

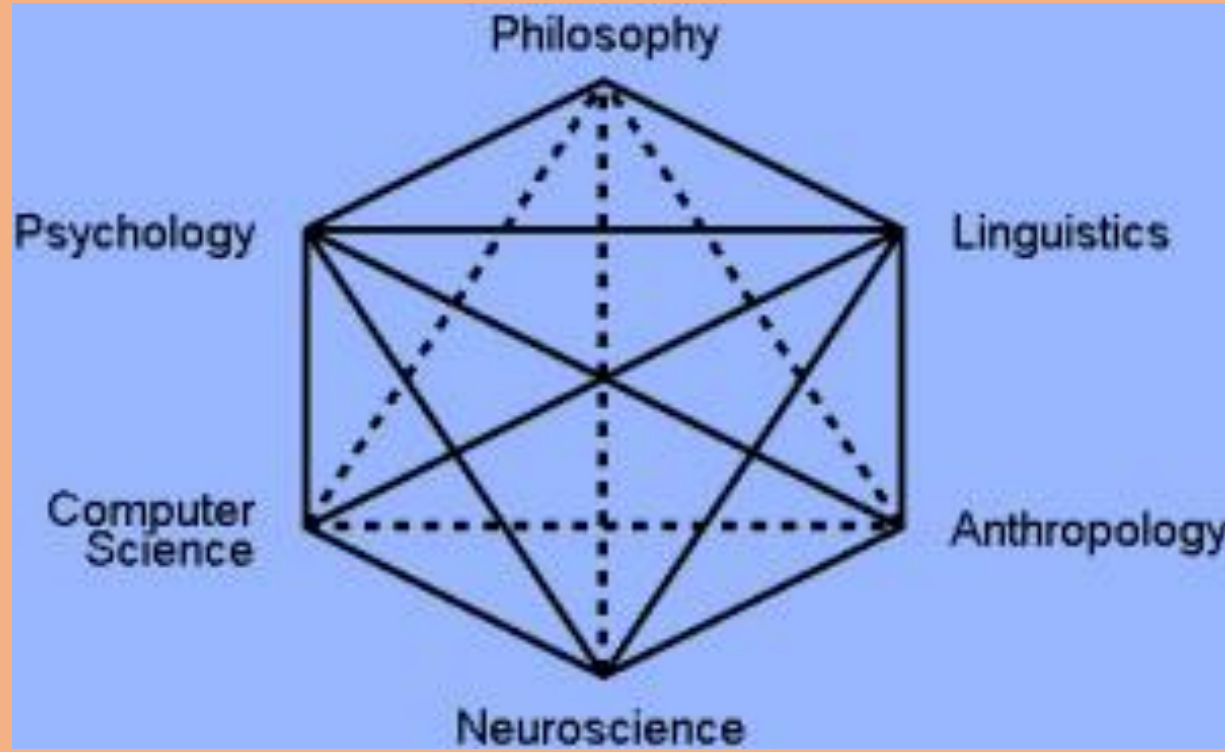
# Investigating the impact of AI on the human brain; An educational neuroscientific perspective of the teaching and learning of secondary school science.

