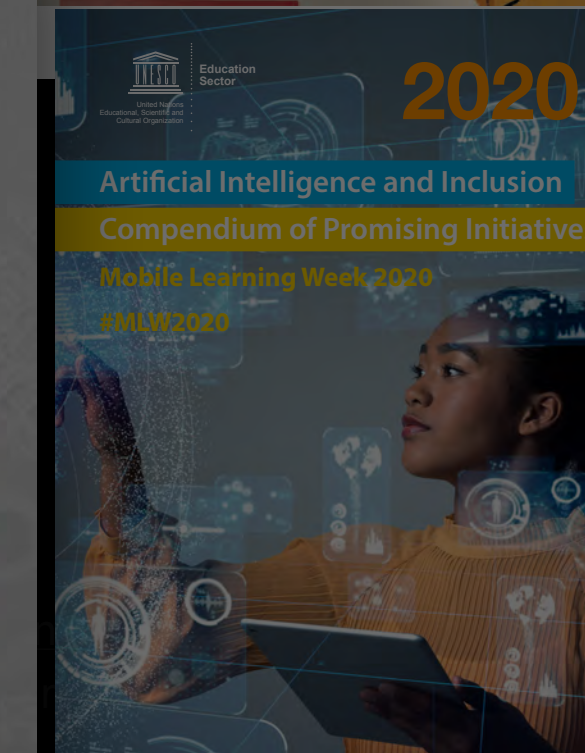
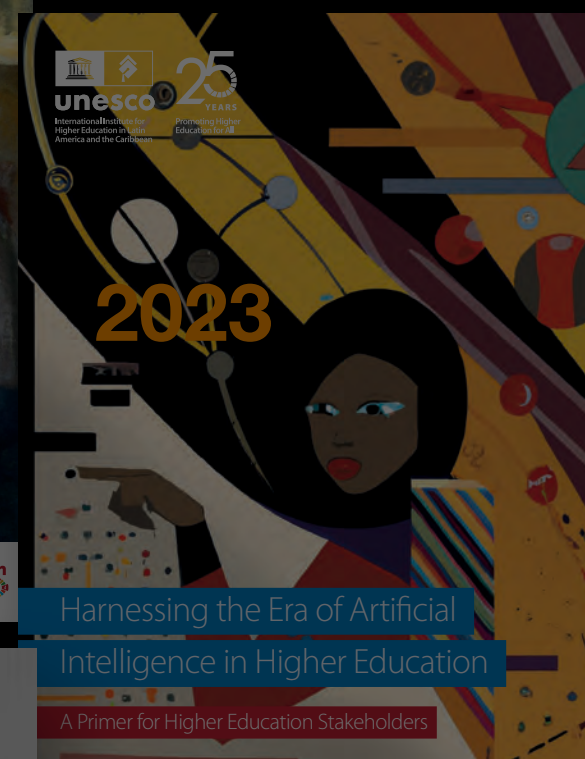
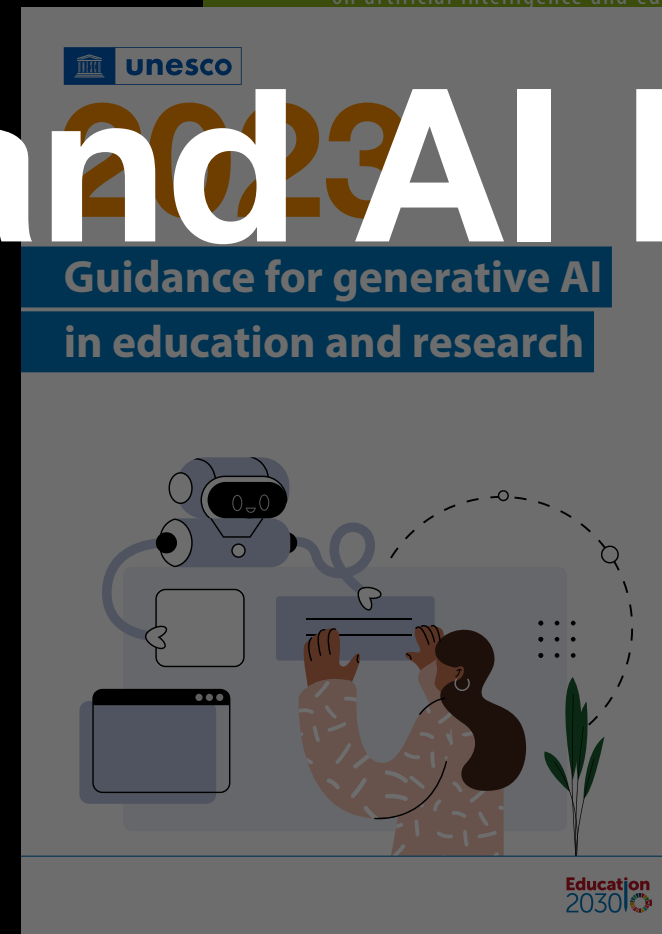
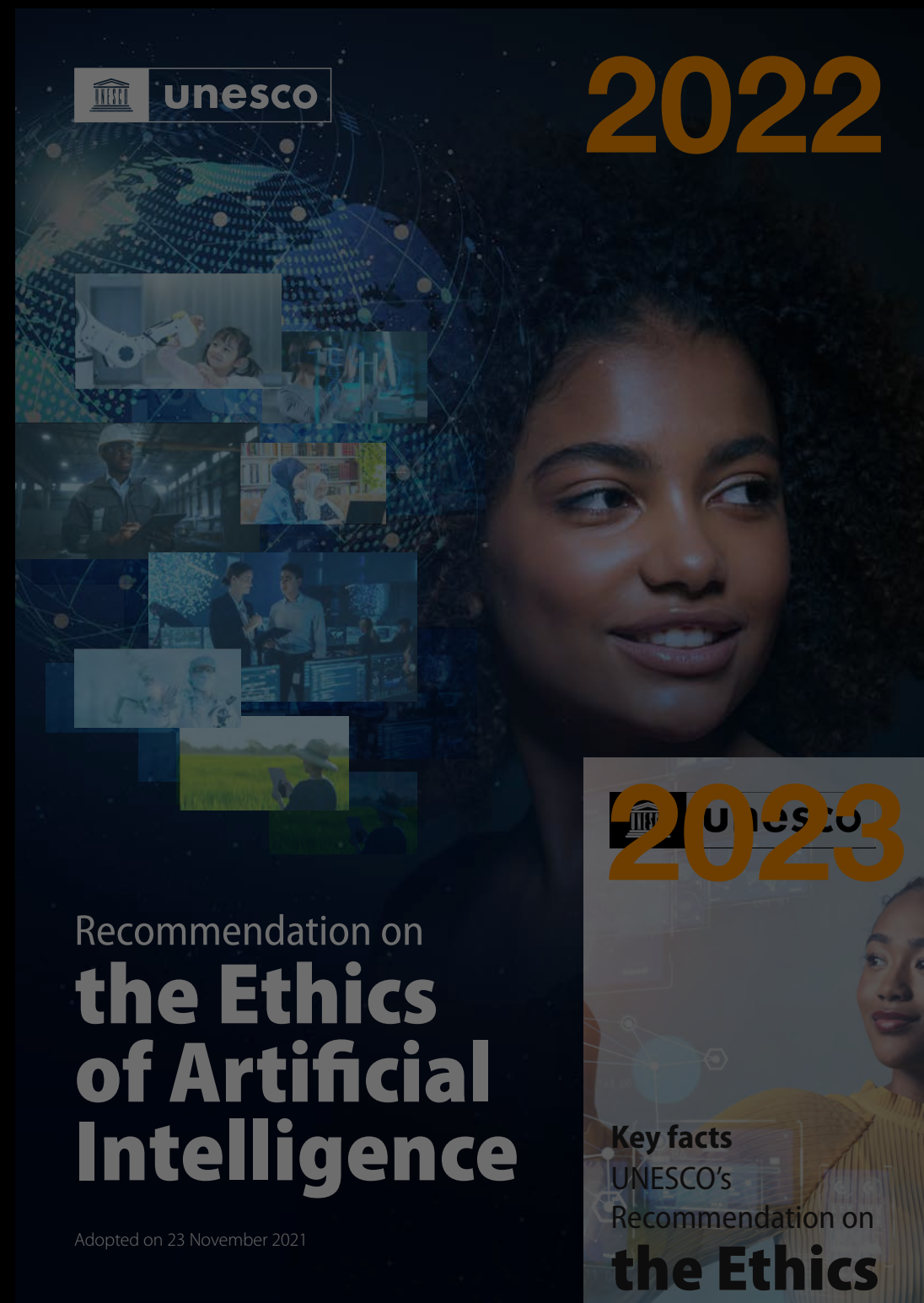
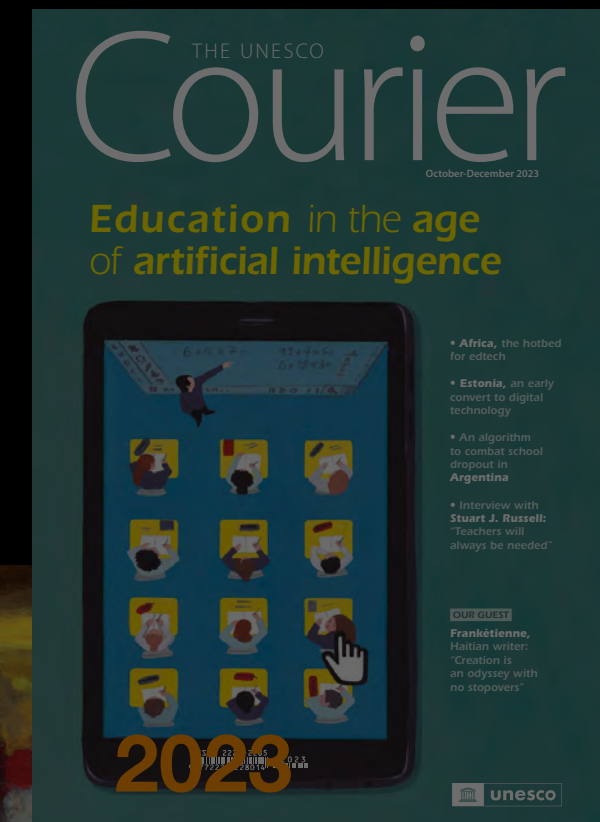
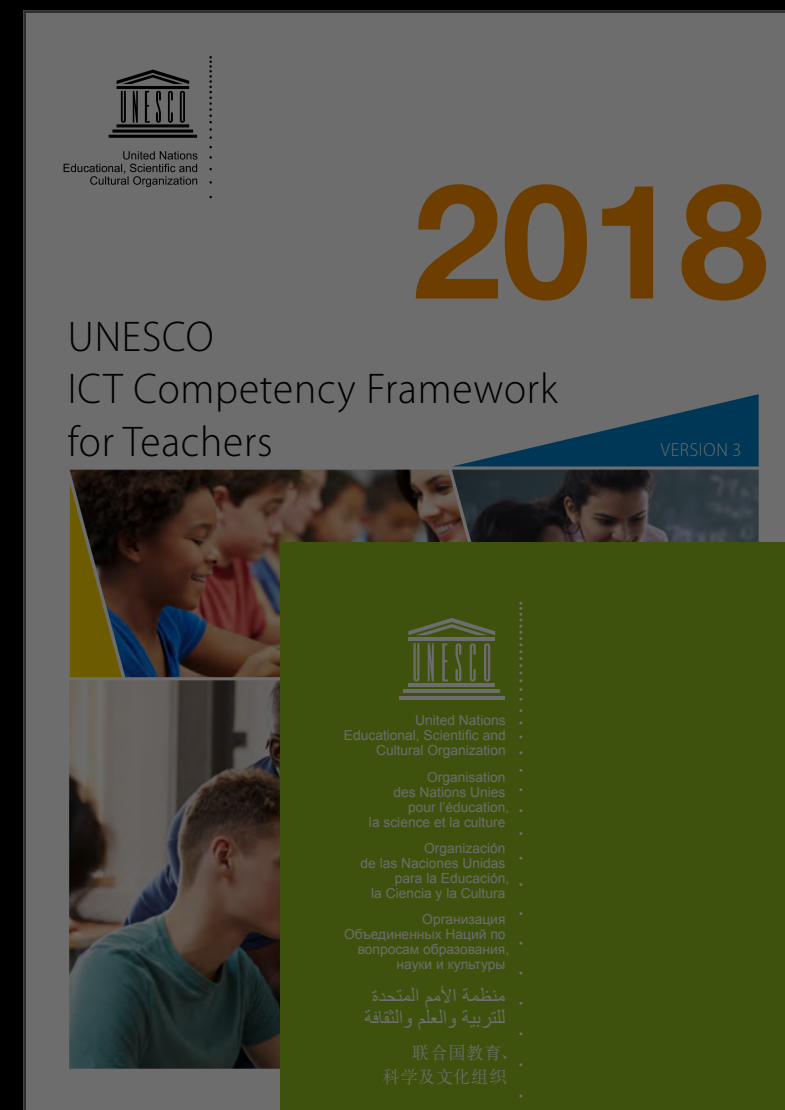


