

Use of artificial intelligence in education delivery and assessment

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Overview

- Artificial intelligence (AI) tools have the potential to provide different ways of learning and to help educators with lesson planning, marking and other tasks.
- Research suggests that generative AI tools such as ChatGPT are increasingly able to produce text capable of passing some exams, which risks undermining the validity of some assessment methods.
- Some stakeholders have expressed concerns that over-reliance on AI could diminish educator-learner relationships. Concerns also relate to potential negative impacts on learners' writing and critical thinking skills, through work being undertaken by AI.
- In November 2023, the Department for Education published a report on the use of generative AI in education. The Government has also announced an investment of up to £2 million to provide new AI-powered resources for teachers in England.
- Stakeholders have indicated that the successful implementation of AI in education will require: evidence demonstrating where AI can be effective at delivering educational outcomes; training and guidance for educators; and further clarity surrounding the legal frameworks that control how AI collects and uses educator and learner data. They also indicate that there is a need to tackle 'digital divides', otherwise AI tools may not be available to disadvantaged groups and may therefore exacerbate inequalities.

Background

Artificial intelligence technologies have developed rapidly in recent years.^{1,2} This has been driven in part by advancements of generative AI (Table 1), which is now capable of performing a wide range of tasks including the production of realistic content such as text, images, audio and video ([PB 57](#)).

Some policymakers and education experts predict that AI technologies, if properly implemented, could improve learning outcomes and reduce staff workloads in educational settings, including in schools, colleges and universities.³⁻⁶

Adoption of AI in education is low compared to other sectors^{7,8} and is still in an early and experimental phase. There is uncertainty about the benefits and limitations.^{9,10}

Use of AI in education poses several challenges. In addition to general concerns about bias, safety and the use of personal data ([PN 708](#)), many AI tools have not been developed with younger audiences in mind and could expose learners to inappropriate content.¹⁰⁻¹²

Stakeholders have raised concerns that an over-reliance on AI tools could lead to the erosion of teaching, writing and reasoning skills, and may fundamentally change the educational experience offered to young people.^{10,13-16} For example, some educators have noted that over-use of generative AI could negatively affect the development of some teaching skills¹³. Further, AI-tutors may lack the pastoral care which can be offered to learners by human teachers.¹⁷⁻¹⁹

In March 2023, the Department for Education (DfE) set out its position on using AI in education in England, including opportunities and limitations, considerations around data and intellectual property, and how students might be supported to gain knowledge and skills around AI.^{20,21}

Following a call for evidence, the DfE published a report on the usage of generative AI in education in November 2023. It found that early adopters of AI in education mostly held positive views of the technology, however respondents also expressed significant concerns.¹³ In October 2023, the DfE organised a two-day 'hackathon' with educators and data scientists to determine how AI could be used in schools most effectively.²²

Education is a devolved policy. This briefing focuses primarily on education policy in England, which is overseen by the Department for Education. Statistics, strategies, policy and funding refer to England, unless otherwise specified.

Table 1: AI definitions

Definitions are not universally agreed, move at a fast pace and are interlinked.

Artificial intelligence (AI)	The UK Government's 2023 policy paper on 'A pro-innovation approach to AI regulation' defined AI, AI systems or AI technologies as "products and services that are 'adaptable' and 'autonomous'". ²³ The adaptability of AI refers to AI systems, after being trained, often developing the ability to perform new ways of finding patterns and connections in data that are not directly envisioned by their human programmers. The autonomy of AI refers to some AI systems that can make decisions without the intent or ongoing control of a human (PB 57).
Generative artificial intelligence	Defined by the Alan Turing Institute as "an artificial intelligence system that generates text, images, audio, video or other media in response to user prompts." ²⁴ Generative AI systems are often trained on huge datasets by employing a machine-learning approach. ²⁵
Large language model (LLM)	AI systems trained on a vast amount of text that can carry out a variety of language tasks, such as generating text (generative AI), answering questions, and translation. LLMs work by recognising patterns and predicting text but are limited in their understanding of context. Examples include OpenAI's ChatGPT and Google Bard. ²⁶⁻²⁹
Educational technology (EdTech)	Technologies specifically developed to facilitate teaching and learning which may or may not encompass AI. ⁴

