Chapter 7
Artificial Intelligence and Education: Ethical Questions and Guidelines for Their Relations Based on Human Rights, Democracy, and the Rule of Law

Christian M. Stracke

Abstract This chapter presents an overview of the relationship between Artificial Intelligence (AI) and education. It discusses both perspectives: the use of AI in education (AIED) and the education about AI (EDAI, also labeled as AI literacy) which combined is abbreviated as AI&ED. The AIED research has existed since the 1950s but the broader focus on AI&ED and related ethical debates is just starting now due to the new popularity in mass media and public. Thus, the ethical principles and new questions in relation to AIED are the main focus of the analysis. The discussion demonstrates that AI&ED requires a solid foundation in the core global values; that is, human rights, democracy, and the rule of law. The main reason is that education is a special sector with specific conditions. On the one hand, education is a human right, and on the other hand, education is mandatory for school pupils. In addition, education should strengthen and contribute to inclusion and equity, also in AI&ED. Thus, the educational sector needs AI&ED regulations as well as careful considerations and ethical reflections to guarantee human, democratic, and safe developments for our learners as well as for our future generations of society. It can be concluded from our discussion that for sustainable and responsible AI&ED we have to follow and realize three ethical imperatives: technology-independent, impact-oriented, and society-focused. These ethical demands require holistic approaches for the design, development, implementation, and evaluation of AI&ED to guarantee positive impacts and benefits of AIED.

Keywords Trustworthy and ethical AI · Education and learning · Informatics and technologies · Human rights · Democracy · Rule of law · Digital transformations · Scientific literature · Educators and teachers · Computer and information scientists

C. M. Stracke (✉)
University of Bonn, Bonn, Germany
e-mail: stracke@uni-bonn.de

D. Burgos et al. (eds.), *Radical Solutions for Artificial Intelligence and Digital Transformation in Education*, Lecture Notes in Educational Technology,
https://doi.org/10.1007/978-981-97-8638-1_7

7.1 Introduction

The concept of artificial intelligence (AI) is controversially discussed since the term coincided with what is often credited to John McCarthy in the 1950s (Aiken & Epstein, 2000; Chaka, 2022; Huang et al., 2023). AI has been introduced and used in many branches and disciplines since the start of this millennium (Borenstein & Howard, 2021). Due to the anticipated high impact caused by AI, many researchers and initiatives have started to discuss and define transparent AI (Larsson & Heintz, 2020) and ethical AI (European Commission, 2022; HLEG on AI, 2019; Kazim & Koshiyama, 2021; UNESCO, 2021), including debates about the ethics of ethical AI (Hagendorff, 2020).

The relationship between AI and education (AI&ED) is broader than the simple use of AI in education (AIED) and covers also the education about AI (EDAI) which is reflected in the overall abbreviation "AI&ED" combining both perspectives (Holmes et al., 2023; Stracke et al., 2024b).

This chapter presents the results of our analysis and discussion of ethical questions related to AI and education. In the following sections, we summarize the latest research and developments related to AI&ED and the causing ethical questions with a focus on the special case of education. In our analysis and discussion, we can identify three ethical principles that we present as imperatives for future ethical AI&ED.

7.2 AI & Education (AI&ED)

The use of AI in education (AIED) has been researched for more than forty years related to various perspectives (Dillenbourg, 2016; Kent et al., 2022; Pinkwart, 2016), mainly focusing on K-12 education (Hrastinski et al., 2019; Luckin et al., 2022) and higher education (Crompton et al., 2020). The published research offers several SLRs (Stracke et al., 2024c), some with special focus on AIED in K-12 education (Crompton et al., 2022; Sanusi et al., 2022), on AIED in higher education (Zawacki-Richter et al., 2019), and AIED for specific educational purposes (Kurdi et al., 2020; Sottilare et al., 2018). Starting with intelligent tutoring systems (ITS) several decades ago (Corbett et al., 1997; Dermeval et al., 2018; du Boulay, 2016), diverse use cases for AIED have been analyzed, such as feedback functions (Benotti et al., 2018) and automatic grading (Luckin, 2017; Yang et al., 2019) next to the overall relation between artificial and human intelligence (Baker, 2016). Finally, several international agencies have discussed the potential of AIED for future sustainable education, e.g., UNESCO's 'AI in Education. Guidance for Policy-makers' (Miao et al., 2021).