Digitalisierung und KI aus UNESCO-Perspektive: Ethische und pädagogische Zielsetzungen im Spiegel der Forschung zu „AI in Education“

DGfE-Kongress 2024, 12.3.2024



AI and AI histories



control

**inter-
action**

**gene-
ration**

pattern
recognition

control

**inter-
action**

**gene-
ration**

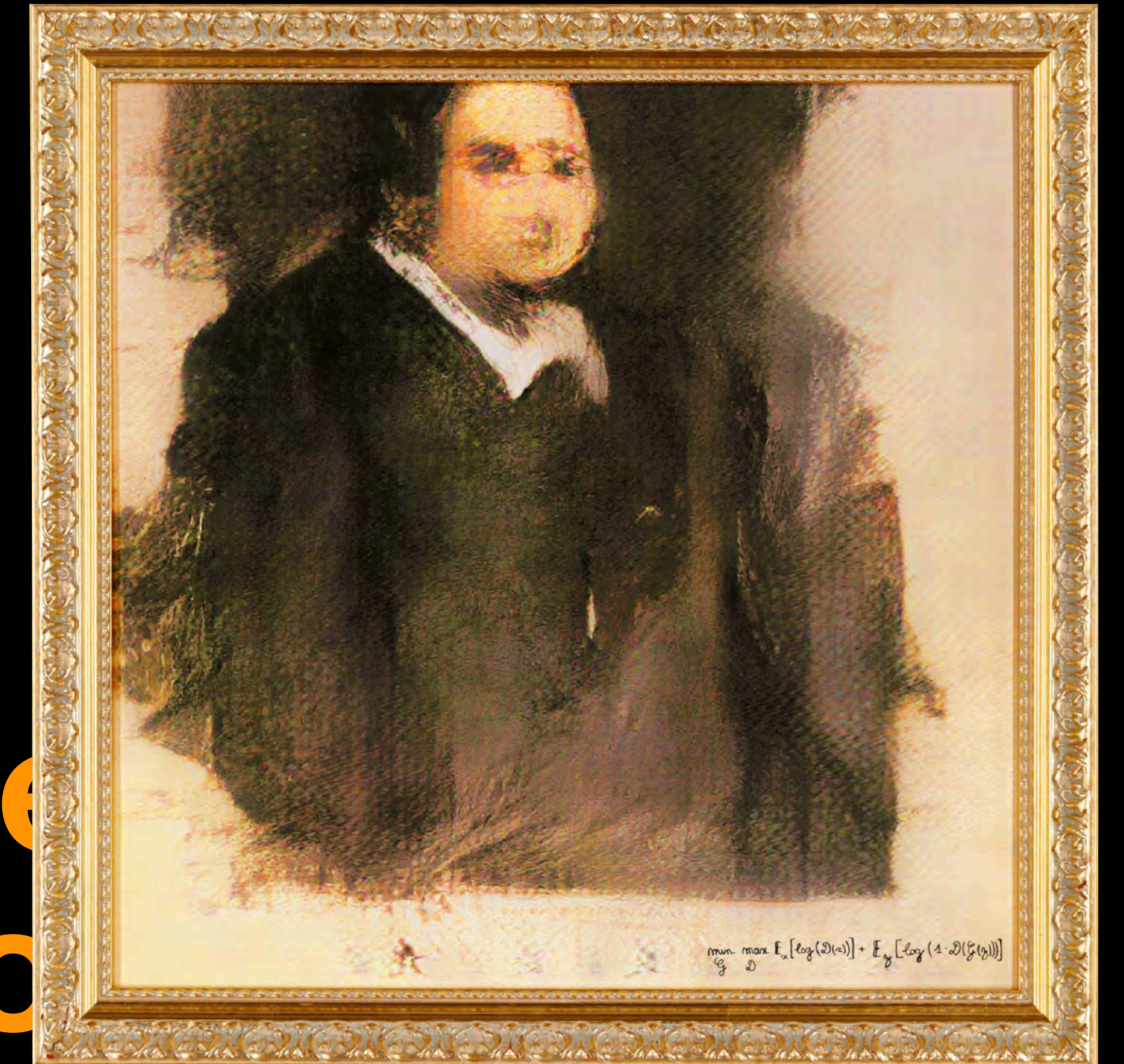
expert
system

**Generative Adversarial
Network (GAN)**



pattern
recognition

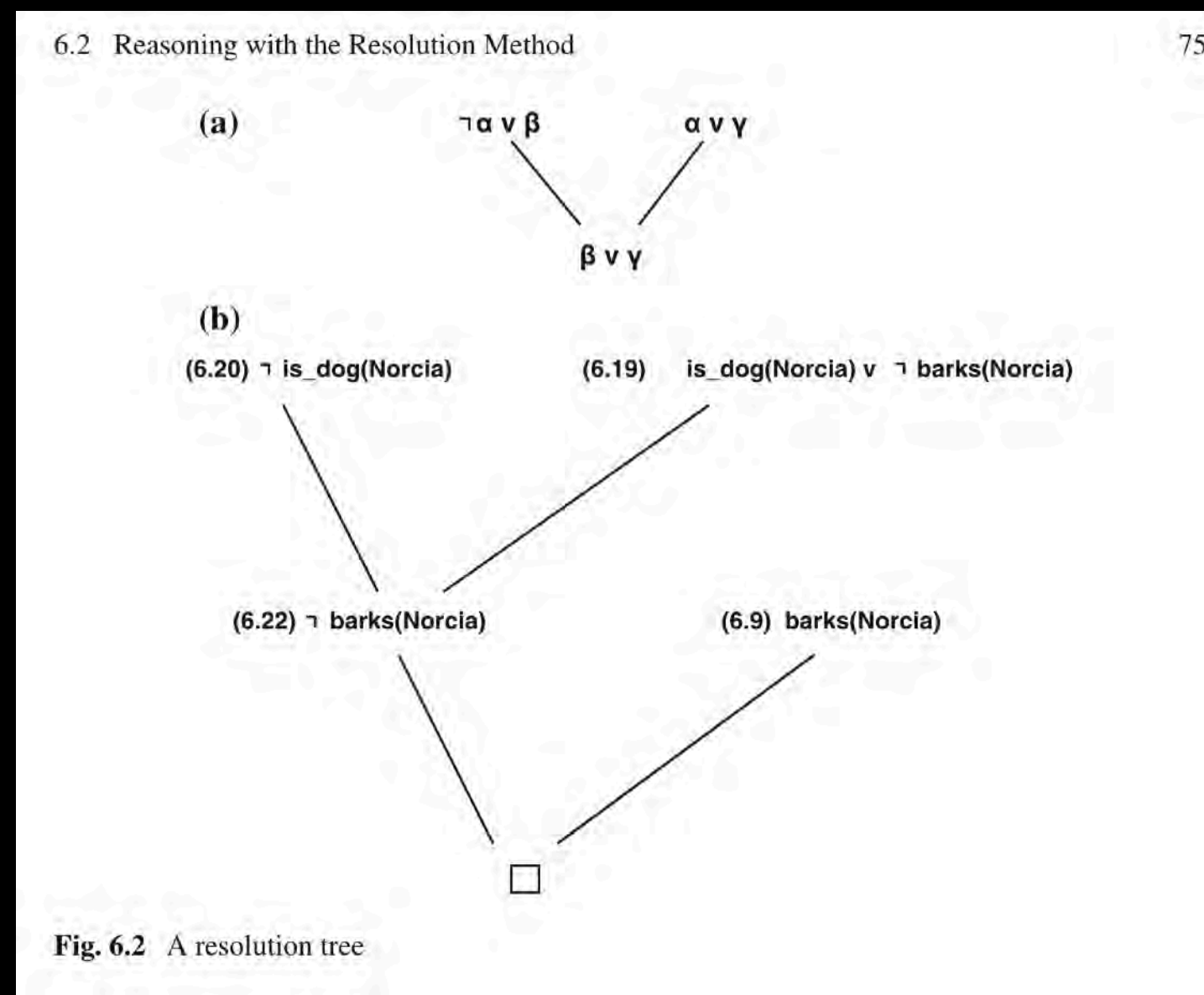
control



gene
ratio

Generative Adversarial
Network (GAN)

expert
system



pattern
recognition

autonomous
vehicle

smart home
ecosystem

control

predictive modeling

**inter-
action**

**gene-
ration**

expert
system

Chatbots

Generative Adversarial
Network (GAN)

robotik

pattern
recognition

Automated Decision
Making (ADM)

autonomous
vehicle

smart home
ecosystem

control

predictive modeling

Augmented Decision
Making

health
advisory
system

**inter-
action**

**gene-
ration**

expert
system

Chatbots

Generative Adversarial
Network (GAN)