For more details and further definitions, including of 'machine-learning' and 'algorithm', see [PB 57](#) and The Alan Turing Institute's [Data Science and AI Glossary](#).²⁴

AI use in education delivery

Reducing educators' workloads

In April 2023, the DfE's 'Working lives of teachers and leaders' report surveyed over 10,000 teaching staff and leaders in English state schools.³⁰ The report found that:

- 72% of teachers felt that their workload was unacceptably high
- high workloads were reported as the biggest reason for teachers considering leaving the state school sector

- 66% of teachers reported that they spent less than half of their working hours teaching due to time spent on activities including lesson planning, marking, and tracking pupil data, as well as administrative tasks

Staff have also reported increasing workloads in higher and further education institutions.^{31,32}

In September 2023, the DfE set up the Workload Reduction Taskforce with the aim of reducing primary and secondary schoolteacher workloads by 5 hours a week within 3 years.³³ Part of this initiative involves exploring how educational technologies (Box 1) with AI can assist with lesson planning and marking, and reduce administrative burdens.²²

In October 2023, the Government announced an investment of up to £2 million into the curriculum and teaching resources platform Oak National Academy to provide free access to AI-powered lesson planning resources to all teachers in England.³⁴

AI has the potential to reduce workloads by assisting with education planning and production in multiple ways.^{6,13,35–38} For example, AI tools can:

- scan text and make it more concise, or put it into language more suitable for specific age-groups^{6,39}
- generate definitions for key-terms found in a section of text⁴⁰
- produce questions and quizzes with model answers, which can be tailored to address specific weak points in learners' understanding^{13,17,41,42}
- automate or support administrative tasks such as the production of emails, reports, or seating plans¹³

AI products that can be used to mark learner work and provide feedback are also in development.^{13,43–45} Some digital platforms used for setting and marking work are being used to identify learners who may require additional assistance or a greater degree of challenge in a given area (Box 1).^{38,46}

In November 2023, the survey app Teacher Tapp found that 42% of over 9,000 surveyed teachers had used AI to help with school work at least once.⁴⁷

Limitations in reducing workloads

The novelty of AI teaching tools means that research into their suitability for practical use in education is still in an early phase. Lesson planning and marking are considered central parts of the teaching profession through which learner understanding and progress are supported and developed,^{48,49} and so may be more suited to only partial support from AI tools.^{50,51} Administrative tasks such as report writing may be more readily outsourced to AI systems, although this may depend on subject areas and individual teaching styles.¹³

Large Language Models (LLMs, Box 1) are liable to producing inappropriate, biased, or factually incorrect outputs (PB 57).^{10–12} Their outputs may require human review before being used in educational settings, reducing the time-savings offered through their use.^{20,52}

A 2023 survey of 284 academics working in UK universities revealed that 83% anticipated increasing their usage of generative AI over the coming years, although some respondents expressed a concern that work outsourced to AI tools could then be replaced by other, potentially more time-consuming, tasks.³¹

Personalised education and support

Online teaching platforms, where learners interact directly with AI tutors, can be tailored to individual users. There are claims that such platforms can offer more support than is typically available in classes or lectures.^{6,53}

These systems can mimic some aspects of 1:1 human tuition by communicating via chatbot interfaces that use clear and natural-sounding language produced using LLMs.^{38,54} Platforms can use learner data to provide personalised tuition aimed at the specific strengths and weaknesses of each learner.^{38,55} However, some academics contest the extent to which many AI EdTech tools are truly personalised.⁵⁶

While some AI tutors are likely to be more accessible and affordable than human tutors,^{57,58} they may be constrained in their teaching abilities, and may not be able to provide additional context to lessons, or pastoral care.¹⁷⁻¹⁹

AI can also improve the accessibility of education¹⁰ by assisting learners with disabilities or learning difficulties, such as dyslexia.⁵⁹⁻⁶¹ For instance, AI is being used to power screen reader technologies that allow visually impaired learners to use computers by converting text and images into speech or braille.⁶²⁻⁶⁵ Speech-to-text technologies can transcribe educator instructions for learners with hearing impairments or with English as a second language.^{66,67}