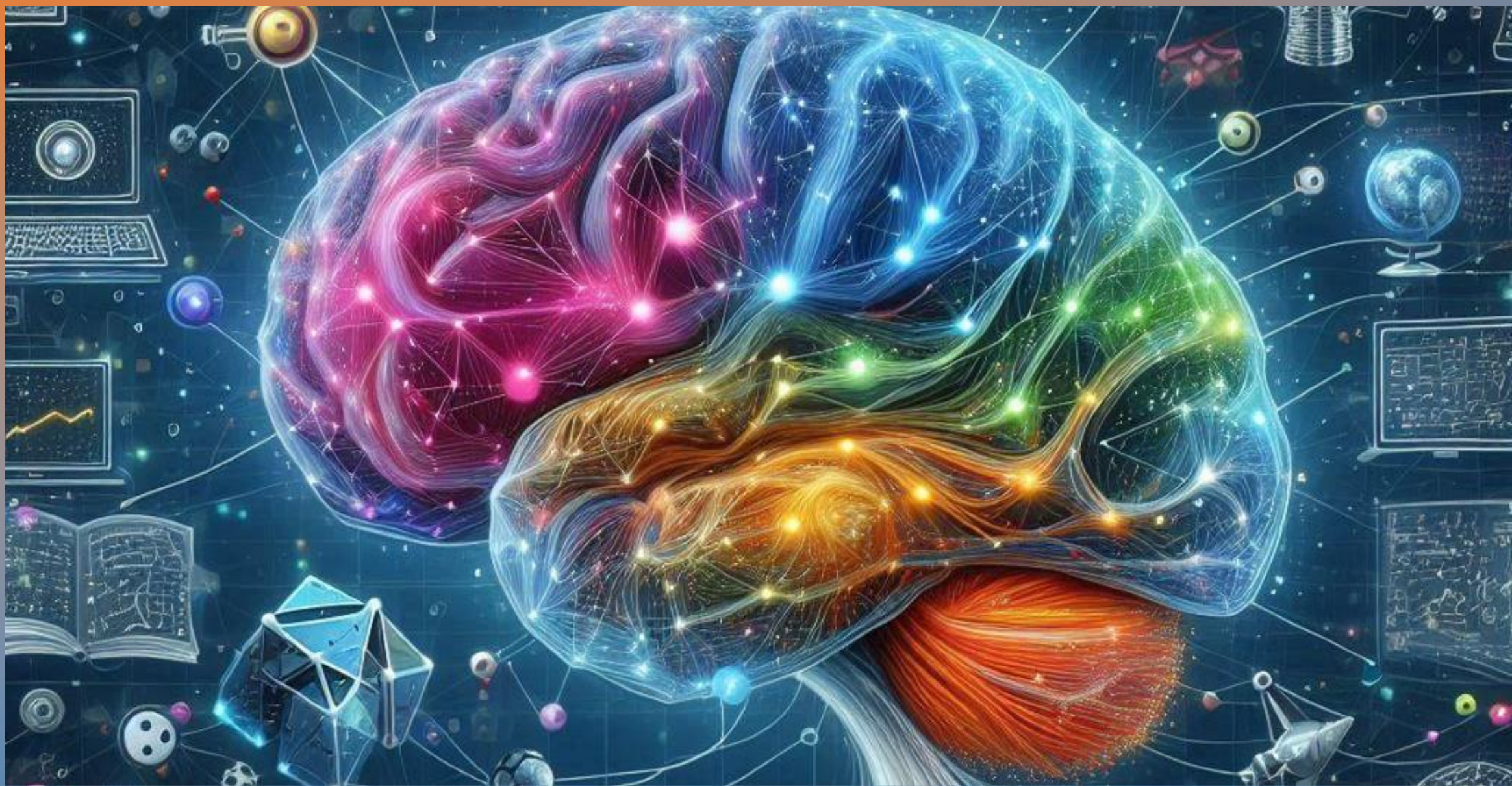


• + *“Artificial intelligence is not a substitute  
+ for human intelligence; it is a tool to  
• +  
◦ amplify human creativity and ingenuity.”*

Dr. Li, Stanford University Professor

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# The Role of AI in Education

## Transforming Teaching Methods and Learning

AI is reshaping educational environments by providing dynamic, responsive learning tools.

