

The Transformation of the Natural Sciences through AI by 2034 and beyond with Trusted WEB 4.0 (August 2026)



"Trusted WEB 4.0 is the Integration of all resources available via the Web into an overall system.

Machines, devices and people are globally accessible, organized in decentralized, anonymous structures.

Trusted WEB 4.0 maps pre-digital social structures.

*The value chains are being reorganised."
(Olaf Berberich, 2007)*

The Transformation of the Natural Sciences by AI by 2034 and Beyond: Focus on Mathematics, Education, Research, and Trusted WEB 4.0

- AI is already solving mathematical problems that remained unsolved for decades, thereby fundamentally changing the natural sciences.
- Schools and universities must adapt in order to integrate AI meaningfully, with a focus on creativity and critical thinking.
- Research practice is changing through AI, towards new methods of knowledge generation, validation, and interdisciplinary collaboration.
- Participation and creative interaction with AI require new models of human-AI collaboration that foster trust and social bonding.
- As a decentralized, transparent, and user-centric platform, Trusted WEB 4.0 can safeguard the trustworthiness and security of AI applications and thus support the transformation.
- The EU-D-S deliberately does not address all citizens: the AI transformation will make the divide between those willing to learn and others even more visible.
- Thanks to AI-supported education, the EU-D-S's promise of upward mobility can actually be delivered: those willing to learn will find concrete advancement paths in the EU-D-S.
- No one is excluded – but for those who are unable, or unwilling, to learn and participate, the EU-D-S will not offer any attractive incentives.

Introduction

The rapid development of artificial intelligence (AI) is transforming the natural sciences, and mathematics in particular, to an unprecedented degree. By 2034 and beyond, AI will act not merely as a tool but as a transformative partner in research, education, and application. This transformation affects the way knowledge is generated, conveyed, and used, and at the same time places high demands on the design of the interaction between humans and machines. Trusted WEB 4.0, as a decentralized, transparent, and user-centric platform, can play a key role here in safeguarding trust, security, and accessibility.

As in all areas of the European Digital System (EU-D-S), the delineation of the target group applies here as well: the EU-D-S is not aimed at all citizens, but at people with an active interest in education and participation. The AI transformation will make the divide between those willing to learn and others even more visible – and it is precisely in this that the opportunity lies to actually deliver on the EU-D-S's promise of upward mobility. No one is excluded; however, those who are unable, or unwilling, to learn and participate will not find any attractive offers within the EU-D-S. The present analysis examines these changes comprehensively and shows how AI is revolutionizing the natural sciences, what adjustments are necessary in schools, universities, and research, and what a new interaction model that enables participation and the creative linking of AI results might look like.

Current State of AI in the Natural Sciences

Mathematics

AI models have already solved mathematical problems that had remained unsolved for decades. For example, in May 2026 OpenAI published a counterexample to the “Unit Distance Conjecture”, a conjecture in geometric graph theory that had been open since 1946. It is one of hundreds of problems associated with the mathematician Paul Erdős. Only one week later, human researchers adapted this proof technique to refute another important conjecture. These successes raise

fundamental questions about the future of mathematical research and the role of humans. The reactions of the professional community are multifaceted, ranging from enthusiasm about new tools to concerns about a possible erosion of mathematical culture. [1]

AI is increasingly being used in mathematics teaching to individualize and support learning processes. Pilot projects in North Rhine-Westphalia are testing the use of generative AI in lower secondary schools in order to create new learning opportunities and gain experience in handling AI. AI is used, for example, to work out tasks such as proving that the interior angles of a triangle sum to 180 degrees and to provide immediate feedback, which underscores the relevance of mathematics to real-world problems while at the same time fostering critical reflection and teamwork. [2]

Other Natural Sciences

In physics, chemistry, and biology, too, AI is used to perform complex calculations, build models, simulate chemical reactions, develop new materials, or analyze genomes. These applications expand the didactic possibilities and promote interdisciplinary collaboration. The integration of AI into teaching and the development of professional development programs for teachers are important steps in order to exploit the potential of AI and to address ethical challenges. [2][3]