Several advantages and promises are claimed for AI use in general and in education more specifically, for example, by G20 (2023) and OECD (Vincent-Lancrin & van der Vlies, 2020), such as

- Personalization through diversity and adapted pathways

- Inclusiveness for special needs
- Individual support by AI Chatbots and intelligent tutor systems (ITS)
- Equal chances for all learners independent from human teachers
- Reduction of drop-outs
- Assessment of skills.

On the other hand, several disadvantages and serious problems are discussed for AI use in general and in education (Bozkurt et al., 2023; Holmes et al., 2022), such as:

- Biases and inequities due to non-representative data sources
- Anthropomorphism and dumb trust in AI
- Social scoring of learners and their comparisons among themselves and with other groups
- Lack of emotional, social, and collaborative aspects
- Traditional pedagogies, teaching, and sequencing
- Data theft and commercialization by pure revenue interests.

In AIED research, several systematic reviews have already analyzed several aspects of the state-of-the-art related AI in education (such as Chen et al., 2020; Crompton et al., 2022; Sanusi et al., 2022; Stracke et al., 2023, 2024c; Zawacki-Richter et al., 2019).

7.3 Global Ethical Values and the Special Case of Education

In ethics, we can distinguish between three main ethics approaches: metaethics, normative ethics, and applied ethics (Kronqvist et al., 2022). Normative ethics are often controversially discussed in politics relating moral principles to behavior and how they are permeated through socio-cultural systems, both discursively and systemically (Gewirth, 1960). The *introduction and use of AI touch all three ethical dimensions as AI does not only require new normative ethics as spreading discipline but AI is also raising general questions about our human development and conditions related to thinking, thought models, intelligence, and responsibility* (Gabriel, 2020). *We can only state that AI systems are not intelligent and cannot become intelligent due to their dependencies on human decisions and implementations but it requires more discussion and argumentations that we cannot address here. However, we need to reflect on the special case of education as a starting point for our analysis of AI&ED.*

In education, the learners are in a special situation, in particular in formal school education with mandatory participation and most of them are not of legal age. Education is a human right (United Nations, 1948). It is focused on Sustainability Development Goal No. 4 which requires special attention and efforts by the public authorities (United Nations, 2015). SDG 4 demands to "ensure inclusive and equitable quality

education and promote lifelong learning opportunities for all" (United Nations, 2015, 21). This includes that the special needs of all pupils have to be addressed which is even more challenging for learners handicapped by brain malfunctions or damages. Furthermore, all learners should have equitable chances for education. And SDG 4 asks for quality education which is defined through the ten targets and related indicators in detail. Lifelong learning should be facilitated for all human beings which extends the human right beyond formal school education. In addition, education as a right and mandatory teaching and learning of young children is guaranteed, protected, and defined through the UN Convention on the Rights of the Child (1990).

Finally, education is not a product like any other delivery but a promise and learning process that cannot be predicted and pre-assessed (Stracke, 2019). *On the one hand, the provided teaching and achieved learning results are not predictable as they depend on many conditions and factors. On the other hand, teachers cannot force pupils to learn but learners have always to build, develop, and improve knowledge, skills, and competencies by themselves.*

In summary, education is a fluid relationship between teachers and learners and requires careful consideration and ethical reflections due to the importance of learners' personal development as well as for our future generations of society.

7.4 Ethical Questions Related to AI&ED

The ethical aspects and theories for AI&ED are currently under scrutiny and potential regulations are just in development as the broad use of AI in education came suddenly despite the long AI development period before. Therefore, we are facing many open ethical questions that we need to quickly answer as the AI development progress is continuously increasing. Overall, five ethical principles are globally discussed in AI ethics: transparency, justice and fairness, non-maleficence, responsibility, and privacy (Jobin et al., 2019). And there are many more ethical issues related to AI implementation and use in education than in other sectors (Holmes et al., 2022a). Next, the "standard" ethical questions that are valid in all sectors including education, the teaching and learning process, and settings are raising additional ethical challenges. In principle, human beings should be aware of, recognize, and reflect on any use of AI. Therefore, AI&ED has to address both, AIED as well as EDAI, next to the special situation of education (Holmes et al., 2023; Stracke et al., 2024b).