## Education 4.0 and 5.0

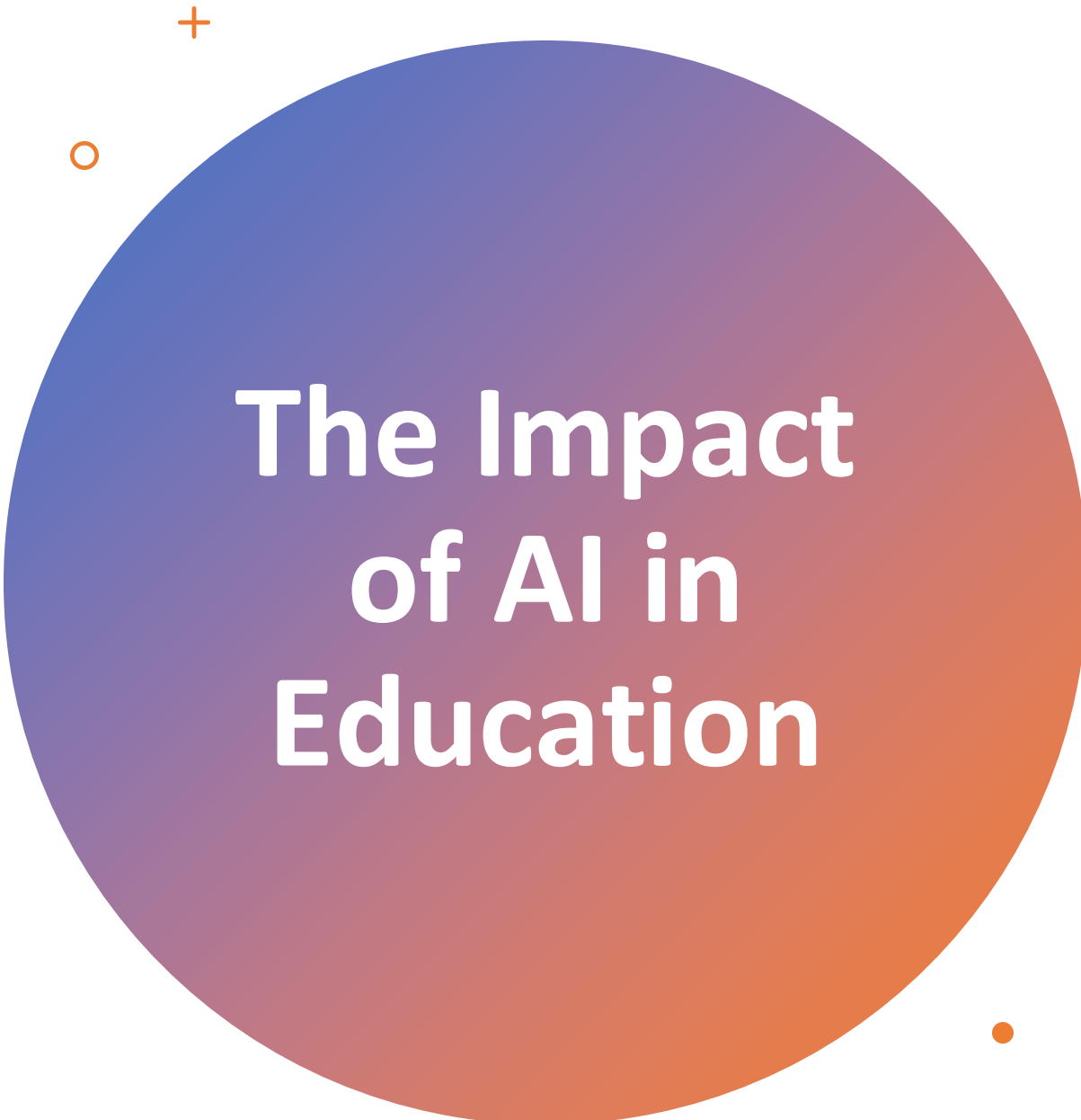
AI supports personalized, flexible learning, fitting into both Education 4.0 and 5.0 models.

## STEM Education

Intelligent tutors, automated assessments, and learning analytics in AI improve teaching quality and student engagement.

## Sustainable Development Goals

AI supports **Sustainable Development Goal 4**, which aims for inclusive and equitable education for all.



# The Impact of AI in Education

- **Teacher-Student Relationships**

AI is reshaping teacher roles, shifting from traditional methods to more interactive, student-driven approaches.

- **Personalised Learning**

AI-driven platforms tailor content to students' individual needs, adjusting difficulty and providing real-time feedback.

- **Student Performance**

AI enhances creativity, critical thinking, and academic performance, especially in STEM.