Education Systems in Transition: Adjustments in Schools and Universities

Schools

The integration of AI in the classroom requires a fundamental adaptation of curricula and teaching methods. Teachers must learn to use AI effectively in order to individualize and support learning processes. Professional development for teachers is essential in order to use AI reflectively and to support learners in a targeted manner. Curricula must incorporate the handling of AI, in particular the teaching of creativity and critical thinking when using AI results. This requires close cooperation between science and educational practice in order to take account of framework conditions and ethical aspects. [2][3]

Universities

At universities, AI is increasingly being used to support and individualize learning processes. Students in scientific, mathematical, and medical fields are significantly more in favour of AI applications than students in other disciplines. This points to growing interdisciplinarity in teaching and research. Degree programs must be adapted in order to integrate the handling of AI, with a focus on creativity and critical thinking. Here, too, close cooperation between science and educational practice is necessary in order to take account of framework conditions and ethical aspects. [4][3]

Research in the Age of AI: New Methods and Paradigms

New Methods of Knowledge Generation

AI is fundamentally changing research practice by enabling new methods of knowledge generation. It supports the validation of results and promotes interdisciplinary collaboration. The increasing complexity of human-AI interaction requires a holistic perspective that encompasses technical, emotional, ethical, and philosophical aspects. The German Research Foundation (DFG) and other scientific organizations emphasize the need to reflect on these changes not only technically but also emotionally, ethically, and philosophically. [5]

Interdisciplinary Collaboration

The integration of AI promotes interdisciplinary collaboration, as AI applications are used across the various natural sciences. This requires close cooperation between researchers from different disciplines in order to exploit the full potential of AI while at the same time addressing ethical challenges. [6]

Participation and Creative Use of AI: Models for Inclusive Interaction

Iterative and Dialogue-Based Models

Iterative, dialogue-based models with explicit feedback lead to better results than one-off, static input-output scenarios. The creative performance of AI systems depends heavily on the interaction between humans and machines. People who were supported by generative AI systems in creative tasks achieved systematically better results than those without machine assistance. [7]

Trust and Social Bonding

Trust in human-AI interactions must be built through repeated positive experiences and the formation of social bonds. The progressive development of AI is leading to a fundamental change in interaction, with personalization, social elements, task variety, and contextual understanding on the part of AI steadily increasing. [8]

Emotional and Ethical Aspects

The increasing complexity of human-AI interaction requires a holistic perspective that encompasses not only technical but also emotional, ethical, and philosophical aspects. The DFG and UNESCO emphasize the importance of reflecting on these changes emotionally, ethically, and philosophically as well, in order to preserve and further develop values, skills, and attitudes in the age of AI. [9][5]

The EU-D-S: Target Group, Divide, and a Genuine Promise of Upward Mobility

Target group: not all citizens

As in all areas of the EU-D-S, the following applies here as well: the European Digital System (EU-D-S) is not aimed at all citizens. The 2033 study on adapting political elections and parties to permanent digital feedback mechanisms already established this delineation: the EU-D-S deliberately addresses a target group that brings an active interest in permanent participation. In the context of the educational transformation, this means concretely: the addressees are those willing to learn – people who are prepared to learn, to develop themselves further, and to actively seize the opportunities of AI-supported education.

The AI transformation will make the divide between those willing to learn and others even more visible. The EU-D-S does not create this divide – it arises from the differing willingness to learn within society and is made visible by the transformation: those who want to learn can, with AI support, achieve within a few years what earlier generations needed decades for. Those who do not want to learn remain untouched by this progress. The EU-D-S makes this divide transparent instead of covering it up – and therefore offers everyone willing to learn a genuine path upwards.