Intelligent Virtual Agents
(IVA)

„Good Old Fashioned AI“ versus Deep Learning

- A. KRR: Wissenrepresentation und Schlussfolgern,
- B. PLAN: Planen
- C. MAS: Multi-Agent Systems
- D. RBT: Robotik
- E. PHIL: Philosophische Fragen
- F. NLP: Prozessieren natürlicher Sprachen
- G. CV: Computer vision
- H. ML: Machine Learning

12

1 From Logic to Cognitive Science

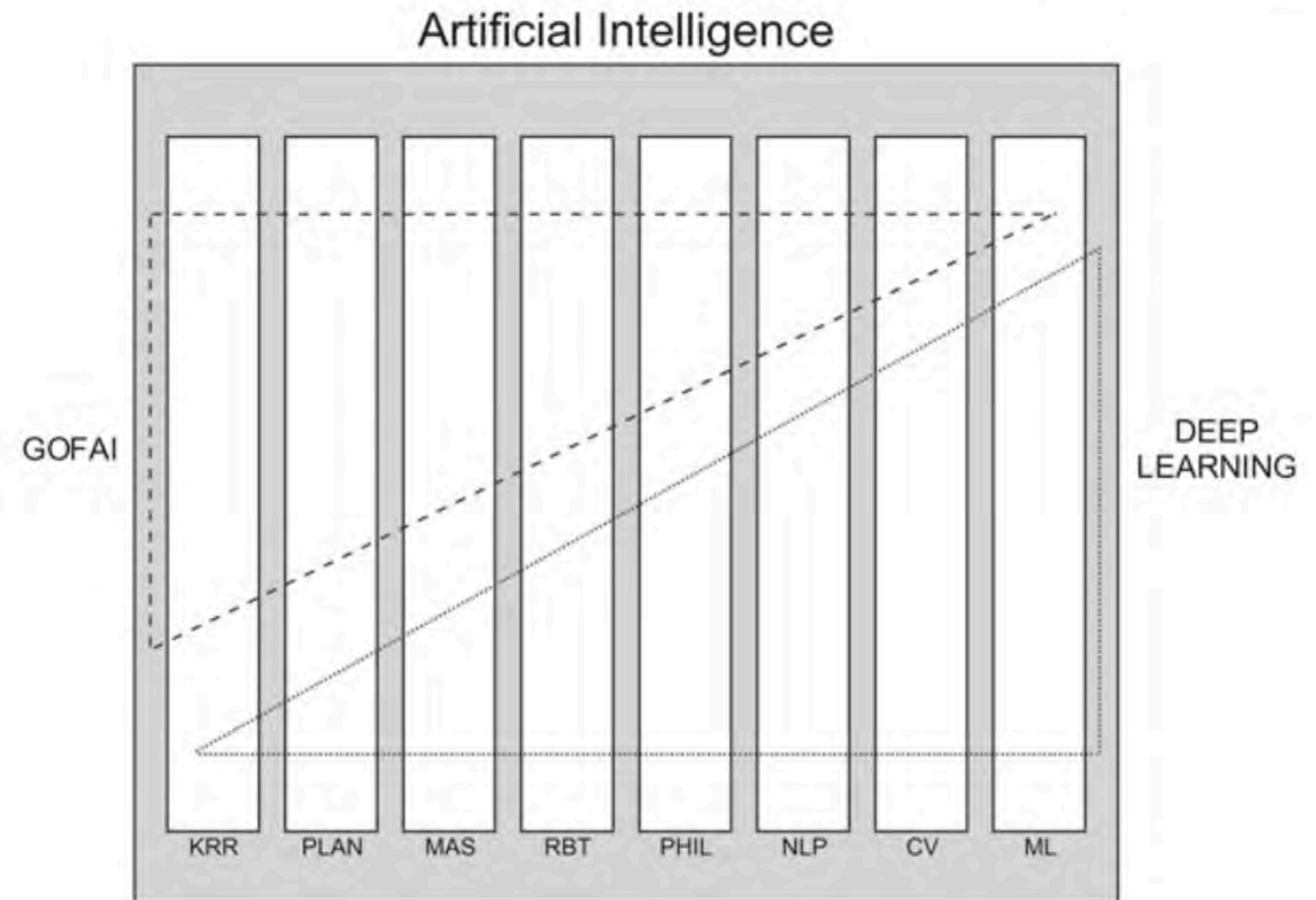


Fig. 1.1 Vertical and horizontal components of AI

1961

Steps Toward Artificial Intelligence*

MARVIN MINSKY†, MEMBER, IRE

1966

A view of artificial intelligence

by FRED M. TONGE
University of California, Irvine

INTRODUCTION

By "intelligence" we mean a property of a system ment based on observation of the system's beha agreed to by "most reasonable men" as inte "Artificial intelligence" is then that property as in non-living systems. Work directed toward p such behavior is thereby work in artificial inte

While the above is indeed a loose definition, n ful in suggestiveness than in precision, it shoul for our purposes. It does contain at least on assumption — that, *a priori*, intelligence is not r to "living" systems. And it does suggest that, if of whether artificial intelligence does or will eve ever) exist is really worthy of further argumen cern, then some agreement should be reached.

Summary—The prob computers solve really di areas: Search, Pattern Induction.

A computer can do, in

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

PHILIP G. JACKSON

1977

HISTORY OF ARTIFICIAL INTELLIGENCE

P. McCorduck (Session Chairman), Univ. of Pittsburgh! M. Minsky, MIT: O. Selfridge, Bolt Beranek and Newman? H. A. Simon, Carnegie-Mellon University

The Early History

P. McCorduck

Though our discussion is en History of Artificial Intellige fact we are focusing here on c but highly significant moment history the moment when art r

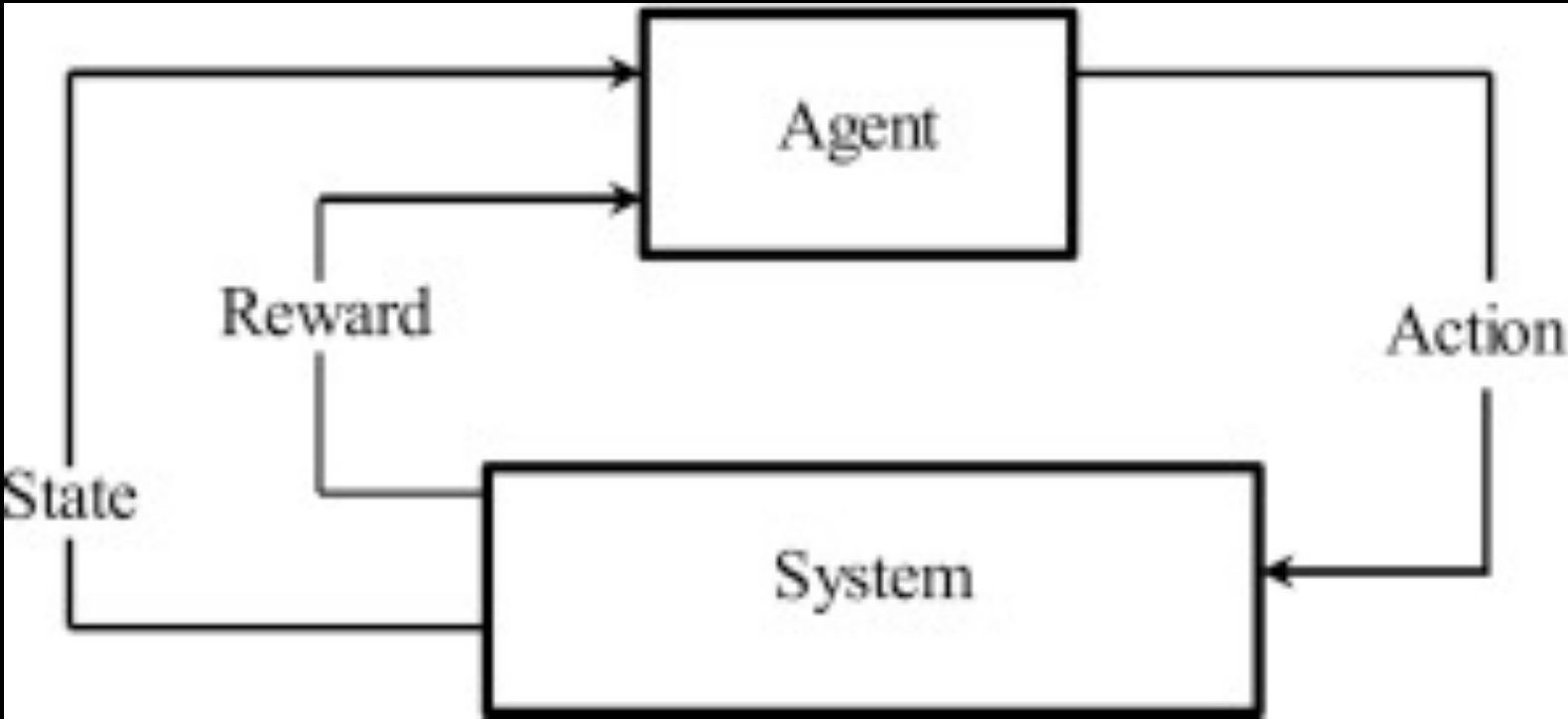
1974

2004

PAMELA McCORDUCK
MACHINES WHO THINK



Bildungsplanung mit Markovketten (1972)



Socio-Econ. Plan. Sci. Vol. 7, pp. 283–294 (1973). Pergamon Press. Printed in Great Britain

THE APPLICATION OF A MARKOV CHAIN IN EDUCATIONAL PLANNING

JAMES N. JOHNSTONE and HUGH PHILP

School of Education, Macquarie University, North Ryde, New South Wales 2113, Australia

(Received 24 September 1972)

Mathematical models can assist educators in the preparation of their educational plans and their potential in this regard is being increasingly realized. As a result, models have found application at all levels at which planning is conducted.

