AI as an opportunity for quality education: tailoring learning to individual needs, lighten teachers' workload, and fostering future-skills

Recommendations for the use of AI across the education system

This document has been machine-translated from German. The original German version is available here.

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Summary

Artificial intelligence offers the opportunity to significantly improve the quality of education across the entire education system. Learning processes can be tailored more individually, educational pathways better supported, and the workload of teaching staff noticeably reduced. This can strengthen equality of opportunity and participation, whilst enhancing the quality of teaching and motivation to learn. To ensure that this potential can be effectively harnessed, clear and reliable framework conditions are needed from policymakers at federal and state level. Education authorities should clarify legal requirements, make them practical to implement, and provide educational institutions with guidance on the safe use of AI. They should also encourage the use of AI applications. At the same time, educational institutions require access to AI applications that comply with data protection regulations, a robust digital infrastructure (Wi-Fi, hardware and software), and reliable IT administration. However, they also need the freedom to experiment within permissible limits and to develop and test innovative forms of teaching.

A key factor for the successful and responsible use of AI applications is the systematic teaching of AI skills. These should be a mandatory component of the initial, in-service and continuing professional development of teaching staff, whilst also being gradually introduced and expanded for learners throughout the entire education system. In addition to a basic technical understanding, this also includes legal (data protection) and ethical issues. On the learners' side, the teaching of AI skills first requires strengthening basic skills and developing future-oriented skills such as communication, collaboration, creativity and critical thinking. AI competence is a key factor for competitiveness. Professional activities are now almost inconceivable without AI competence and continue to change rapidly. Vocational education and training in particular can benefit from the possibilities offered by AI. AI applications make learning less dependent on time and place; they can respond to the challenges and needs of individual target groups and make learning dynamic and practical. A prerequisite is that training regulations and continuing education programmes are systematically and needs-oriented developed by those responsible, and that new learning formats are tested and evaluated in a way that suits the target groups.

In detail

Early childhood education: Using AI to strengthen language and interaction at an early stage

The use of AI can support and relieve the workload of early years educators in their work. Examples of good practice should be more widely disseminated, and institutions should be empowered by their funding bodies to test and implement new concepts. Modern training and professional development for early years educators consistently implements this and embeds AI skills from the outset. Only with the appropriate training can early years educators understand AI applications and integrate them confidently into their daily work. They should then also be able to teach children, in a playful way, the limits of AI and how to engage with it critically. Early years education settings will then require the appropriate infrastructure and support with IT administration to make systematic use of AI applications.

With the help of AI, support needs can be diagnosed more easily, individual support plans drawn up, and progress measured and documented. This applies in particular to language skills. Image- and text-generating applications can, for example, be used to stimulate children's creativity and curiosity. For instance, stories can be developed and illustrated collaboratively. This playful approach to AI also enables children to engage critically with AI applications at an early stage. Errors in text and images can serve as a starting point for a child's initial understanding of AI and its limitations. Many children are exposed to digital media in their everyday lives from a very early age. It is the task of modern early childhood education to foster an awareness of risks and dangers in this regard, within a limited framework and on a pedagogically sound basis. This contributes in particular to equal opportunities.

AI can help early years educators plan daily routines and provide inspiration for developing new ideas. AI applications can relieve staff in early years education of administrative tasks, thereby freeing up more time for educational work with the children. AI-based language programmes can improve communication with non-German-speaking parents or make it possible in the first place.

Schools: Using AI for personalised learning and better teaching quality

The use of AI tools in schools can help to identify learning deficits at an early stage, provide individualised support for learning pathways, differentiate teaching content and make lessons more practical. To ensure that this potential is effectively harnessed, clear and reliable policy frameworks are needed. School authorities and headteachers should provide teachers with legally sound and practical guidelines within which they can operate freely, whilst encouraging them to use AI. At the same time, schools need spaces for experimentation so that innovative applications can be tested and practical experience gained. Supporting this is, in particular, a task for headteachers. Close cooperation between school authorities and school management, as well as a continuous exchange of experiences between schools, is recommended. Pupils and their everyday experiences with AI should be incorporated as far as possible to establish a connection to their everyday lives.