AI chatbots can also be designed to answer general enquiries or questions about homework, providing pupils and students with additional online support,⁶⁸ whilst potentially also preventing educational staff from feeling obliged to answer emails outside of working hours.⁶⁹

Box 1: Examples of AI EdTech

- **Personalised education platforms:** AI tutors such as Khanmigo⁷⁰ interact directly with learners by providing personalised support through a chatbot interface. Platforms such as CENTURY⁴⁶ provide teachers with an overview of learning progress, and the strengths and weaknesses of each student in a classroom, and tailor learning to meet each individual learner's needs.
- **Marking technologies:** Applications including Graide⁴³ and Progressay⁴⁴ assist or automate the marking and grading of student work using, for example, teacher inputs and AI-powered marking schemes. Some platforms are also capable of automatically generating feedback for learners.
- **Classroom assistant platforms:** These provide teachers with materials and resources for a range of purposes, for example, lesson plans, quizzes and classroom activities. Examples include TeacherMatic⁷¹ and the Oak National Academy platform.⁷²
- **Teacher training tools:** Tools such as Teacherverse⁷³ focus on teacher development, for example, by allowing teachers to practise teaching skills by using AI simulations of classroom scenarios.

Several AI experts predict that AI-tools, if properly implemented, could revolutionise education and help close attainment gaps.⁷⁴⁻⁷⁷

However, some education experts are concerned that an over-reliance on AI for lesson planning or marking risks de-skilling teachers and impacting teacher-learner relationships.¹³ This could lead to generalised, and less personal education outcomes.^{14,51} Bespoke education-focused LLMs that are fine-tuned using teaching content could help to ensure that outputs align more closely to the relevant school curricula,^{34,72,78} although at present fine-tuning cannot completely prevent LLMs from producing occasional false or biased outputs.⁷⁹

Educator training

AI systems can use data from teaching sessions to provide educators with feedback on their teaching.^{4,78,80-82} Some systems are being developed to use recordings of teaching sessions to develop teaching skills by providing feedback on educator-learner interactions.^{81,83}

Generative AI can also be used to prompt discussions during professional development by producing simulations of educator-learner interactions within classrooms.^{83,84}

However, whilst performance data could improve educator performance, some teaching unions have expressed concerns that the same data could be used in a punitive manner for job performance surveillance.¹⁴

AI use by educators in assessment

AI could potentially be used for the setting, marking and grading of exams and assessed coursework,⁸⁵ as well as the delivery and invigilation of remote assessments.⁸⁶ These tools are still in the early stages of development, and teaching professionals are reluctant to rely on AI for major assessments such as GCSEs or national exams because of issues with fairness, accountability and validity.⁸⁷

Human markers are prone to their own unique errors and biases, which can impact the grades that learners receive.^{88,89} Unlike AI markers, the decisions made by human markers can be influenced by situational factors such as mental fatigue.⁹⁰ There can also be some degree of variation depending on the nature of the exam. The Office of Qualifications and Examinations Regulation (Ofqual)⁹¹ has reflected that some types of exam questions (such as those requiring longer responses) have a lower rate of agreement between human markers than, for example, multiple choice questions.⁹²

There is a risk that AI used for marking could draw on a set of viewpoints and biases which were most common in the training data ([PN 708](#)). This could lead to discrimination^{93–95} and/or narrow the range of acceptable answers.^{10,52} Additionally, human markers can give clear reasoning for their marking decisions, in contrast to the less transparent way in which many AI systems make decisions ([PB 57](#)).^{93,96,97}

Surveys conducted by Jisc* in 2023 showed that some university students are open to the use of AI for marking their short answers and responses in quizzes, but are less comfortable with AI-automated marking of other forms of assessment.⁹⁹

Experts in assessment have suggested that, given the critical importance of exam results, there are significant barriers to the marking of exams being fully outsourced to AI,⁹³ although there may be scope for tools with AI to assist with marking.⁹⁷

Learner use of AI

In 2021, the UK Government set out a 10-year National AI strategy with the aim “to make the UK a global AI superpower”.^{100,101} This included measures to support people to learn about AI, including engaging children with AI through work with the National Centre for Computing Education (NCCE).