- **The Role of the Teacher**

Teachers must adapt to fast-changing AI technologies, transitioning to facilitators of learning rather than content providers.

# Challenges



## **Teacher Adaptation**

Educators may struggle to keep up with the rapid evolution of AI technologies.



## **Professional Training**

Insufficient professional development hinders teachers' ability to effectively use AI tools.



## **Costs**

Implementing AI requires significant financial investment in infrastructure and resources.



## **Inclusion and Equity**

AI could exacerbate the digital divide between privileged and disadvantaged students.



## **Privacy Concerns**

AI systems collect vast amounts of student data, raising ethical concerns about privacy and security.

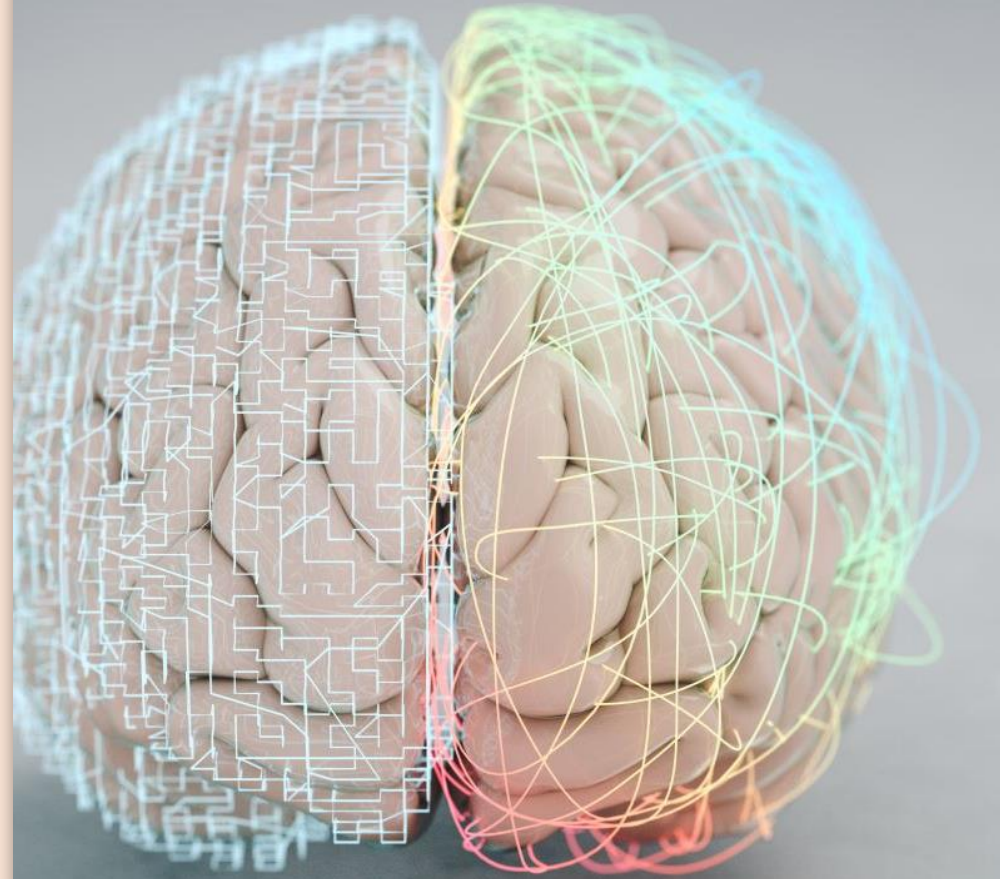


## **Bias and Discrimination**

AI algorithms can reflect biases in data, leading to unintended discrimination.

# Teaching with the brain in mind

- *“The Decade of the Brain”*  
(Zeer & Symanyuk, 2021)
- Neuroeducation should equip educators with the **right tools** for them to be able to reach **each and every** student despite all the challenges.
- Knowing the basics of how our brain functions is just a **stepping stone** into understanding the impact that all these changes are having on various brain processes.