A key factor in the efficient and meaningful use of AI systems in schools is empowering teachers to use AI actively and confidently in the classroom and for lesson preparation. This can only be achieved if AI competence becomes a mandatory component of teacher training and professional development across all school types. Only then will teachers be able to assess the opportunities, limitations and risks of AI, and appreciate its potential for educational use. Responsibility for this lies with the federal states, universities and teacher training institutes.

It is also crucial that schools' IT infrastructure enables the secure and data-protection-compliant use of AI applications. This includes reliable support for IT administration. The federal states should specifically promote this within the Digital Pact for Schools. Close cooperation between education authorities, school governing bodies and schools with relevant (edutech) providers is advisable. This applies in particular as long as no public services are available. Only through close cooperation between the various stakeholders can it be ensured that the latest technological developments are always taken into account. The use of AI also requires that examinations and assessment procedures take into account the possibilities of generative AI and focus more strongly on future-oriented skills[1], in particular the so-called 4 Cs (communication, collaboration, creativity, critical thinking). This helps to ensure that pupils' own work can be adequately assessed, even when AI applications are used and this is made transparent.

Early media education is crucial to enabling pupils to use AI safely and responsibly. This includes, in particular, the ethical challenges posed by AI. School curricula must be refined in an interdisciplinary manner with this in mind. This requires sufficient basic skills, in particular language comprehension for the use of generative AI and an understanding of mathematical and computer science concepts. Only when pupils understand how algorithms work and how generative AI applications are trained can they critically reflect on the results and, where necessary, recognise false or fabricated facts or discriminatory suggestions. Early language support, language comprehension and STEM education are key to this and must be strengthened accordingly[2].

AI systems offer the opportunity to support pupils, particularly those with lower academic achievement, and to provide teachers with important guidance in their support of these pupils. In this way, they can strengthen equality of opportunity within the education system. Adaptive learning systems can identify learning gaps at an early stage and, building on this, suggest ways forward. AI systems can analyse learning processes and solutions, make diagnoses and provide feedback. In doing so, they can support and relieve the burden on teachers, leaving them with more time for their educational work.

Teachers can also use AI tools for communication, for example with parents who speak a foreign language, or for the integration or inclusion of children with language barriers or special educational needs. In this way, they can also play an important role in promoting participation and reaching key target groups that are currently, in some cases, difficult to reach. AI applications can also help to make lessons lively and

[1] BDA position paper "Starting future skills today": https://arbeitgeber.de/wp-content/uploads/2024/10/bda-arbeitgeber-positionspapier-zukunftskompetenzen_heute_starten_10_punkte_zu_future_skills-2024.pdf

[2] BDA position paper "The formula for the future: STEM education": https://arbeitgeber.de/wp-content/uploads/bda-arbeitgeber-positionspapier-zukunftsfor-mel_MINT_bildung-2025_09_26.pdf

interactive. Through the use of robotics, technical skills and programming can be taught in a playful and practical way, whilst immersive media can simulate real-world scenarios. This can be particularly beneficial for STEM subjects, but can also make humanities lessons more engaging. AI can also support career guidance and bring the world of work to life. Through increased collaboration with businesses, schools can help students experience the importance of AI applications in the workplace and counteract young people's fears about the future.

Vocational education and training: Optimising, simulating and personalising training scenarios with AI

The growing importance of AI in the world of work is fundamentally changing the requirements for professional skills. Those involved in vocational education and training (VET) therefore face the challenge of using AI applications safely and in a pedagogically sound manner, whilst at the same time imparting and strengthening relevant AI skills. It is therefore crucial that they are equipped to do so as quickly as possible and on an ongoing basis through needs-based further and continuing professional development. In addition to general basic AI skills, vocational trainers in companies and teachers at vocational schools must also possess job-specific AI skills. Training regulations are generally technology-neutral, i.e. they do not usually specify particular technologies and define a minimum standard. However, training practice constantly adapts to changing standards and developments in the world of work. In the reality of the workplace, training takes place within specific work processes and directly addresses changing requirements. All new training regulations also contain, through the standard occupational profile item 'Digitalised world of work', many important points of reference for imparting AI skills in schools and workplaces. Both learning environments should consistently utilise the specified anchors and bring them to life. The aim is for all trainees – regardless of the size and level of technological sophistication of the training company – to learn how to use AI tools and to apply them productively and efficiently. AI should also, conversely, be more firmly embedded across subjects in vocational school teaching. Vocational schools and inter-company structures play a particular role as learning partners, especially for SMEs. The development of shared digital platforms for learning content, data and best practice should, for example, contribute to better exchange between teachers and trainees. It is a crucial factor in taking account of job-specific AI use cases.