Some staff and institutions in the education sector, including schools that use International Baccalaureate qualifications¹⁰² and the Russell Group of universities¹⁰³, are actively encouraging pupils and students to use AI tools in their work to varying extents.^{15,102,103} They argue that this will help learners to develop a balanced view of AI and its limitations, thereby preventing misuse, and can equip new generations with some of the skills and knowledge needed for the future workforce.^{13,103}

However, some education experts have expressed several concerns including:

* Jisc is a not-for-profit agency which conducts research and provides advice regarding the use of digital services in higher and further education within the UK.⁹⁸

- learners may develop an over-reliance on AI in education, impacting their development of writing and critical thinking skills^{4,16,66,104,105}
- a negative impact on literacy skills¹³
- the syntax and grammar of text produced by AI-tools may flatten individual writing styles¹⁰⁶
- less personal creativity when used in subjects such as art and music¹³

In addition, there are concerns that the online text LLMs are trained on may over-represent the writing style, culture and biases of English-speaking nations such as the UK and the USA¹². LLM outputs may therefore lack the social and cultural nuances of any given community.⁴

Learner use of AI in assessment

There are widespread concerns regarding the impact that generative AI will have on education assessments.^{13,52,93,107,108}

Research has shown that the latest versions of generative AI software are able to produce outputs that can, in some circumstances, pass some school and university level assessments.^{109–112}

Generative AI could therefore compromise multiple forms of assessment, including essays, dissertations, online exams, and applications for courses.^{13,113–116}

Generative AI's ability to produce highly graded coursework may also risk putting some learners at a competitive advantage if they are assessed in this way, compared to assessment through invigilated exams.^{117,118}

Detecting the use of generative AI is extremely challenging. Some experts believe that the ongoing race between constantly-improving generative AI and AI-detection tools means it is unlikely that detection tools will ever be able to identify AI-generated text with 100% accuracy.^{119,120}

Multiple studies have shown that commercially available AI-detection software is often inaccurate and prone to 'false positives', where learners are falsely accused of using generative AI.^{121–124}

Rethinking assessment

There are growing calls on schools, colleges and universities to implement new ways of evaluating learner progress that are less likely to be undermined by AI.^{108,125,126} Proposed approaches include:

- **exams under invigilated conditions:** for example, returning to handwritten exams to prevent AI misuse.¹²⁷ Several stakeholders including the Quality Assurance Agency[†] see this as a regressive response that may reduce the

[†] The Quality Assurance Agency for Higher Education is an independent quality body and registered charity which assures the quality of teaching and assessment for tertiary education within the UK.¹²⁸

accessibility of examinations.¹⁰⁸ Exams delivered through secure online browsers have been proposed as a more accessible alternative.¹²⁹

- **oral examinations:** the assessment of student understanding and reasoning through oral examinations, as is already done in some circumstances, could be expanded to other subject areas.^{130,131} This approach comes with significant logistical challenges. These include time constraints, and the possibility of students assessed at the start of the process discussing exam content with those assessed later.¹⁰⁸
- **observed examinations:** commonly used in medical teaching, in these examinations, students conduct a series of tasks in a controlled environment. However, this approach may be limited to subjects which include practical elements.¹⁰⁸

Alternatively, the Joint Council for Qualifications[‡] and some education experts argue that the large-scale abuse of AI can be reduced through preventative measures including:¹⁰⁷

- openly discussing AI with learners and explaining how its exploitation could lead to diminished learning outcomes (as is already done in relation to essay-mills[§])^{107,134,135}
- providing greater levels of support during writing tasks^{136,137}
- setting more specialised assignments which are less readily completed by using generative AI¹³⁸

Other stakeholders are calling for new methods for evaluating learner work and understanding, with a greater focus on learning and skill development through means that help prepare learners for the working world, such as internships, presentations or group activities.^{139,140}

However, implementing radical changes to current assessment systems could cause significant disruption to learners and teaching staff.¹⁴¹