International institutions and public authorities have already addressed AI&ED and published their first policies (Council of Europe, 2023; European Commission, 2022; European Parliament, 2021; UNESCO Education & AI by Miao et al., 2021). Their first analysis revealed ten ethical principles for AI&ED clustered into seven topics (Nguyen et al., 2023).

In addition, the Special Rapporteur of the United Nations has underlined the global right to privacy, in particular of children, in relation to AI recommending legal regulation and certainty (Cannataci, 2021). However, global or regional legal instruments are still lacking and only first attempts are on the way in some countries.

The European Union started its first international initiative with the AI Act in the year 2021. It is very much welcomed to launch the global debate but it lacks the focus on education as a special sector as well as the foundation on the fundamental values of human rights, democracy, and rule of law.

In the global AI&ED community, the discussion on ethics started early but it was not broadening and continued (Aiken & Epstein, 2000). It took 20 years to see community-driven proposals and frameworks again as well as the identify the need for trustworthy and ethical AI&ED in general (Borenstein & Howard, 2021; Holmes et al., 2022b, 2023; Stracke et al., 2023, 2024b) and in particular in K-12 education (Akgun & Greenhow, 2021; Chounta et al., 2022).

Inclusive AI for learners with special needs requires even more sensitive and careful implementation. The more learners need special attention and support, the more the use of AI has to be carefully planned and designed to avoid problematic situations and tasks that learners cannot overview or fulfill. *It is the responsibility of all involved stakeholders including AI&ED policymakers, public authorities, developers, and implementers of AI systems to address inclusiveness and to guarantee appropriate AI&ED practices for all.*

However, current research reveals that there are many occurring legal violations and issues: "a recent report by Human Rights Watch (2022) reviewed 164 EdTech products deployed across 49 countries, finding that 89% of them had monitored or had the capacity to monitor students and harvest their personal data without consent, as well as tracking students across the internet and over time" (Lazarus et al., 2022, 7). International regulations such as the started initiatives by the European Commission and Council of Europe are urgently required to establish legal conditions and rules next to demanded international ethical guidelines.

In summary, we can conclude that AI&ED should contribute to the global ethical values guaranteeing, facilitating, and supporting human rights, democracy, and the rule of law (Holmes et al., 2022a, 2023). *We need more debates related to ethical questions worldwide to increase awareness and consensus about our preferred AI&ED future.*

7.5 The Ethical Imperatives for AI and Education (AI&ED)

The analysis and discussion of the global values and ethical questions related to AI&ED is leading us to three ethical imperatives for AI&ED as core recommendations:

1. Technology-independent
2. Impact-oriented
3. Society-focused.

These three ethical imperatives have to be considered in the discussions about AIED as well as on EDAI as they are relevant and important for both perspectives of AI&ED.

The first ethical imperative demands technology-independent AI&ED which means that there has to be a clear definition and decision of the intended learning objectives before starting AIED and/or EDAI. The question of whether and how AI should be implemented and used in education (AIED) or whether and how education about AI (EDAI) should be designed and provided can only be answered based on technology-independent goals (the learning objectives) that the planned education (AIED or EDAI) should achieve (Stracke et al., 2024a). *Technology should not be used in education only because it is possible but always connected to specific learning objectives that it should facilitate and foster* (Stracke, 2018).

The second ethical imperative asks for impact-oriented AI&ED so that the effects of using and teaching AI are considered from the beginning. In particular, learners should get the opportunity and become aware of the potential short- and long-term impacts of AI within AIED and through EDAI. That includes the future chances and risks of using AI in general and opportunities for building and improving digital competencies and AI literacy for all citizens and in particular for school pupils (Bozkurt et al., 2023).

