

# Periodic Table of AI in Education

## Periodic Table of AI in Education©

<b>ML</b> Machine Learning	<b>DL</b> Deep Learning	<b>AT</b> Adaptive Tutoring Systems	<b>AV</b> AI driven Virtual Labs	<b>LP</b> Lesson Planning Assistants	<b>ASG</b> Assessment Generation	<b>SE</b> Study Enhancement Tools	<b>DA</b> Digital Accessibility	<b>BI</b> Bias	<b>AC</b> Accountability	<b>AGI</b> Artificial General Intelligence	<b>CT</b> Creative AI Tools
<b>NLP</b> Natural Language Processing	<b>CV</b> Computer Vision	<b>PF</b> Personalised Feedback	<b>CB</b> Chatbots for Learning	<b>RM</b> Resource Matching	<b>TT</b> Translation & Transcription	<b>PL</b> Pronunciation & Language Learning	<b>MW</b> Mental Wellbeing Monitors	<b>PR</b> Privacy	<b>EA</b> Equity & Access	<b>HMC</b> Human Machine Collaboration	<b>SAE</b> Sentiment Analysis In Education
<b>AS</b> Automated Speech Recognition	<b>RL</b> Reinforcement Learning	<b>PL</b> Predictive Learning Analytics	<b>AG</b> Automated Grading	<b>CWS</b> Content Writing & Submission	<b>DS</b> Data Driven Student Insights	<b>AW</b> AI Writing Companions	<b>CP</b> Career Pathway Advisers	<b>TR</b> Transparency	<b>IP</b> Intellectual Property	<b>XR</b> Extended Reality with AI	<b>EDP</b> Ethical Design principles
<b>Core Technologies</b>		<b>Applications in Education</b>		<b>Teaching Support Tools</b>		<b>Pupil Empowerment</b>		<b>Ethics &amp; Challenges</b>		<b>Future Directions</b>	

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### Definitions for each element on the periodic table

#### Core Technologies (blue)

- **ML** – Machine Learning - A system that learns patterns from data without explicit programming. It is the foundation for most modern AI applications.
- **DL** – Deep Learning - A subset of machine learning that uses multi-layered neural networks. This technology excels at complex tasks like image and speech recognition.
- **NLP** – Natural Language Processing - Allows computers to understand, interpret, and generate human language. This is the core technology behind tools like ChatGPT and translation apps.
- **CV** – Computer Vision - Enables computers to "see," interpret, and make sense of visual information. Used for features like facial recognition and identifying objects in videos.
- **AS** – Automated Speech Recognition -The process of converting spoken language into written text. Essential for voice assistants and dictation software.
- **RL** – Reinforcement Learning -A system that learns the best actions through trial and error, maximising rewards. It is often used to train AI to master complex games and make sequential decisions.

#### Applications in Education (green)

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- AT – Adaptive Tutoring Systems - AI platforms that adjust the teaching content and pace to each student's needs. They provide personalized learning paths and target specific knowledge gaps.
- PF – Personalised Feedback - AI tools that analyse student work and offer constructive, tailored comments. This provides immediate, specific guidance on assignments, writing, or code.
- PL – Predictive Learning Analytics - Uses student data to forecast performance, identifying students at risk of falling behind. It allows educators to intervene early with necessary support.
- AV – AI-driven Virtual Labs - Simulated environments powered by AI for hands-on, risk-free experimentation. They allow students to explore complex scenarios without needing physical equipment.
- CB – Chatbots for Learning - Conversational AI designed to answer student questions and provide support 24/7. They act as a digital study partner or an administrative assistant.
- GR – Automated Grading - Software that uses AI to score assessments, particularly multiple-choice or short-answer questions. It saves teachers time while offering rapid results to students.

### Teaching Support Tools (yellow)

- LP – Lesson Planning Assistants - AI tools that help teachers quickly generate, organize, and refine lesson outlines. They can suggest activities, learning objectives, and required resources.
- RM – Resource Matching - AI that analyses content and aligns it with specific curricula, standards, or student needs. This helps teachers find the most relevant and high-quality materials instantly.
- CWS – Content Writing & Summarisation - Tools that quickly draft explanations, quizzes, or simplify complex texts. They reduce the administrative load of preparing reading materials and handouts.
- ASG – Assessment Generation - AI that creates varied quiz questions, prompts, or test papers based on specified topics. It ensures quick, standards-aligned assessment creation for educators.
- TT – Translation & Transcription - Real-time tools that convert spoken lectures into text and translate content between languages. This significantly improves accessibility for diverse student populations.
- DS – Data-driven Student Insights - AI systems that analyse student performance data to generate actionable reports for teachers. They help educators understand class-wide trends and individual progress quickly.

### Student Empowerment (purple)

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- SE – Study Enhancement Tools -AI apps that create flashcards, summaries, or optimal study schedules for learners. They help students organize information and optimize their revision process.
- PR – Pronunciation & Language Learning -Tools that use speech analysis to offer feedback on pronunciation and grammar. They provide a personalised, non-judgmental coach for language acquisition.
- AW – AI Writing Companions - Software that offers real-time suggestions for improving grammar, style, and structure. They serve as a digital editor to strengthen a student's writing process.
- DA – Digital Accessibility - AI features like automatic captions, alt-text generation, and intelligent screen readers. These tools ensure equal access to digital content for all learners.
- MW – Mental Wellbeing Monitors - AI that can analyse language patterns in communication to flag potential emotional distress. They provide an early warning system to connect students with support resources.
- CP – Career Pathway Advisers - AI tools that suggest educational paths and jobs based on a student's skills and interests. They offer personalised guidance for future academic and professional choices.

### Ethics & Challenges (red)

- BI – Bias -The risk that AI systems perpetuate or amplify societal prejudices present in their training data. This leads to unfair or inaccurate outcomes for certain groups of people.
- PR – Privacy - The challenge of protecting sensitive student data collected by AI-driven educational tools. It involves ensuring data is secure and used only for its intended, ethical purpose.
- TE – Transparency -The need for AI algorithms to be clear about how they reach a decision or output. Users must be able to understand the "why" behind the AI's recommendations or actions.
- AC – Accountability - Establishing who is responsible when an AI system makes a harmful or incorrect decision. This is a critical issue in high-stakes areas like grading or admissions.
- EA – Equity & Access - The challenge of ensuring all students have fair and equal access to powerful AI tools. It addresses the potential for AI to widen the digital and educational divide.
- IP – Intellectual Property - The legal debate over the ownership of content generated by AI or used in its training. It affects the originality and ownership of creative work produced by students and teachers.

## Periodic Table of AI in Education

### Future Directions (grey)

- AGI – Artificial General Intelligence - The theoretical future state where an AI can perform any intellectual task a human can. It represents the ultimate goal of AI development, with profound societal implications.
- HMC – Human–Machine Collaboration - The synergistic partnership where humans and AI work together, each leveraging the other’s strengths. This model focuses on AI augmenting human roles, not replacing them entirely.
- XR – Extended Reality with AI - The integration of AI into Virtual and Augmented Reality (VR/AR) to create immersive learning. AI can adapt simulations and tutors within the virtual environment in real-time.
- CT – Creative AI Tools - Advanced generative AI that can produce highly original music, art, poetry, and stories. These tools are becoming central to creative expression and artistic education.
- SAE – Sentiment Analysis in Education - AI that analyses the emotional tone in written or spoken communication. It can help educators gauge student engagement and well-being during discussions.
- EDP – Ethical Design Principles - The movement to build new AI tools with fairness, privacy, and accountability as core features. It promotes a proactive approach to mitigating the risks of new technology.