[‡] The Joint Council for Qualifications represents the eight largest qualification providers within the UK on issues regarding examination and education policy¹³²

[§] Essay mills are businesses which allow students to pay third parties to produce academic essays or coursework on their behalf. This practice became illegal in England in 2022.¹³³

Policy considerations

There is uncertainty around how AI technologies, including those used in education, will develop over the coming years.⁷⁸

A general explainer on AI technologies, including factors driving advancements in AI, and concerns around AI systems, is available in [PB 57](#). The wider policy implications of AI, including an outline of benefits and risks of AI use, are discussed in [PN 708](#).

Several experts in AI in education predict that AI will have a transformative effect on teaching and learning.^{142–144} This raises several wider and complex questions about the future of education, and the sort of relationship with technology that might be fostered in young people, including how this might vary across contexts.^{123,140,143–145}

Stakeholders have also suggested several practical considerations, around evidence of effectiveness of AI-powered EdTech, training and guidance for educators, a need to tackle 'digital divides', and further clarity surrounding the legal frameworks that control how AI collects and uses educator and learner data.

Evidence of effectiveness

Despite its growing use, the effectiveness of AI-powered EdTech has been assessed only in a small number of studies, and is often constrained to specific use-cases.^{56,148–150} This is particularly the case with tools that use generative AI.^{10,125}

Most available information comes directly from EdTech companies themselves, making it less objective.^{151–153} Robust, independently-produced evidence on the benefits and limitations of AI, for instance independent certifications, could help educators to make decisions about AI use in their settings.^{52,154} Schools have also indicated that they have limited time to review the suitability of EdTech.¹⁵⁴

There are several initiatives that are supporting research and learning into AI in education in England. These include pilot studies such as those funded by the Northern Council for Further Education^{*,156} and government-funded experiments conducted by Oak National Academy¹⁵⁷, which are seeking to find the best use-cases of AI. Some institutions are exploring how AI can be used in their contexts in their educational settings.^{158–160}

Several countries, including China, Singapore, South Korea and the USA, have invested heavily into EdTech research and are integrating AI teaching tools into schools and universities.^{161–164}

Many advanced AI Edtech tools are being developed outside the UK.^{78,165,166} Some stakeholders have indicated that AI EdTech developed outside the UK may be less suitable for use within UK education contexts.¹⁵⁰

* The Northern Council for Further Education is an educational charity and an awarding body for technical and vocational qualifications.¹⁵⁵

Training and guidance

A 2023 report by Oxford University Press found that whilst many teachers believed that AI would have a positive effect on education, only 23% of UK teachers felt prepared for a shift toward an AI-enabled classroom.¹⁶⁷ Training for educators around AI was called for by almost all respondents to the DfE's Call for Evidence on generative AI in education.¹³

Some independent organisations such as the Teacher Development Trust* have produced online guidance for using AI in education.¹¹ However, education experts suggest that increased AI-awareness and competency through teacher training and professional development courses may also be necessary if AI tools are to become widely used by teaching staff.^{53,169} Similar interventions may also be useful in further and higher education.^{53,170,171}

Tackling 'digital divides'

Regional inequalities, and differences in socioeconomic circumstances amongst other factors, can lead to differing levels of access to reliable internet access, computers, tablets or smartphones.¹⁷² This is often referred to as a 'digital divide'.¹⁷³

Digital divides mean that some educational institutions may lack the infrastructure needed for the effective utilisation of AI tools.

A 2023 report published by the education company Pearson found that half of English secondary schools do not have access to reliable WiFi, and that only 44% of secondary schools have access to laptops for in-class learning.¹⁷⁴ Research from Jisc looking at learner experiences in the 2022-2023 academic year found that more than half of surveyed students in UK further and higher education reported WiFi issues as a barrier to education.¹⁷⁵⁻¹⁷⁷

The DfE has published research showing that budgetary constraints are the greatest factor preventing wider use of technology in schools, and has committed £200m to connect all English schools to highspeed broadband by 2025.^{178,179}

However, some stakeholders have stated that without sustained funding for the upkeep of IT infrastructure, there is a risk that the greatest benefits of AI may be limited to institutions and learners with more financial resources.^{13,177} Further, only some learners may be able to afford the cost of some paid-for or premium versions of AI tools, giving them an advantage when working from home or completing coursework.³

Safety and data security

In 2023 the UK Government published a white paper on a 'pro-innovation' approach to AI regulation²³. This is based on existing legal frameworks rather than introducing new legislation, and seeks to regulate through existing regulators ([PN 708](#)).²³ Data, safety and security are considered in the white paper.