The third ethical imperative requires society-focused AI&ED to gain benefits for all through global AI implementations and uses. Therefore, teachers, designers, policymakers, and public authorities responsible for AI&ED have to take into consideration social and societal implications and effects to avoid AI abuse for individual profits. Everybody should understand that AI use is always initiated and accounted for by human beings and can and should be regulated by human decisions for the best intentions and effects related to our society (Holmes et al., 2022a, 2023; Stracke et al., 2024b).

These three ethical imperatives for AI&ED are simple but important conditions and aspects for successful and trustworthy use and reflection of AI in education, both as a means (AIED) as well as a topic (EDAI).

7.6 Conclusions

AI is causing many ethical questions. That is true in particular for the special sector education that requires specific ethical considerations and cautions due to its status as a global human right as well as mandatory participation for young children not of legal age. Thus, ethical AIED has to fulfill more obligations and careful reflection is needed before an appropriate and safe implementation meets learners' needs. The demand for ethical AIED guidelines and principles especially in school education covers the avoidance of further digital divide and inclusiveness for all young pupils. Our analysis and discussion of the current AIED and related research led to the development of three ethical imperatives for AIED: AIED should be technology-independent, impact-oriented, and society-focused to guarantee positive impacts and benefits.

In this way, AIED can serve a sustainable society as a broad and ambitious objective for future AI developments and applications (Chen et al., 2020; Chounta et al.,

2022; European Parliament, 2021; Miao et al., 2021). To achieve such a sustainable society, it is not only necessary to facilitate education through AI, i.e., AIED, but also to foster and improve education on AI, i.e., EDAI (Holmes & Tuomi, 2022; Holmes et al., 2022a). We need educated students and citizens with digital competencies including AI literacy to understand, support, and realize the future of our sustainable society (Holmes et al, 2022b; Stracke et al., 2022a, 2022b). Therefore, we require both perspectives (AI&ED as the combination of AIED and EDAI) in future implementations and research to foster ethical AI&ED and the fulfillment of the three ethical AIED imperatives.

References

Aiken, R. M., & Epstein, R. G. (2000). Ethical guidelines for AI in education: Starting a conversation. *International Journal of Artificial Intelligence in Education, 11*, 163–176.

Akgun, S., & Greenhow, C. (2021). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics, 2*, 431–440. https://doi.org/10.1007/s43681-021-00096-7

Baker, R. S. (2016). Stupid tutoring systems, intelligent humans. *International Journal of Artificial Intelligence in Education, 26*, 600–614. https://doi.org/10.1007/s40593-016-0105-0

Benotti, L., Martínez, M. C., & Schapachnik, F. (2018). A tool for introducing computer science with automatic formative assessment. *IEEE Transactions on Learning Technologies, 11*(2), 179–192. https://doi.org/10.1109/TLT.2017.2682084

Borenstein, J., & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. *AI and Ethics, 1*(1), 61–65. https://doi.org/10.1007/s43681-020-00002-7

Bozkurt, A., Xiao, J., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., ... Jandrić, P. (2023). Speculative futures on ChatGPT and generative Artificial Intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education, 18*(1), 53–130. https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/709/394

Cannataci, J. A. (2021). *Artificial intelligence and privacy, and children's privacy*. Report of the UN Special Rapporteur on the right to privacy (A/HRC/46/37). https://documents-dds-ny.un.org/doc/UNDOC/GEN/G21/015/65/PDF/G2101565.pdf

Chaka, C. (2022). Fourth industrial revolution—A review of applications, prospects, and challenges for artificial intelligence, robotics and blockchain in higher education. *Research and Practice in Technology Enhanced Learning, 18*. Retrieved January 13, 2023, from https://rptel.apsce.net/index.php/RPTEL/article/view/2023-18002

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access, 8*, 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Chounta, I.-A., Bardone, E., Raudsep, A., & Pedaste, M. (2022). Exploring teachers' perceptions of Artificial Intelligence as a tool to support their practice in Estonian K-12 education. *International Journal of Artificial Intelligence in Education, 32*(3), 725–755. https://doi.org/10.1007/s40593-021-00243-5

Corbett, A. T., Koedinger, K. R., & Anderson, J. R. (1997). Intelligent tutoring systems. In *Handbook of human-computer interaction* (pp. 849–874).