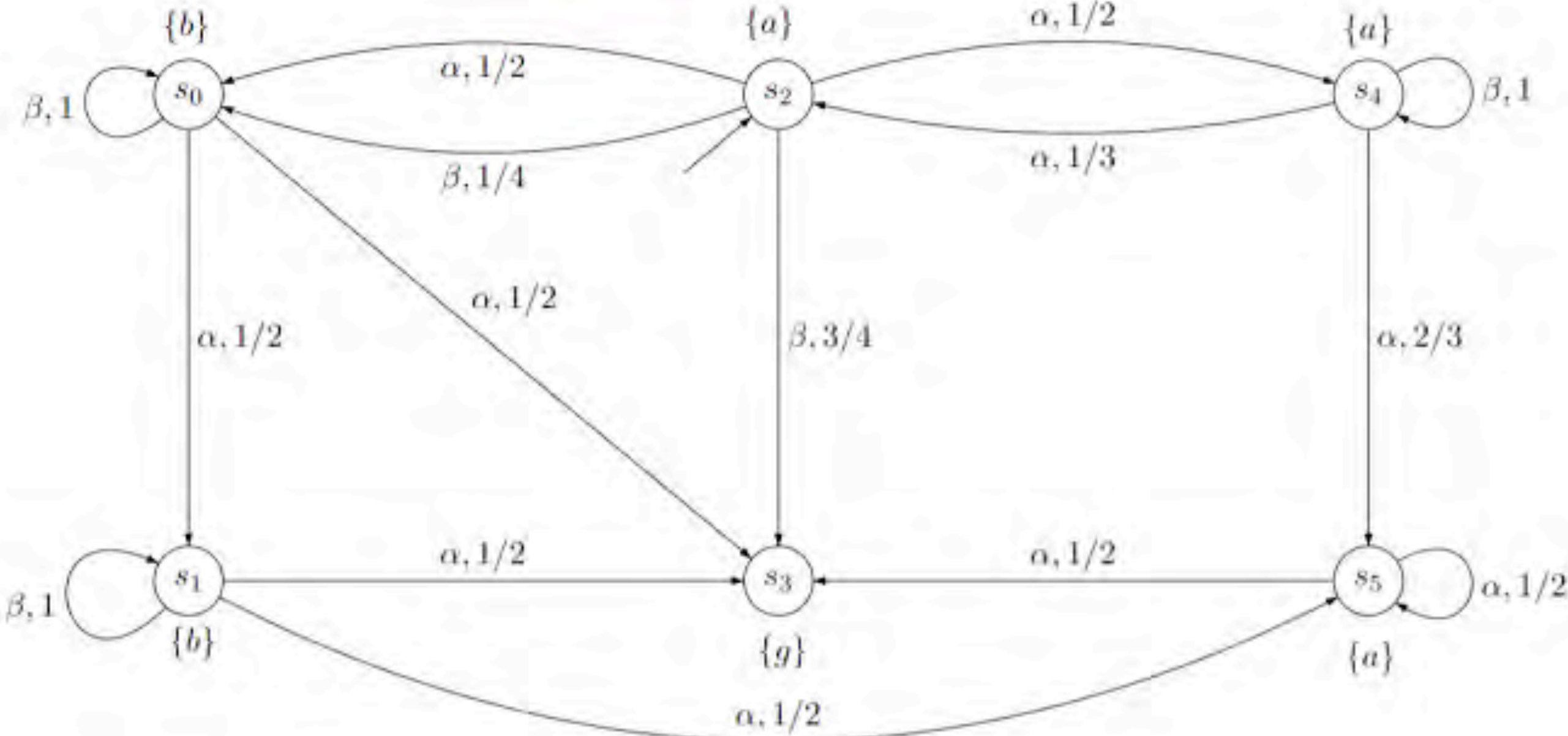
This paper examines the potential of one model—the Markov Chain—which is capable of predicting enrolments for an education system.

The model is applied to the New South Wales State Government education system between 1947 and 1961 and the projected enrolments compared to the actual enrolments in those years.

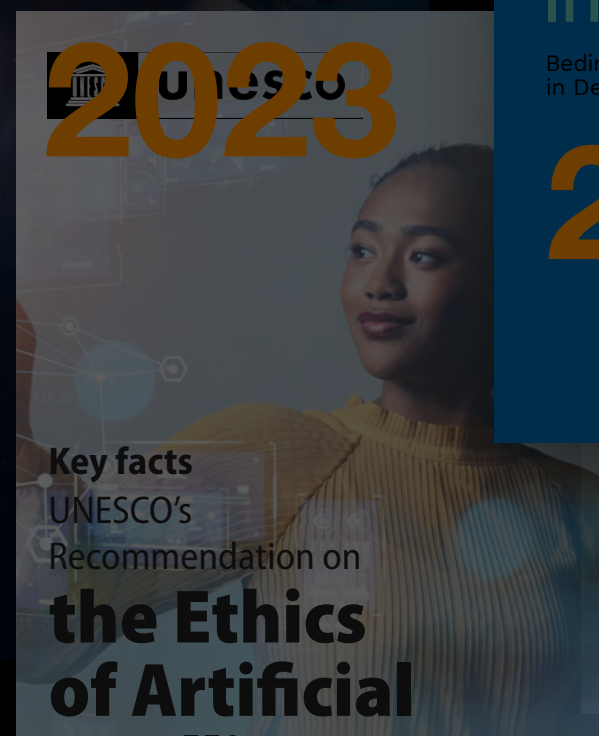
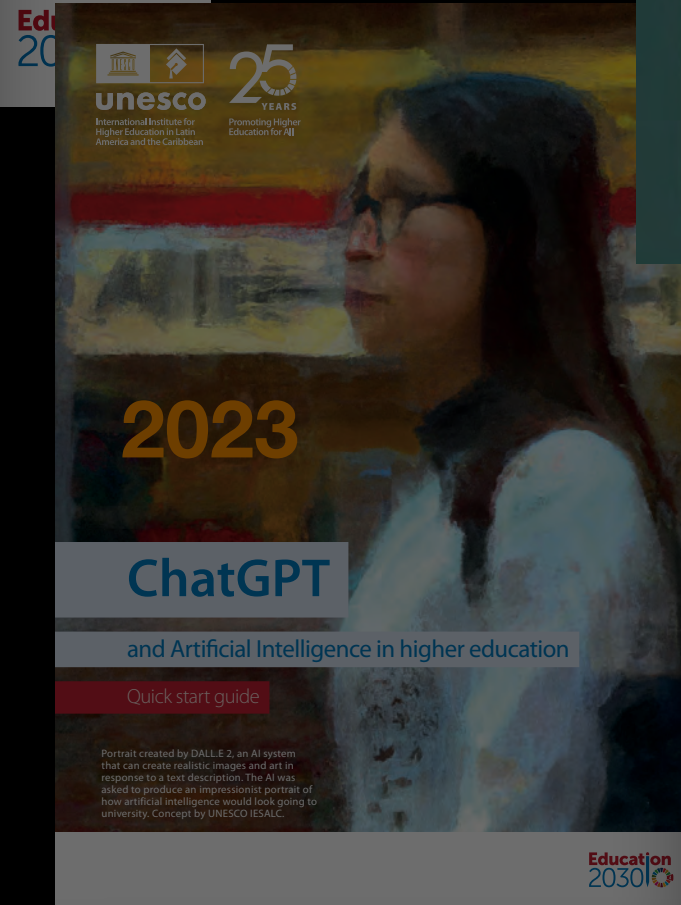
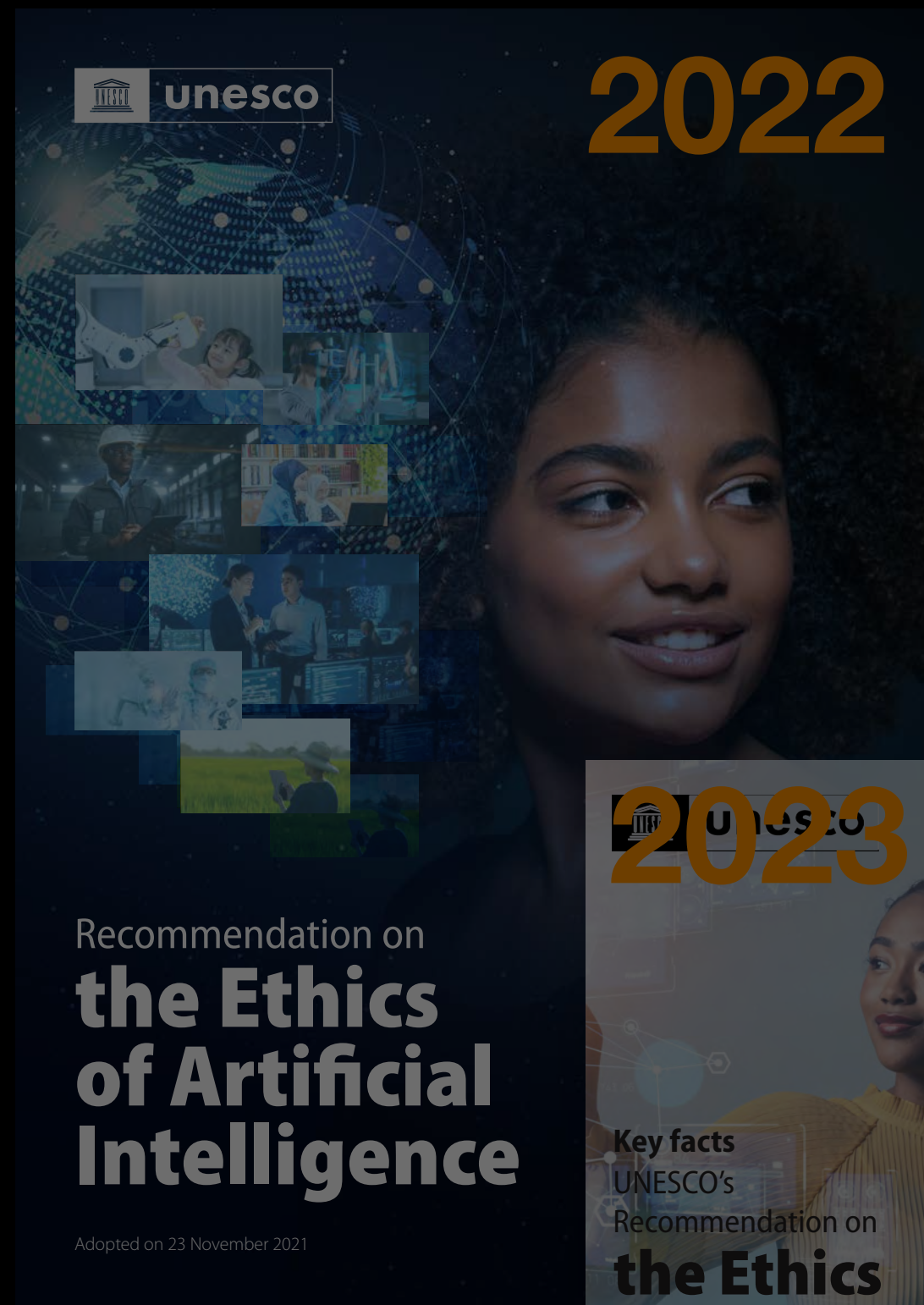
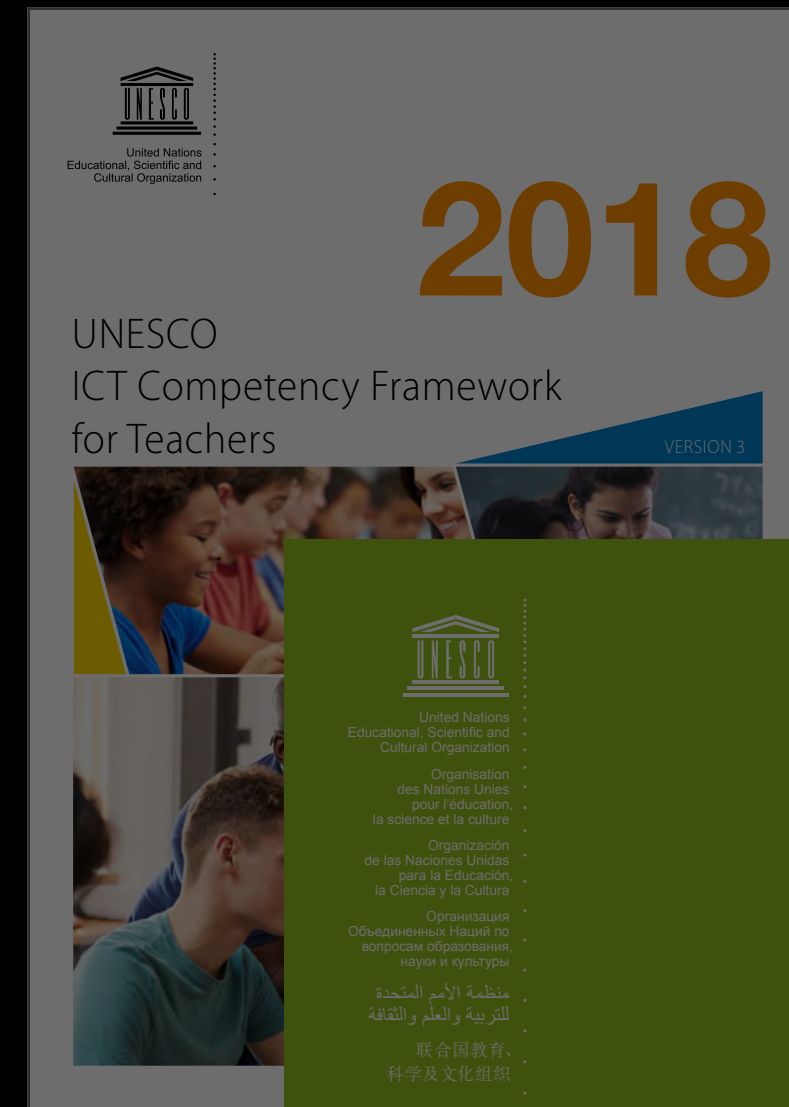
Some success is achieved but it appears as if the data rather than the model are responsible for this. The limitations of the Markov Chain approach are discussed and present research and directions listed.