In VET all stakeholders should also explore the possibilities of adaptive learning environments more thoroughly and roll them out more widely, for example by introducing AI-supported learning platforms that can create and support individual learning pathways. This applies in particular to the vocational school context or inter-company structures. Schools have a responsibility to make greater use of these possibilities for digital-supported teaching and distance learning. In the workplace, training staff are responsible for translating workplace AI applications into the training programme. Social partners are tasked with defining industry standards where necessary. Pedagogical responsibility remains with the training staff; AI systems cannot replace them. This is another reason why it makes sense to develop standards for the use of AI and to establish evaluation systems to measure its impact.

The application of AI has implications for examination structures. Those responsible for drafting examination regulations and the relevant authorities must select methods and tools that allow the trainees'

own performance to be assessed as effectively and efficiently as possible. The use of AI is possible in this context, but must be made transparent and must be beneficial to professional competence. The federal government, the Länder, social partners and chambers should also examine the extent to which AI can be used to overcome language or other barriers. If non-native-speaking trainees possess the necessary professional competence in theory and practice, new examination pathways should be trialled so that they do not fail the written examinations solely due to a lack of language comprehension. This could include, for example, AI-supported translation tools. Vocational schools and companies should make greater use of adaptive learning systems, including in exam preparation. This can boost motivation and enable tailored support.

The use of simulations, augmented and virtual reality (AR/VR)[3], and adaptive learning systems offers numerous opportunities to make training attractive, practical and motivating. This applies across all occupational profiles. In technical professions, for example, trainees can practise dealing with complex requirements in simulations without endangering their own health or risking costly damage to equipment or machinery. In the commercial sector, these systems can be used to familiarise oneself with process flows or to practise handling customer situations. Particularly in off-site learning environments, this allows training content to be delivered in a lively and practical manner. Training staff, just like teachers at vocational schools, can be supported by AI in their daily training work and relieved of some of the burden of planning and documentation. AI-supported systems can analyse learning progress and suggest personalised learning content. They can also help to identify the risk of trainees dropping out at an early stage through continuous monitoring. The pedagogical assessment remains the responsibility of the trainer. Trainers must therefore be continuously and systematically supported and trained in how to use AI systems efficiently and effectively. In doing so, didactic, legal and ethical aspects should all be taken into account.

All stakeholders in VET should increasingly initiate and evaluate pilot projects to test specific AI applications in training. Successful approaches should then be rolled out more widely. Trainees and trainers must engage intensively with these systems to enable or facilitate an optimal start to their careers.

Higher education: Using AI to support academic teaching, improve study pathways and unlock innovation potential

Higher education institutions require cross-cutting AI strategies for the use of AI in study programmes, teaching and examinations to ensure the quality of academic work whilst simultaneously providing targeted support for students for the rapidly changing world of work and fields of activity. These strategies must provide a clear framework, whilst at the same time creating scope and encouraging lecturers and students to utilise the technologies. This is where university management comes into play. It is the responsibility of the faculties and departments to tailor these strategies precisely to their specific academic requirements. Crucial to implementation is ensuring that the existing IT infrastructure and access to AI applications are taken into account and guaranteed. University lecturers also require the necessary qualifications to be able to use AI in teaching whilst simultaneously imparting subject-specific AI skills. Support and further training

[3] BDA brochure ‘VR and AR in the world of work’: https://arbeitgeber.de/portfolio-item/vr-und-ar-technologien-in-der-arbeitswelt/

programmes for teaching staff and students that combine technical, pedagogical and legal aspects are essential for this.