Council of Europe. (2023). *Regulating Artificial Intelligence in education.* https://rm.coe.int/regulating-artificial-intelligence-in-education-26th-session-council-o/1680ac9b7c

Crompton, H., Bernacki, M. L., & Greene, J. (2020). Psychological foundations of emerging technologies for teaching and learning in higher education. *Current Opinion in Psychology, 36*, 101–105. https://doi.org/10.1016/j.copsyc.2020.04.011

Crompton, H., Jones, M. V., & Burke, D. (2022). Affordances and challenges of artificial intelligence in K-12 education: A systematic review. *Journal of Research on Technology in Education*. https://doi.org/10.1080/15391523.2022.2121344

Dermeval, D., Paiva, R., Bittencourt, I., Vassileva, J., & Borges, D. (2018). Authoring tools for designing intelligent tutoring systems: A systematic review of the literature. *International Journal of Artificial Intelligence in Education, 28*, 336–384. https://doi.org/10.1007/s40593-017-0157-9

Dillenbourg, P. (2016). The evolution of research on digital education. *International Journal of Artificial Intelligence in Education, 26*, 544–560. https://doi.org/10.1007/s40593-016-0106-z

du Boulay, B. (2016). Recent Meta-reviews and Meta–analyses of AIED Systems. *International Journal of Artificial Intelligence in Education, 26*, 536–537. https://doi.org/10.1007/s40593-015-0060-1

European Commission. (2022). *Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators*. Retrieved Janury 13, 2023, from https://data.europa.eu/doi/10.2766/153756

European Parliament. (2021). Report on artificial intelligence in education, culture and the audiovisual sector (2020/2017(INI)). Committee on Culture and Education. https://www.europarl.europa.eu/doceo/document/A-9-2021-0127_EN.html

Gabriel, M. (2020). *The meaning of thought*. Polity.

Gewirth, A. (1960). Meta-ethics and normative ethics. *Mind, 69*(274), 187–205. https://doi.org/10.1093/mind/LXIX.274.187

G20. (2023). *G20 New Delhi Leaders' Declaration*. New Delhi, India (9–10 September 2023). https://www.g20.org/content/dam/gtwenty/gtwenty_new/document/G20-New-Delhi-Leaders-Declaration.pdf

Hagendorff, T. (2020). The ethics of AI ethics: An evaluation of guidelines. *Minds and Machines, 30*(1), 99–120. https://doi.org/10.1007/s11023-020-09517-8

High-Level Expert Group (HLEG) on AI. (2019). *Ethics Guidelines for Trustworthy A*I. Retrieved January 13, 2023, from https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

Holmes, W., Persson, J., Chounta, I.-A., Wasson, B., & Dimitrova, V. (2022a). *Artificial Intelligence and education. A critical view through the lens of human rights, democracy and the rule of law*. Retrieved January 13, 2023, from https://rm.coe.int/artificial-intelligence-and-education-a-critical-view-through-the-lens/1680a886bd

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Buckingham Shum, S., … Koedinger, K. R. (2022b). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 32*(3), 504–526. https://doi.org/10.1007/s40593-021-00239-1

Holmes, W., Stracke, C. M., Chounta, I.-A., Allen, D., Baten, D., Dimitrova, V., ... Wasson, B. (2023). AI and education. A view through the lens of human rights, democracy and the rule of law. Legal and organizational requirements. In *Artificial intelligence in education. Communications in computer and information science* (Vol. 1831, pp. 79–84). https://doi.org/10.1007/978-3-031-36336-8_12

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education, 57*, 542–570. https://doi.org/10.1111/ejed.12533