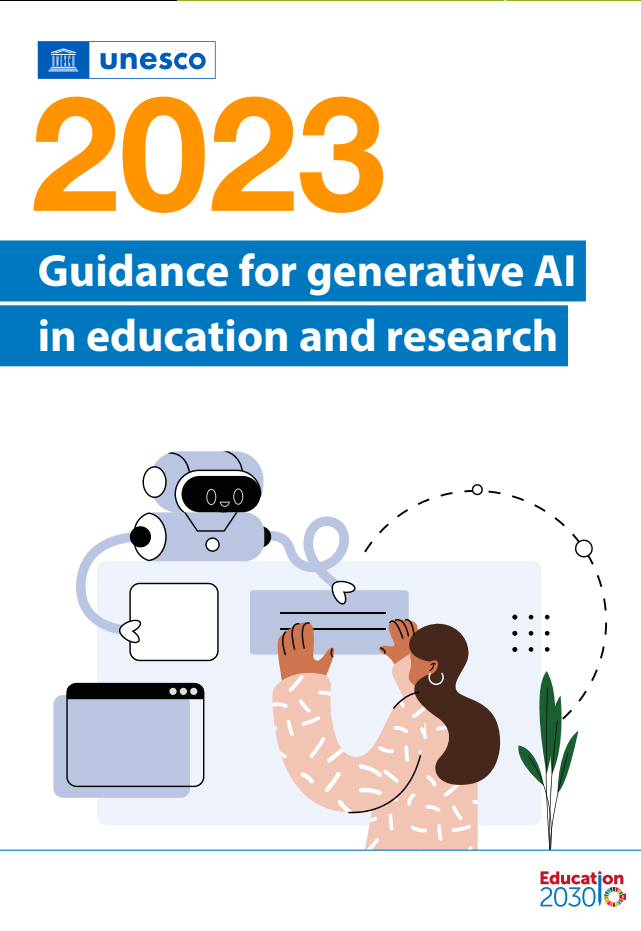
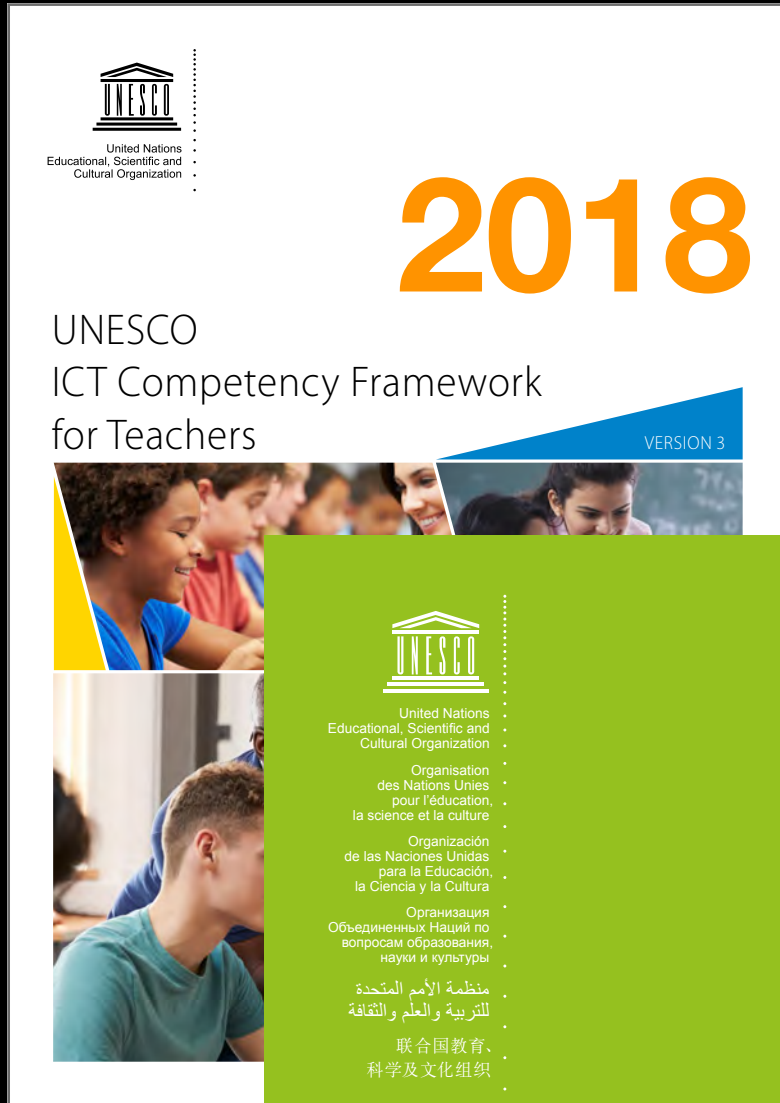
INTRODUCTION

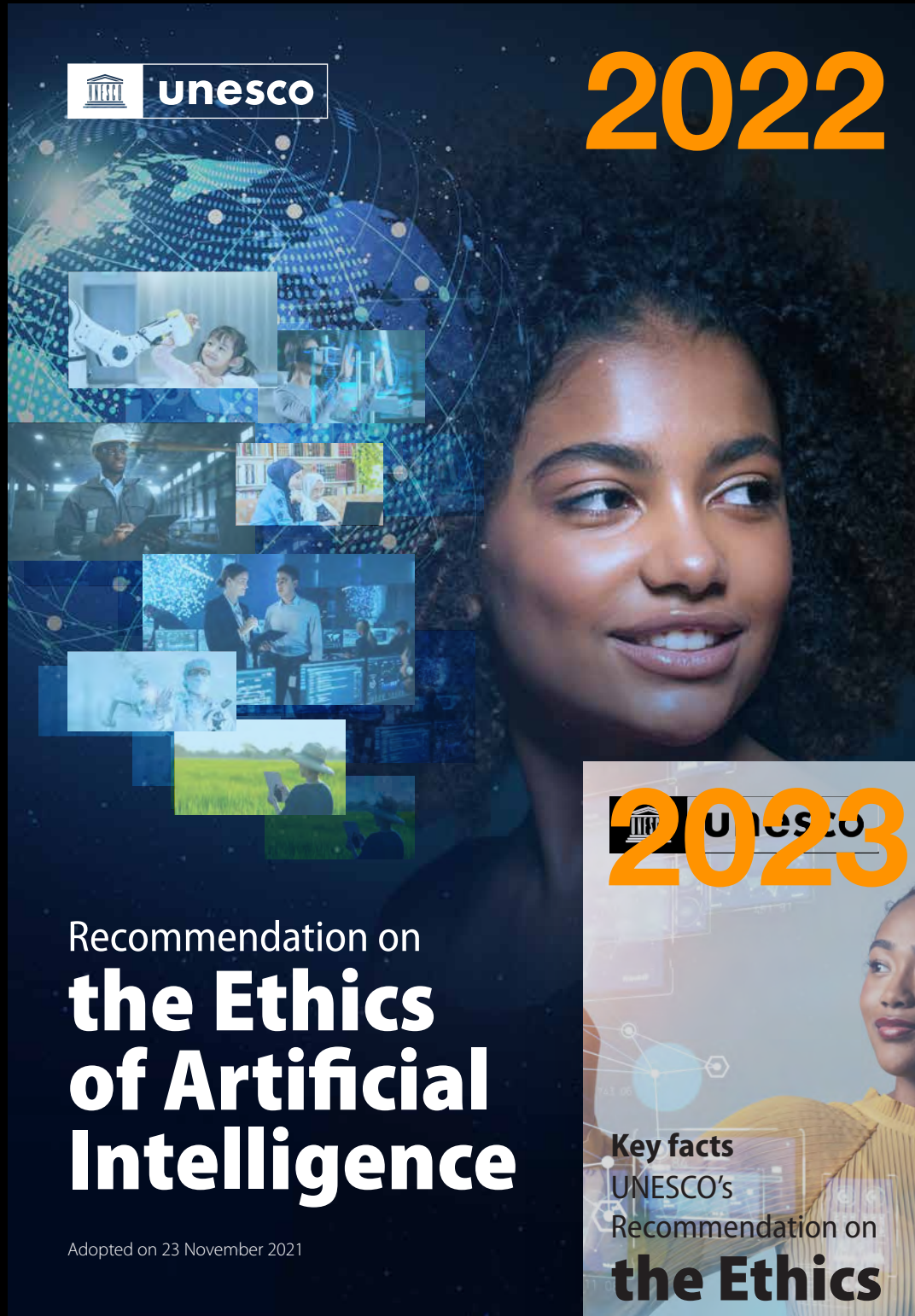
THE APPLICATION of mathematical models to educational planning is a comparatively recent