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As **educators**, we need to ensure that:

all our students are presented with the right **environment** & the appropriate **learning tasks**.

**emotions** play an essential role in the learning experience

a good **rapport** is built with all students

the **social** aspect of learning is considered  
(Li et al., 2020)

previous experiences are **revisited** and **connected** to new knowledge  
(Terno, 2011)



# Bridging the gap

- The human brain was rigorously studied to understand **better ways of developing AI**. Additionally, the computational models developed were also used to **describe theories of learning** and to simulate various brain processes in humans (Doroudi, 2023)
- The original aim of computer scientists was to bring computer science to children in the classroom **not** simply get computers to the classrooms (Wright, 2002).

*“Two worlds could hardly be more different. But I made the transition because I believed that my new world of machines could provide a perspective that might lead to solutions to problems that had eluded us in the old world of children. Looking back, I see that the cross-fertilization has brought benefits in both directions.”*

(Papert, 1980, pg. 208)

- The significance of **thinking simultaneously about how our human brain functions and how AI powered machines work** is crucial in progressing further.

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- **Framework for AI integration in Education**

- **Inclusive and Equitable Learning**
  - AI should provide equal access to tailored educational resources, ensuring that all students have the support they need.
- **Detecting Learning Patterns and Behaviors**
  - AI analytics can identify students' strengths and weaknesses, enabling timely interventions.
- **Enhancing Student Engagement**
  - AI-driven interactive tools and simulations foster deeper engagement with learning materials.
- **Customization and Personalization**
  - AI can tailor educational experiences to individual students' needs, promoting personalized learning paths.

# Framework for 21st-Century Skills, Assessment, and Collaboration



## 21st-Century Skills

AI can help develop critical thinking, problem-solving, and digital literacy —skills essential for the future workforce.



## Assessment and Evaluation

AI allows for more accurate, efficient, and continuous assessments, helping teachers identify where students need the most improvement.



## Collaboration

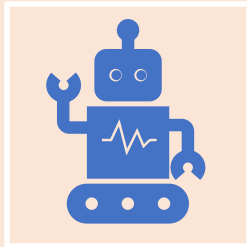
AI encourages collaborative learning environments, facilitating teamwork between students and between educators and stakeholders.



# Ethical Considerations

- **Data Privacy and Security**
  - Ensuring compliance with privacy laws and safeguarding sensitive student data.
- **Algorithmic Bias**
  - Addressing bias to prevent unequal treatment based on race, gender, or socio-economic status.
- **Human Oversight**
  - Retaining human control in educational decisions, ensuring AI tools support educators rather than replace them.

# Applying the AI Framework in Schools



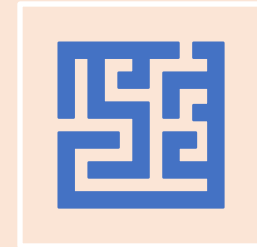
## Subject Integration

How AI tools can support both STEM and non-STEM subjects, personalizing learning for all students.



## Implementation Strategy

Steps for gradually introducing AI into classrooms, ensuring teacher training and student awareness.



## Challenges and Solutions

Identifying key challenges (costs, accessibility, training) and proposing practical solutions for effective AI adoption.

# Concluding remarks

- In this paper, the **transformative potential of AI in secondary school science education** was explored through a **neuroscientific** lens.
- The integration of AI into educational settings promises to create more **inclusive, engaging, and personalised learning environments** while equipping students with essential **21st-century skills**. However, the journey towards effective AI integration must be navigated with rigorous consideration of **ethical issues and thoughtful implementation** strategies.
- Educators, policymakers, and stakeholders must **collaborate** to harness the power of AI responsibly, ensuring it serves as a **tool that amplifies** human creativity and learning rather than replacing it.
- As AI continues to evolve, **ongoing research and dialogue are essential** to adapt and refine our approaches. By doing so, we can unlock new possibilities for education, ultimately fostering a generation of learners who are not only technologically proficient but also capable of critical thinking, creativity, and collaboration.

# *Question Time*

Thank you for your attention!

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