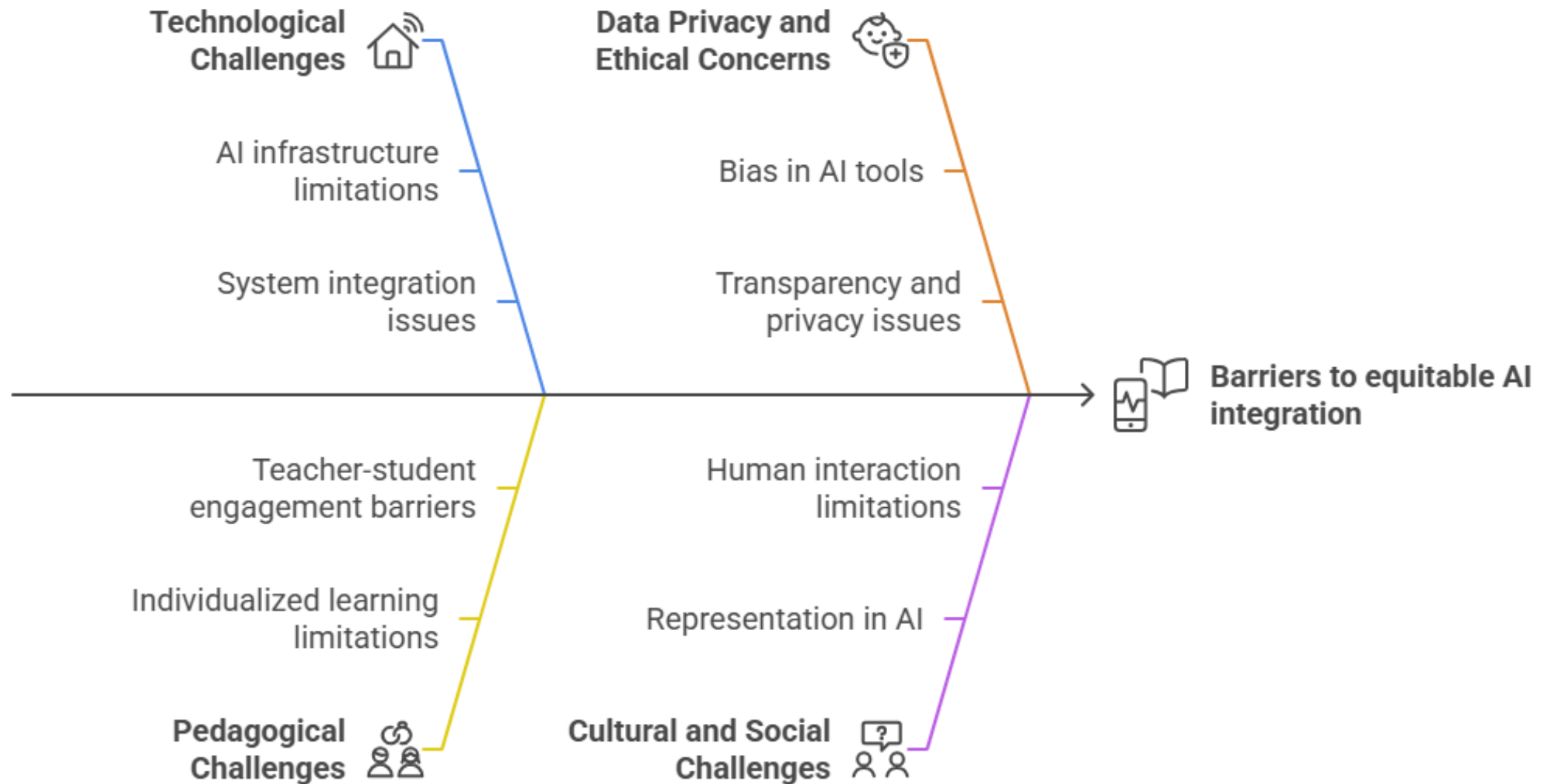
Adapting methodologies

- AI supports educators in evolving their teaching approaches as technology advances.

Responsible use

- Training in AI tools helps teachers maximize benefits while upholding academic integrity.

Challenges of AI for inclusive digital education (overview)



Technological Challenges in AI for Inclusive Education

Infrastructure Gaps

- Many institutions, especially in rural or underfunded areas, lack stable internet, modern hardware, and integrated platforms, creating a digital divide.