* The Teacher Development Trust is a UK charity which offers training and guidance to school leaders.¹⁶⁸

Some legal experts have highlighted the importance of a tailored approach to regulation, including in education.¹⁸⁰ Stakeholders have highlighted the role of data protection regulations, notably the UK General Data Protections Regulations (UK GDPR), in ensuring the data used by AI tools is handled responsibly.^{14,17} In November 2023, the UK hosted a global summit on AI safety which was followed by the creation of the UK's AI Safety Institute.^{182,183}

The DfE and the educational departments of devolved executives in the UK have published advice for the use of AI on their websites.^{20,184,185} However, educators and AI experts have expressed the need for further, more in-depth guidance.^{52,186}

The teachers' union NASUWT has set out 12 principles for the ethical use of AI and digital technologies within education. This emphasised that engaging teachers in decisions about the development and use of AI and Edtech in learning environments is crucial in order to ensure that the technology supports education goals and objectives and is manageable.¹⁴ NASUWT also stresses the importance of thorough regulation and monitoring of all AI and Edtech used in learning environments.¹⁴

The Digital Futures Commission* published a report in 2023 recommending three key legislative priorities to ensure that EdTech is used in a way that protects children's personal data and is not detrimental to learning:⁹

1. Clarification of how existing regulatory frameworks including UK GDPR,[†] The United Nations Convention on the Rights of the Child,[‡] and The Age-Appropriate Design Code[§] apply to EdTech tools. Where necessary, these frameworks may require extension so that they comprehensively cover the use of EdTech in education. Additionally, the development of legislation which ensures high standards, transparency, and compliance from EdTech companies.
2. Certification frameworks so that high-quality, peer reviewed EdTech products that have proven educational value and safety standards are easily identifiable by schools.
3. Development of secure data infrastructure which serves the best interests of children and educational institutions, whilst also allowing for controlled data-sharing which supports the development of new EdTech tools.⁹

Guidance on the use of AI in education has also been published by various stakeholders including UNESCO, Jisc and the Russell Group.^{103,125,191}

* The Digital Futures Commission, chaired by Baroness Kidron, is a research collaboration which is assessing the impacts of digital innovations on children and young people, funded by the 5Rights Foundation and the London School of Economics.

† The General Data Protection Regulation (2018) restricts the use of personal information by businesses and organisations without explicit consent.¹⁸⁷

‡ The United Nations Convention on the Rights of the Child (1989) is an international treaty which grants all people under 18 a comprehensive set of rights.¹⁸⁸ Of particular relevance is General Comment no. 25 (2021) which discusses Children's rights in relation to the digital environment.¹⁸⁹

§ The Age Appropriate Design Code (also known as the Children's Code) is a code of practice that online service providers must adhere to in order to protect UK children's data.¹⁹⁰

Intellectual property is a key consideration, with the DfE noting that “Education institutions must not allow or cause pupils’ original work to be used to train generative AI models unless they have appropriate consent or exemption to copyright.”²⁰

Determining the data that can be collected, and how this can be used by AI, may remain a topic of debate.^{14,166,192,193} Allowing AI tools to access learner data raises concerns about privacy and safeguarding. Some organisations such as Defend Digital Me* are questioning whether there is any lawful basis for companies to use children’s data for training purposes and developing new AI tools.¹⁹⁵

However, placing strict restrictions on data use may prevent the training and improvement of AI tools used in educational contexts.^{17,38,196}

* Defend Digital Me is an independent non-governmental organisation (NGO) campaigning for the safe and transparent use of data within English schools.¹⁹⁴

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