A promise of upward mobility that can actually be delivered

Precisely because AI-supported education individualizes learning processes, the EU-D-S's promise of upward mobility can actually be fulfilled. The European Digital System offers those willing to learn concrete advancement paths: individual learning paths supported by adaptive learning systems in schools, universities, and continuing education; access to current research and its methods; a share

in the value creation of the EU-D-S; and social recognition of the learning achieved. Anyone who is in a poor social position today but is willing to learn can genuinely rise within the EU-D-S – not as an empty promise, but underpinned by feedback loops, realistic learning goals, and the participation mechanisms of the EU-D-S (cf. the participation payments in the 2033 study). The promise of upward mobility is thus genuinely redeemable for the first time: the path upwards no longer depends on origin or wealth, but on one's own willingness to learn.

No attractive offers without a willingness to learn

No one is excluded: citizens who are unable, or unwilling, to learn or to participate remain in the existing system and thereby lose nothing. But the EU-D-S will not offer any attractive incentives to this group. This is not a punishment, but the logical consequence of a system based on active participation: those who do not wish to participate cannot derive any added value from such a system. The EU-D-S thus relies on incentives rather than coercion – and leaves it up to each individual whether to seize the opportunities of the AI transformation.

Trusted WEB 4.0 as an Enabler: Technological and Conceptual Foundations

Trusted WEB 4.0 and the European Digital System (EU-D-S) interlock here: Trusted WEB 4.0 provides the technological and conceptual foundations, the EU-D-S the structuring framework – for the target group of those willing to learn.

Trustworthiness and Security

Trusted WEB 4.0 can play a central role in providing trustworthy and secure AI applications in education. It supports the integration of AI in schools, universities, and research by taking account of the necessary framework conditions and ethical aspects. This requires close cooperation between science and educational practice. [6][10]

Decentralized and Transparent Approaches

Trusted WEB 4.0 enables decentralized, transparent, and user-centric approaches that safeguard the trustworthiness and security of AI-supported solutions. It can help provide the necessary resources and materials to promote AI applications in education and to develop and provide the necessary professional development programs for teachers. [11][12]

Supporting Teacher Education

Trusted WEB 4.0 can contribute to developing and providing the necessary professional development for teachers in order to support the use of AI in the classroom. It can help provide the necessary resources and materials to promote AI applications in education. [11][13]

Challenges and Opportunities

Ethical and Practical Challenges

The integration of AI into the natural sciences brings ethical and practical challenges with it. The increasing complexity of human–AI interaction requires a holistic perspective that encompasses not only technical but also emotional, ethical, and philosophical aspects. The DFG and UNESCO emphasize the importance of reflecting on these changes emotionally, ethically, and philosophically as well. [5]

Technical Challenges

The use of AI language models in school education is currently the subject of controversial debate, particularly for the subject of mathematics. There are initiatives for the development, evaluation, and integration of AI teacher training into the professional development landscape, as well as the provision of adaptive learning systems in schools. These initiatives aim to make the use of AI in the classroom safe and effective. [3]

Acceptance in the Scientific Community

Acceptance of AI in the scientific community is multifaceted. While some researchers embrace the new possibilities with enthusiasm, there are also concerns about a possible erosion of scientific culture and the role of humans in research. The integration of AI therefore requires careful design of the interaction and close cooperation between researchers from different disciplines. [1]

The Divide as the Central Societal Challenge

The growing divide between those willing to learn and others is the central societal challenge of this transformation. AI-supported education rewards a willingness to learn immediately: those who bring it with them benefit; those who do not fall behind. The EU-D-S answers this challenge not with symbolic politics but with a promise of upward mobility that can actually be delivered: for all those who want to try, the doors are open. For those who do not wish to participate, there is deliberately no attractive offer – remaining in the existing system is voluntary and without disadvantage. No one is excluded; the decision lies with each individual.

Conclusion and Outlook

The transformation of the natural sciences by AI by 2034 and beyond will be profound. AI is already solving problems that long remained unsolved, thereby fundamentally changing research practice. Schools and universities must adapt in order to integrate AI meaningfully and to promote the teaching of creativity and critical thinking. Research practice is changing towards new methods of knowledge generation and interdisciplinary collaboration. Participation and creative interaction with AI require new models of human-AI collaboration that foster trust and social bonding. As a decentralized, transparent, and user-centric platform, Trusted WEB 4.0 can safeguard the trustworthiness and security of AI applications and thus support the transformation.