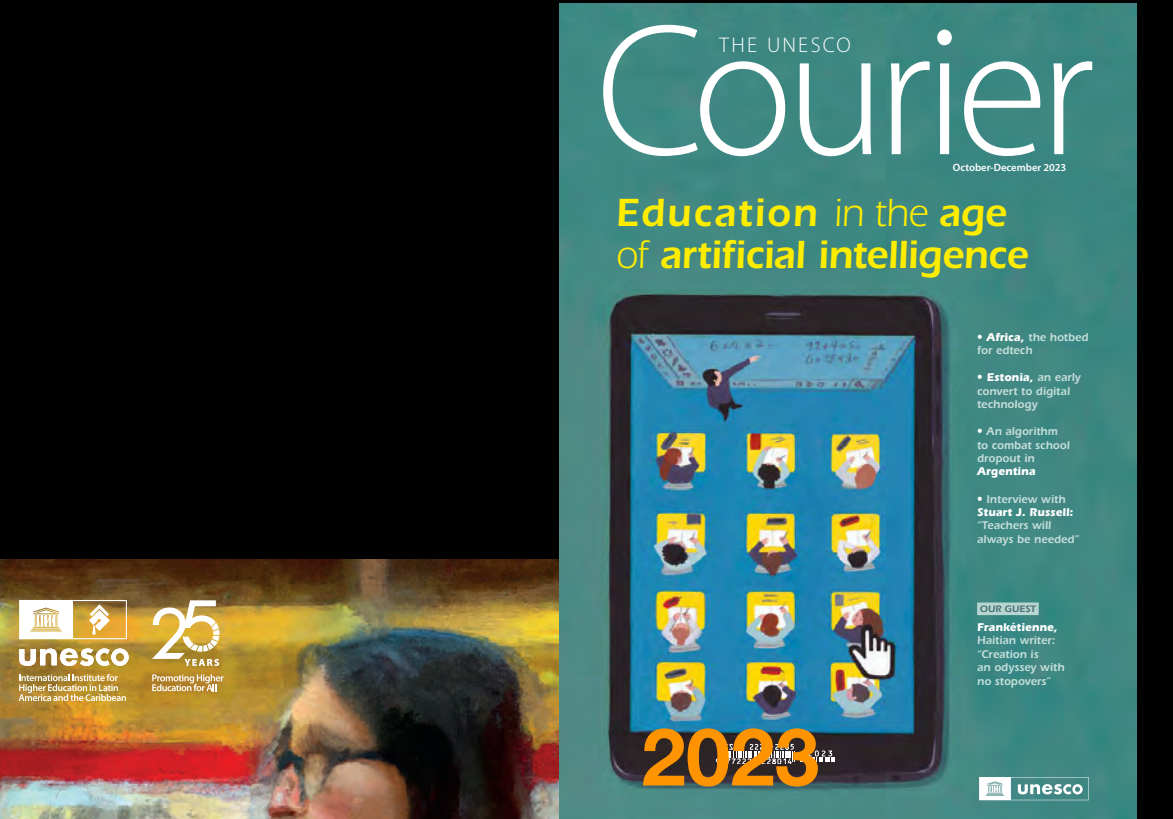
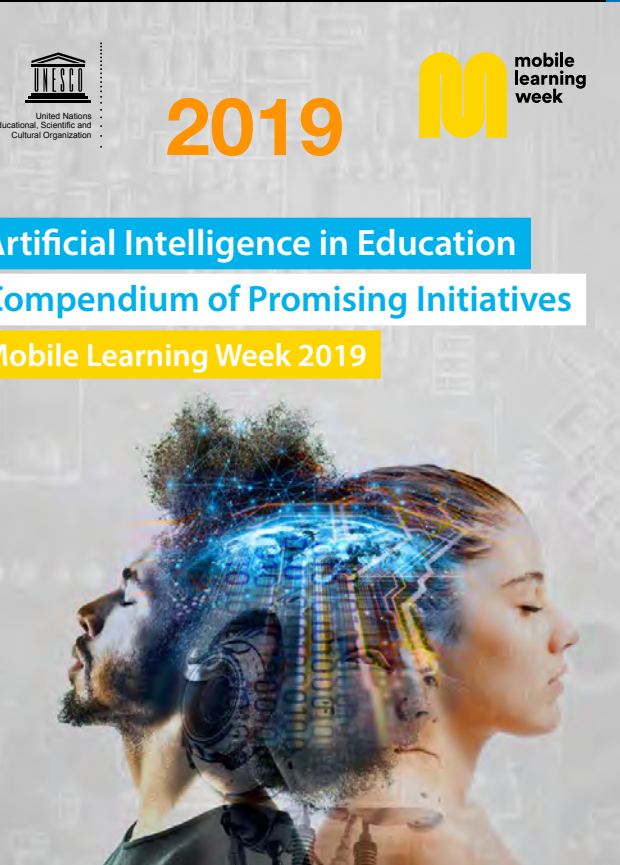
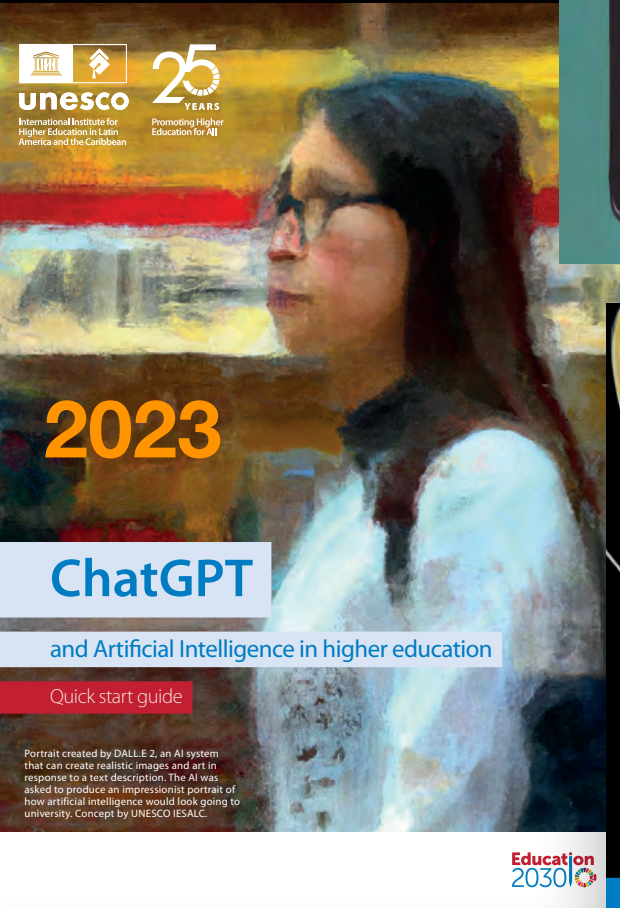
AI in Education in UNESCO discourses