Hrastinski, S., Olofsson, A. D., Arkenback, C., Ekström, S., Ericsson, E., Fransson, G., Jaldemark, J., Ryberg, T., Öberg, L.-M., Fuentes, A., Gustafsson, U., Humble, N., Mozelius, P., Sundgren, M., & Utterberg, M. (2019). Critical imaginaries and reflections on artificial intelligence and robots in post digital K-12 education. *Postdigital Science and Education, 1*(2), 427–445. https://doi.org/10.1007/s42438-019-00046-x

Huang, R., Tlili, A., Xu, L., Chen, Y., Zheng, L., Saleh Metwally, A. H., Da, T., Chang, T., Wang, H., Mason, J., Stracke, C. M., Sampson, D., & Bonk, C. J. (2023). Educational futures of intelligent synergies between humans, digital twins, avatars, and robots—the iSTAR framework. *Journal of Applied Learning & Teaching, 6*(2), 1–16. https://doi.org/10.37074/jalt.2023.6.2.33

Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence, 1*(9), 389–399. https://doi.org/10.1038/s42256-019-0088-2

Kazim, E., & Koshiyama, A. S. (2021). A high-level overview of AI ethics. *Patterns, 2*(9), 100314. https://doi.org/10.1016/j.patter.2021.100314

Kent, C., & du Boulay, B. (2022). *AI for learning*. CRC Press. https://doi.org/10.1201/9781003194545

Kronqvist, A., & Rousi, R. A. (2022). A quick review of ethics, design thinking, gender, and AI development. *International Journal of Design Creativity and Innovation.* https://doi.org/10.1080/21650349.2022.2136762

Kurdi, G., Leo, J., Parsia, B., Sattler, U., & Al-Emari, S. (2020). A systematic review of automatic question generation for educational purposes. *International Journal of Artificial Intelligence in Education, 30*, 121–204. https://doi.org/10.1007/s40593-019-00186-y

Larsson, S., & Heintz, F. (2020). Transparency in artificial intelligence. *Internet Policy Review, 9*(2), 1–16. https://doi.org/10.14763/2020.2.1469

Lazarus, M. D., Truong, M., Douglas, P., & Selwyn, N. (2022). Artificial intelligence and clinical anatomical education: Promises and perils. *Anatomic Science Education*, 1–14. https://doi.org/10.1002/ase.2221

Luckin, R. (2017). Towards artificial intelligence-based assessment systems. *Nature Human Behaviour, 1*(3), 1–3. https://doi.org/10.1038/s41562-016-0028

Luckin, R., George, K., & Cukurova, M. (2022). *AI for school teachers*. CRC Press. https://doi.org/10.1201/9781003193173

Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). *AI and education: Guidance for policy-makers*. United Nations Educational, Scientific and Cultural Organization. Retrieved January 13, 2023, from https://unesdoc.unesco.org/ark:/48223/pf0000376709

Nguyen, A., Ngo, H. N., Hong, Y., Dang, B, & Nguyen, B.-P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies, 28*, 4221–4241. https://doi.org/10.1007/s10639-022-11316-w

Pinkwart, N. (2016). Another 25 years of AIED? Challenges and opportunities for intelligent educational technologies of the future. *International Journal of Artificial Intelligence in Education, 26*, 771–783. https://doi.org/10.1007/s40593-016-0099-7

Sanusi, I. T., Oyelere, S. S., Vartiainen, H., Suhonen, J., & Tukiainen, M. (2022). A systematic review of teaching and learning machine learning in K-12 education. *Education and Information Technologies.* https://doi.org/10.1007/s10639-022-11416-7

Sottilare, R. A., Burke, S., Salas, E., Sinatra, A. M., Johnston, J. H., & Gilbert, S. B. (2018). Designing adaptive instruction for teams: A meta-analysis. *International Journal of Artificial Intelligence in Education, 28*, 225–264. https://doi.org/10.1007/s40593-017-0146-z

Stracke, C. M. (2018). Como a Educação Aberta pode melhorar a qualidade de aprendizagem e produzir impacto em alunos, organizações e na sociedade? [= How can Open Education improve learning quality and achieve impact for learners, organizations and in society?] In *Utopias and Distopias da Tecnologia na Educação a Distância e Aberta* (pp. 499–545). https://doi.org/10.5281/zenodo.3956396