The challenges are manifold and encompass ethical, practical, and technical aspects. The opportunities lie in increasing productivity, fostering creativity, and improving learning processes. Close cooperation between science, educational practice, and technology development is essential in order to create the necessary framework conditions and to shape the transformation successfully.

For the EU-D-S, a central delineation follows from this: it is not aimed at all citizens, but at the target group of those willing to learn. The divide between those willing to learn and others will become even more visible as a result of the AI transformation – the EU-D-S makes it transparent instead of covering it up. Thanks to AI-supported, individualized education, the EU-D-S's promise of upward mobility is genuinely deliverable: the path upwards no longer depends on origin or wealth, but on one's own willingness to learn. No one is excluded – those who are unable, or unwilling, to learn and participate remain in the existing system; the EU-D-S deliberately offers no attractive incentives to this group.

Overview: Aspects of the Transformation

Aspect	Current state / development	Challenges	Opportunities / approaches
AI in mathematics	Solving long-unsolved problems, e.g. the Unit Distance Conjecture	Erosion of mathematical culture, acceptance	New golden age of mathematics, human-AI collaboration
AI in other natural sciences	Use in physics, chemistry, and biology for simulations and analyses	Ethical and practical challenges	Interdisciplinary collaboration, new research methods
Schools	Integration of AI in the classroom, professional development for teachers	Adaptation of curricula, data protection	Individualized learning, fostering creativity
Universities	AI supports learning processes, stronger use in STEM subjects	Adaptation of degree programs, ethical aspects	Interdisciplinarity, fostering critical thinking
Research	New methods of knowledge generation, validation	Complexity of human-AI interaction	Holistic perspective, interdisciplinary collaboration
Participation and interaction	Iterative, dialogue-based models, social bonding	Building trust, emotional aspects	Fostering creativity, better results through feedback
Trusted WEB 4.0	Decentralized, transparent platform for trustworthy AI applications	Technical and ethical challenges	Supporting teacher education, providing resources
EU-D-S and target group	Genuine promise of upward mobility through AI-supported education; the divide between those willing to learn and others becomes more visible	Division of society, differing willingness to learn	Concrete advancement paths for those willing to learn; no one is excluded, but no attractive offers for those unwilling to learn

This analysis shows that the integration of AI into the natural sciences is a complex, multifaceted process that brings with it both enormous opportunities and significant challenges. A successful transformation requires close cooperation among all stakeholders and careful design of the interaction between humans and AI, supported by trustworthy platforms such as Trusted WEB 4.0 and implemented concretely in the European Digital System (EU-D-S).

Sources

- [1] Advances in artificial intelligence in mathematics and their impact on the professional community
- [2] Minister Feller: Exploring new learning opportunities with AI in mathematics and German | Land.NRW
- [3] AI and education • Körber Foundation
- [4] Artificial intelligence at universities (No. 59, April 2021)
- [5] AI & Science – German UNESCO Commission
- [6] Artificial intelligence in science didactics – here to stay: potentials, desiderata, challenges | Zeitschrift für Didaktik der Naturwissenschaften | Springer Nature Link
- [7] Generative AI & creativity: meta-analysis shows human-AI power – SciBlog.at – the science blog
- [8] How human can artificial intelligence be? | EY
- [9] Understanding artificial intelligence and using it competently
- [10] Artificial intelligence in schools
- [11] AI rulebook of the University of Stuttgart | Fraunhofer platform FhGenie | presentations & infographics in NotebookLM | “Her mit den Portr[AI]ts!”
- [12] On the current use of artificial intelligence in education | German Bundestag (WD-8-004-25)
- [13] (PDF) Artificial intelligence in higher education – a quantitative longitudinal study on students' use of AI-based tools (2023 & 2025)

Impressum / Legal Notice

DE

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EU-Register Nr. **244298340978-40**

Complainant at the Federal Constitutional Court:

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