Students must be empowered to use AI applications for academic work whilst also reflecting on them critically. To this end, universities require differentiated training programmes for students that impart both basic AI skills, such as prompting, and advanced skills, such as how to use AI in research and in the context of academic work. It is the responsibility of individual faculties and departments to identify subject-specific AI competencies and integrate them into the curricula. This must be done on an ongoing basis and in close collaboration with industry and the scientific community. Not least in view of the rapid pace of AI development, the process of exchange within universities and between universities and their network partners should be strengthened in this regard.

Generative AI poses particular challenges for universities and the assessment of academic performance. Independent academic work, the careful examination of sources and data, and the ability to develop texts and lines of argument independently must remain core competencies of academic training, even in the age of AI. At the same time, AI skills are becoming increasingly important for future careers across all academic disciplines – starting with STEM subjects, but also in the humanities, law, economics, medicine and education. Universities are therefore under particular pressure to address the challenges posed by AI in a strategic, interdisciplinary and discipline-specific manner. At the same time, AI offers great potential for innovation and academic debate, as well as for enhancing the appeal of degree programmes.

Continuing professional development: Strengthening innovation and employability with AI

In continuing vocational education and training (CVET), AI systems should be used in a targeted manner to individualise learning processes and implement adaptive learning systems. These can continuously adapt content, pace and level of difficulty to the learner's competence level and progress. Providers of continuing vocational training should make greater use of the possibilities offered by AI to further develop existing programmes from a pedagogical perspective and to create new, innovative training formats. The aim is to attract new target groups and address existing ones more precisely. Furthermore, it is their responsibility to support businesses in preparing their employees for the AI world. Key competencies in dealing with AI should be specifically promoted, in particular data literacy, critical thinking, problem-solving skills and the ability to use AI tools effectively and responsibly.

Companies have the task of determining for themselves what impact AI has on their processes and activities, and consequently on the skills requirements of a diverse workforce. Based on this, the role of training providers is to create tailored training programmes that enable companies and employees to understand and apply new technologies, and to realign or further develop business models. AI can also be used to automatically generate or update continuing education programmes. In particular, technological or regulatory changes can thus be swiftly incorporated.

In addition, AI should be used to analyse skills needs in order to strategically align continuing education measures with current and future skills requirements. It is the responsibility of academia and practitioners

to conduct more extensive research into whether and how target groups who are currently distant from continuing education – such as the low-skilled – can be attracted to continuing education through AI applications, or better supported, motivated and assisted during their continuing education. Virtual learning environments and adaptive learning systems, including the use of gamification elements, should be the focus of this research.

Companies are constantly investing in the further training of their employees[4]. Artificial intelligence presents a new challenge in this regard, as it is bringing about significant and lasting changes to the world of work in almost all sectors. Whilst office-based roles have been the main focus so far, generative AI is increasingly being used on the shop floor[5]. Analytical AI is also giving rise to new skill requirements, for example in quality control. Training needs can therefore vary greatly, ranging from basic skills to specialist knowledge. At the same time, AI offers new opportunities for the availability of further training and for motivating learning. Adaptive learning management systems can be used regardless of location or time and can offer new avenues to further training that are precisely tailored to, for example, older employees or people with few formal qualifications. This can also strengthen the individual's willingness to engage in lifelong learning. AI-supported assistance systems can support employees directly within the work process by providing context-related information, recommendations for action or error analyses in real time. This enables a close integration of learning and work and enhances the sustainability of skills acquisition.

AI systems can also support, but not replace, pedagogical responsibility in continuing education. Continuous evaluations are recommended to assess and optimise the effectiveness of AI-supported continuing education measures. Pilot projects can help to roll out successful approaches on a wider scale.

[4] IW Continuing Education Survey 2023: https://www.iwkoeln.de/studien/susanne-seyda-sabine-koehne-finster-thomas-schleiermacher-investitionsvolumen-auf-hoechststand.html

[5] BDA brochure "Generative AI on the shop floor": https://arbeitgeber.de/portfolio-item/generative-ki-auf-dem-shopfloor/

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