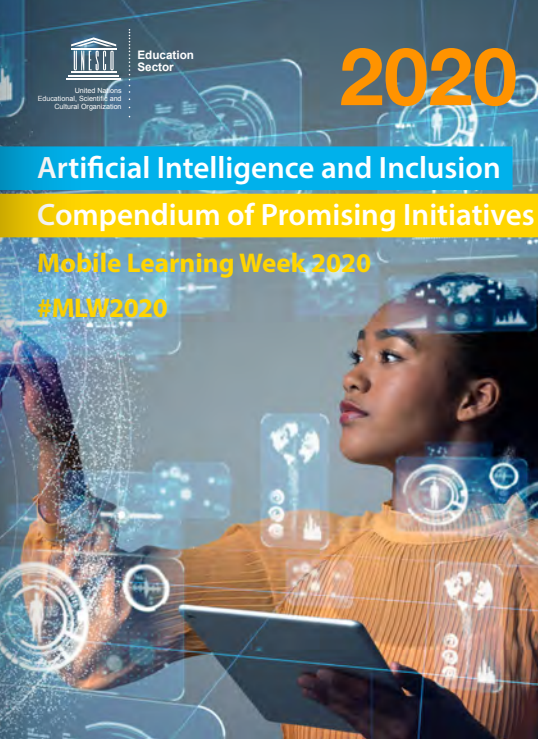
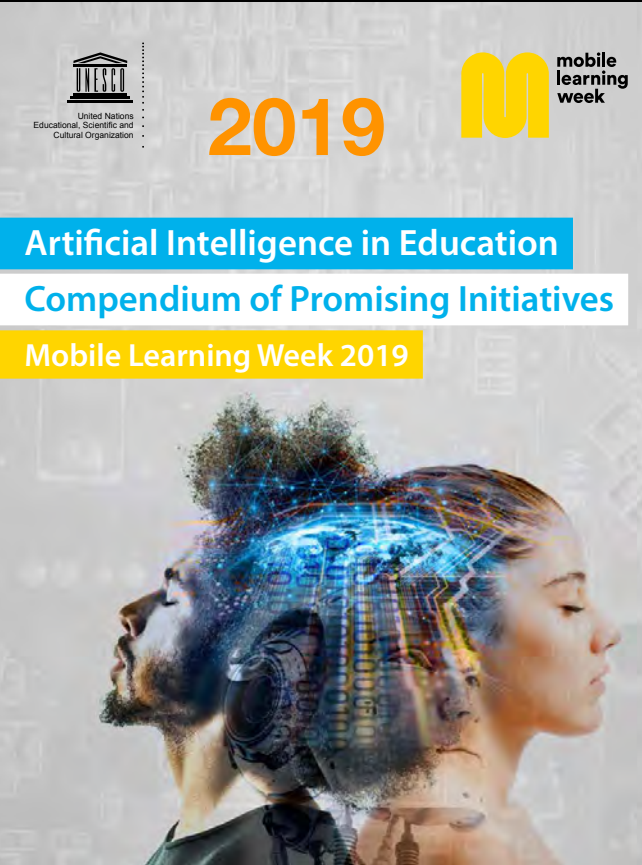
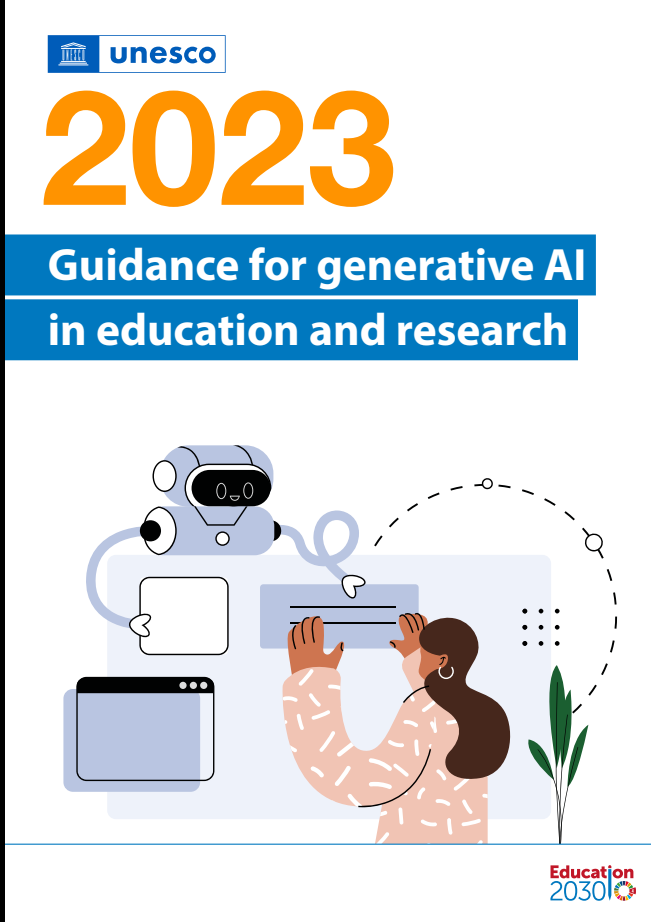
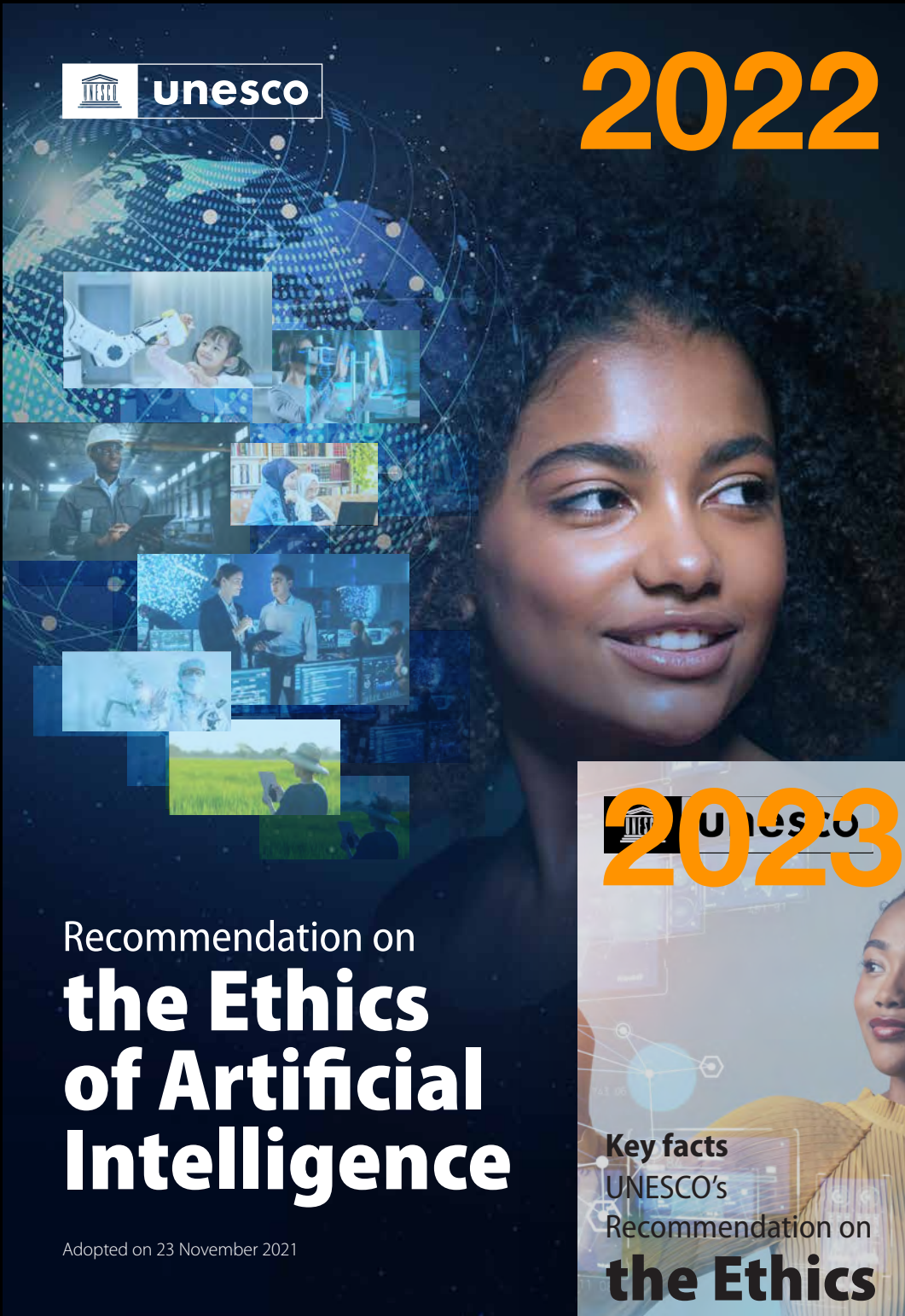
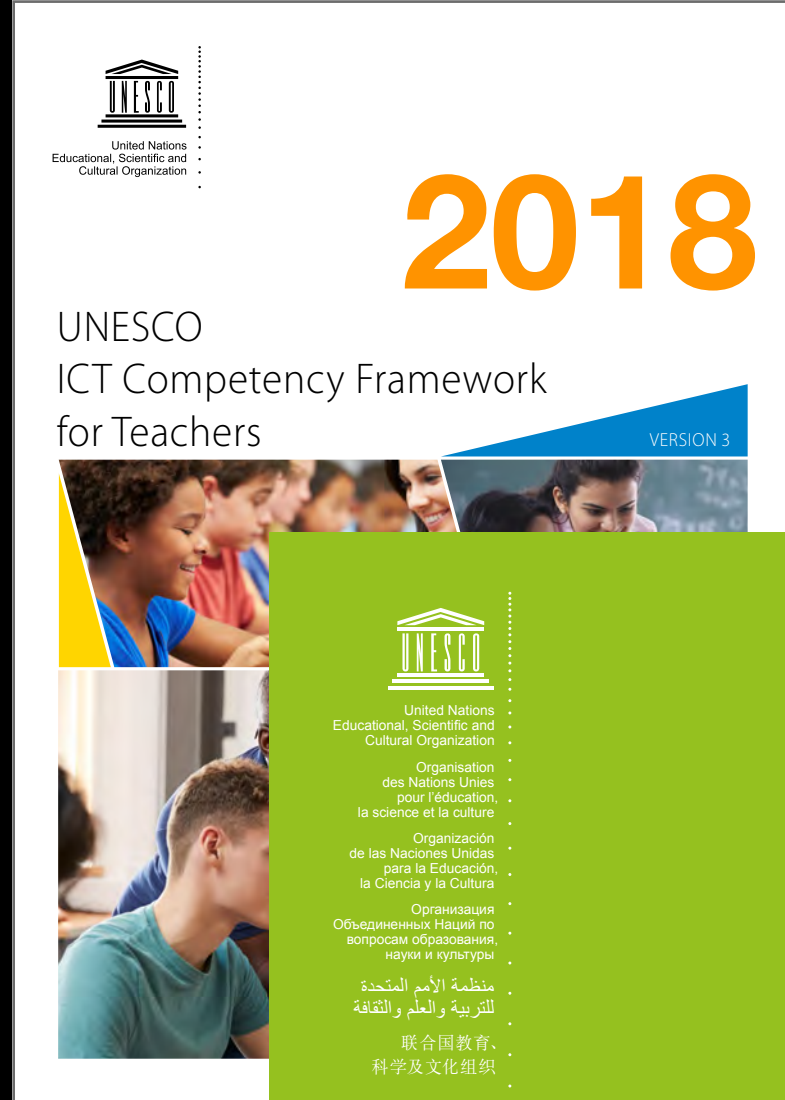












https://www.zotero.org/groups/4643604/ai_in_arts_and_creative_education_curated/search/UNESCO/titleCreatorYear/items/4N7YDPZM/item-list

<https://t1p.de/ai4artsed>



 ARTIFICIAL INTELLIGENCE FOR ARTS EDUCATION
(AI4ARTSED)

ARTIFICIAL INTELLIGENCE FOR ARTS EDUCATION – AI4ARTSED

KI verändert Gesellschaft und Arbeitswelt; sie wird zunehmend Thema der Bildung. Das Projekt sondiert die Chancen, Einsatzbedingungen und strukturellen Grenzen des Einsatzes partizipatorisch ausgerichteter künstlicher Intelligenz (KI) in kulturell diversitätssensiblen künstlerisch-pädagogischen Settings der Kulturellen Bildung. Welche und Chancen, Bedingungen und Grenzen des pädagogischen Einsatzes künstlicher Intelligenz (KI) bestehen in kulturell diversitätssensiblen Settings der Kulturellen Bildung (KuBi)? In drei Teilprojekten – Allgemeinpädagogik (TPap), Informatik (TPinf) und Kunstpädagogik (TPkp) – greifen kreativitätsorientierte pädagogische KI-Praxisforschung und informatische KI-Konzeption und Programmierung in enger Kooperation ineinander, um eine auf partizipativer Praxisforschung basierende KI-Technologie zu erstellen, an dieser zugleich Möglichkeiten und Grenzen

My Library

Group Libraries

- AI in Arts und Creative Education...
 - 0_AI4ArtsEd focus
 - AI Ethics (general, except edu)
 - AI in Education (general)
 - AI Methodologies
 - AI Theory & History
 - AIED Bibliometry, Research R...
 - German Contributions (FIS Bil...
 - Information Science
 - Machine Learning/Deep Learn...
 - Sustainability/SD
 - x_tmp
 - Trash
 - Arbeitskreis Ästhetik – Digitalität ...
 - deprecated
 - DiKuBi-Meta
 - Lehrstuhl + UNESCO Chair Erlan...
 - MetaKuBi
 - PAI-Ed
 - Publications Jörrissen (deprecated)
 - US Latina/o Digital Humanities