Accessibility Barriers

- Students with disabilities often face underdeveloped AI accessibility features (e.g., text-to-speech, captioning), and many tools ignore universal design principles.

High Costs

- AI-based assistive technologies and adaptive learning platforms are expensive, often requiring subscriptions and significant investments in infrastructure and support.

Training & Support Needs

- Specialized tools demand extensive teacher training and continuous technical support, which many schools cannot afford or provide.

Language & Regional Limitations

- Many inclusive AI tools are only available in certain languages or regions, restricting access for diverse student populations.

Compatibility & Standardization Issues

- AI systems often fail to integrate with LMS or assistive technologies, lack common standards, and disrupt existing teaching workflows.

Pedagogical Challenges in AI for Inclusive Education

Lack of Teacher Training

- Many educators are not equipped to use AI tools, especially assistive technologies for students with disabilities, which reduces effectiveness in inclusive classrooms.

No Standardized AI Literacy

- There is a lack of structured training programs, leaving teachers uncertain about how to apply AI for diverse learners and special needs.

Limited Adaptability of AI Tools

- Current systems struggle to customize learning experiences for neurodiverse or disabled students, restricting true inclusivity.

Algorithmic Bias

- AI models often reflect biased data, which can disadvantage students with disabilities, multilingual backgrounds, or non-traditional learning styles.

Equity Concerns

- AI recommendations frequently ignore unique learning needs, reinforcing exclusion instead of supporting fairness and accessibility.

Over-Reliance & Integrity Risks

- Students may depend too much on AI for assignments, leading to plagiarism, reduced creativity, weaker critical thinking, and assessments that lack the human judgment needed for ethical and complex reasoning.

Data Privacy & Ethical Concerns in AI for Inclusive Education

Sensitive Data Collection

- AI platforms gather academic, behavioral, and personal data, raising serious concerns about ownership, consent, and security.

Vulnerability of Students with Disabilities

- Reliance on AI-powered assistive tools makes these learners more exposed to privacy violations and misuse of sensitive information.

Lack of Data Governance

- Many institutions have no clear policies on storing, sharing, or deleting AI-generated learning profiles, leaving student data unprotected.

Transparency & Accountability Gaps

- AI often works as a “black box,” making it hard for teachers and students to understand decisions. Accountability for biased or incorrect outcomes is rarely defined.

Limits of AI in Assessment

- Automated grading lacks human intuition needed to evaluate creativity, ethical reasoning, and complex problem-solving.

Unclear Regulations

- No global framework exists, while regional rules differ. This creates inconsistencies, legal uncertainty, and hesitation among educators in adopting AI responsibly.

Cultural & Social Challenges in AI for Inclusive Education

Cultural Bias in AI Models

- Many AI systems reflect Western-centric perspectives, producing content that lacks cultural diversity and reinforces inequalities.

Language Barriers

- AI-driven language models often perform worse for non-English speakers, limiting inclusivity and fair learning opportunities.

Representation Gaps

- Students from underrepresented communities are frequently excluded because AI-generated learning materials fail to reflect their cultural backgrounds.

Risk of Social Isolation

- Heavy reliance on AI-powered learning aids can reduce teacher-student and peer-to-peer interaction, weakening motivation and social learning.

Reduced Classroom Engagement

- Students depending too much on AI-generated content participate less in discussions, lowering collaboration and exchange of perspectives.

Personalization Risks

- While adaptive learning can be valuable, it may also isolate learners by narrowing exposure to diverse viewpoints and limiting peer collaboration.

Conclusions

- AI brings real opportunities for more inclusive and accessible education.
- To realize AI's promise, we must address different challenges—technical, ethical, and cultural—and provide educators with the right support.
- The future of education will not be about AI replacing teachers, but about **AI becoming a trusted partner that supports both teachers and learners to succeed.**

Conclusions

- Benefits and challenges of AI for inclusive education were identified in the initial phase of our AI-ENABLE project
 - Since then, we have continued our research
 - Please visit <https://aienable.eu/results/>
- In the following session of today's worskop some of the results of this ongoing work will be presented
 - survey insights,
 - classroom practices, and
 - case studies from different countries



showing how AI can support inclusive education in practice.

Thank you!