Stracke, C. M. (2019). Quality frameworks and learning design for open education. *The International Review of Research in Open and Distributed Learning, 20*(2), 180–203. https://doi.org/10.19173/irrodl.v20i2.4213

Stracke, C. M., Burgos, D., Santos-Hermosa, G., Bozkurt, A., Sharma, R. C., Swiatek, C., Inamorato dos Santos, A., Mason, J., Ossiannilsson, E., Shon, J. G., Wan, M., Agbu, J.-F., Farrow, R., Karakaya, Ö., Nerantzi, C., Ramírez Montoya, M. S., Conole, G., Cox, G., & Truong, V. (2022a). Responding to the initial challenge of COVID-19 pandemic: Analysis of international responses and impact in school and higher education. *Sustainability, 14*(3), 1876. https://doi.org/10.3390/su14031876

Stracke, C. M., Sharma, R. C., Bozkurt, A., Burgos, D., Swiatek, C., Inamorato dos Santos, A., Mason, J., Ossiannilsson, E., Santos-Hermosa, G., Shon, J. G., Wan, M., Agbu, J.-F., Farrow, R., Karakaya, Ö., Nerantzi, C., Ramírez Montoya, M. S., Conole, G., Cox, G., & Truong, V.

(2022b). Impact of COVID-19 on formal education: An international review on practices and potentials of Open Education at a distance. *The International Review of Research in Open and Distributed Learning, 23*(4), 1–18. https://doi.org/10.19173/irrodl.v23i4.6120

Stracke, C. M., Chounta, I.-A., Holmes, W., Tlili, A., & Bozkurt, A. (2023). A standardised PRISMA-based protocol for systematic reviews of the scientific literature on Artificial Intelligence and education (AI&ED). *Journal of Applied Learning and Teaching, 6*(2), 64–70. https://doi.org/10.37074/jalt.2023.6.2.38

Stracke, C. M., Bohr, B., Gabriel, S., Galla, N., Hofmann, M., Karolyi, H., Mersmann-Hoffmann, H., Mönig, J. M., Mundorf, M., Opel, S., Rischke-Neß, J., Schröppel, M., Silvestri, A., & Stroot, G. (2024a). Ethical use of artificial intelligence (AI) in higher education—A handout. Edited by the German Network "Ethische Nutzung von KI" (Ethical Use of AI). https://doi.org/10.5281/zenodo.10995669

Stracke, C. M., Chounta, I.-A., Dimitrova, V., Havinga, B., & Holmes, W. (2024b). Ethical AI and education: The need for international regulation to foster human rights, democracy and the rule of law. In *Artificial intelligence in education. Communications in computer and information science* (Vol. 2151, pp. 439–445). Springer. https://doi.org/10.1007/978-3-031-64312-5_55

Stracke, C. M., Chounta, I.-A., & Holmes, W. (2024c). Global trends in scientific debates on trustworthy and ethical. In *Artificial intelligence and education. Communications in computer and information science* (Vol. 2150, pp. 254–262). https://doi.org/10.1007/978-3-031-64315-6_21

United Nations. (1948). *Universal declaration of human rights*. https://www.un.org/sites/un2.un.org/files/2021/03/udhr.pdf

United Nations. (1990). *Convention on the Rights of the Child*. https://www.ohchr.org/sites/default/files/crc.pdf

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. A/RES/70/1. https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2021). *Recommendation on the ethics of artificial intelligence*. Retrieved January 13, 2023, from https://unesdoc.unesco.org/ark:/48223/pf0000381137

Vincent-Lancrin, S., & van der Vlies, R. (2020). *Trustworthy artificial intelligence (AI) in education: Promises and challenges* (OECD Education Working Papers, Vol. 218). OECD Publishing, Paris. https://doi.org/10.1787/9789264311671-en

Yang, Y., Xia, L., & Zhao, Q. (2019). An automated grader for Chinese essay combining shallow and deep semantic attributes. *IEEE Access, 7*, 176306–176316. https://doi.org/10.1109/ACCESS.2019.2957582

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0