Creator	Title	Year	
Lee and Kwon	A systematic review of AI education in K-12 classrooms from 2018 to 2023: T...	2024	
Essel et al.	ChatGPT effects on cognitive skills of undergraduate students: Receiving ins...	2024	
Martin et al.	Systematic review of research on artificial intelligence in K-12 education (201...	2024	
Hwang et al.	How does ChatGPT evaluate the value of spatial information in the 4th indust...	2024	
Huang et al.	Controllable multi-domain semantic artwork synthesis	2024	
Fang et al.	Bias of AI-generated content: an examination of news produced by large lang...	2024	
Petricini	What Would Aristotle Do? Navigating Generative Artificial Intelligence in High...	2024	
Graesser et al.	Where is Ethics in the Evolution of AIED's Future?	2024	
Porayska-Pomsta	A Manifesto for a Pro-Actively Responsible AI in Education	2024	
Peters et al.	The DIKW Model in the Age of Artificial Intelligence	2024	
Peters and Green	Wisdom in the Age of AI Education	2024	
Hayes et al.	Towards a Postdigital Social Contract for Higher Education in the Age of Arti...	2024	
UNESCO	User empowerment through Media and Information Literacy responses to the...	2024	
Green	Review of Jeremy Knox (2023). AI and Education in China: Imagining the Futu...	2024	
Brailas	Postdigital Duoethnography: An Inquiry into Human-Artificial Intelligence Syn...	2024	
Bond et al	A meta systematic review of artificial intelligence in higher education: a call f	2024	

Info Notes Tags Attachments Related

Item Type Journal Article

Title A systematic review of AI education in K-12 classrooms from 2018 to 2023: Topics, strategies, and learning outcomes

Author Lee, Sang Joon

Author Kwon, Kyungbin

Publication Computers and Education: Artificial Intelligence

Volume 6

Pages 100211

Date 2024-06-01

Journal Abbr Computers and Education: Artificial Intelligence

DOI 10.1016/j.caeai.2024.100211

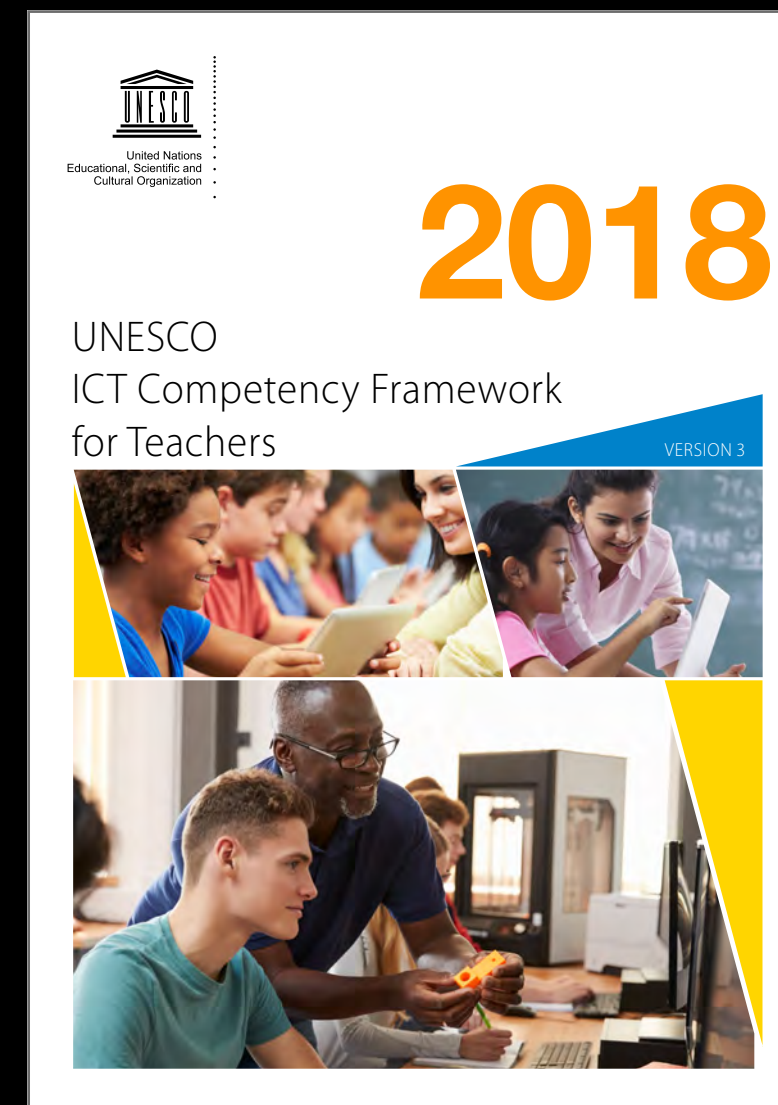
ISSN 2666-920X

Short Title A systematic review of AI education in K-12 classrooms from 2018 to 2023

URL https://www.sciencedirect.com/science/ar...

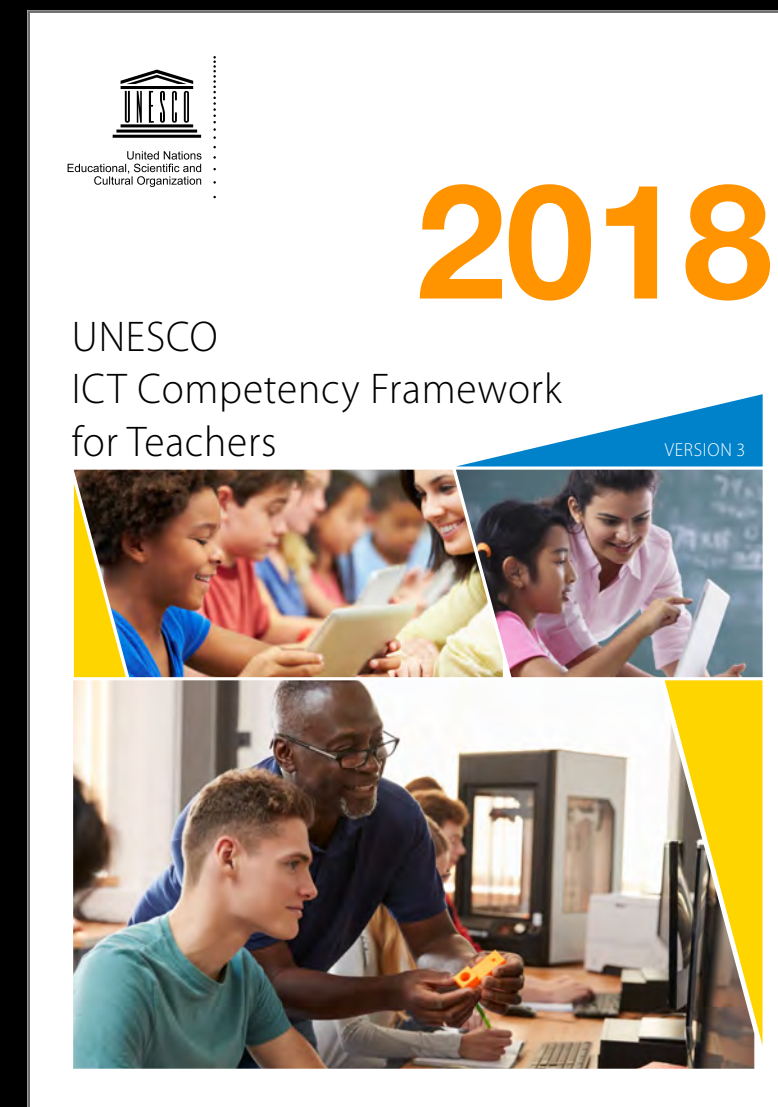
Abstract

AI education aims to teach AI concepts, essential knowledge, and skills related to the fundamental ideas in AI. As AI becomes increasingly prevalent in our daily lives, schools and educators have started to recognize the importance of AI education in K-12 schools. However, there have been a limited number of studies reporting on the implementation of AI education in classrooms. This systematic review aimed to provide an overview of the current state of AI education in K-12 schools, exploring topics, instructional approaches, and learning outcomes. Twenty-five peer-reviewed journal articles published between 2018 and 2023 were selected for this systematic review. The findings highlighted that various topics were covered in K-12 AI education, including fundamental AI concepts, different types of AI, AI applications, and ethical considerations related to AI. To facilitate meaningful learning experiences, educators frequently integrated hands-on activities and project-based learning. The findings supported the benefits of AI education in enhancing students' AI literacy, problem-solving skills, and ethical reflections on AI's societal impact. Furthermore, it fostered motivation, positive attitudes toward AI, and an interest in technology while inspiring career



ICT in education no longer regarded as a specialized area only for ICT teachers, but understood under the premises of social and economic goals – „a key focus of education systems worldwide“ – such as:

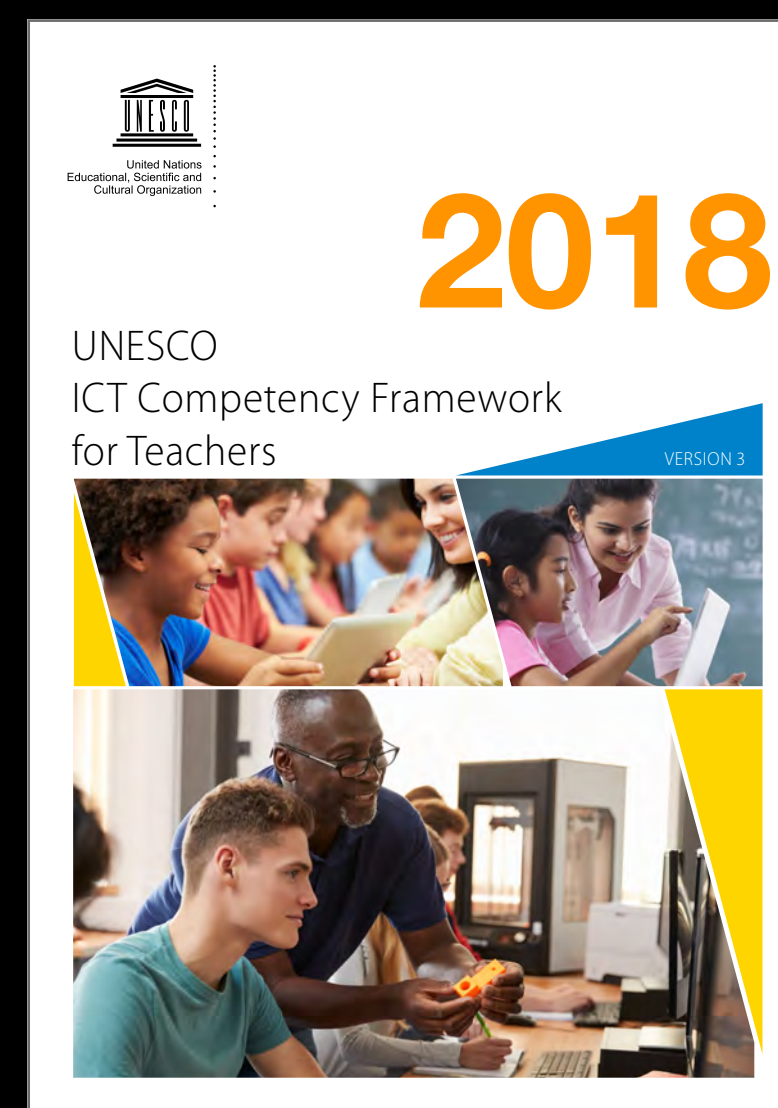
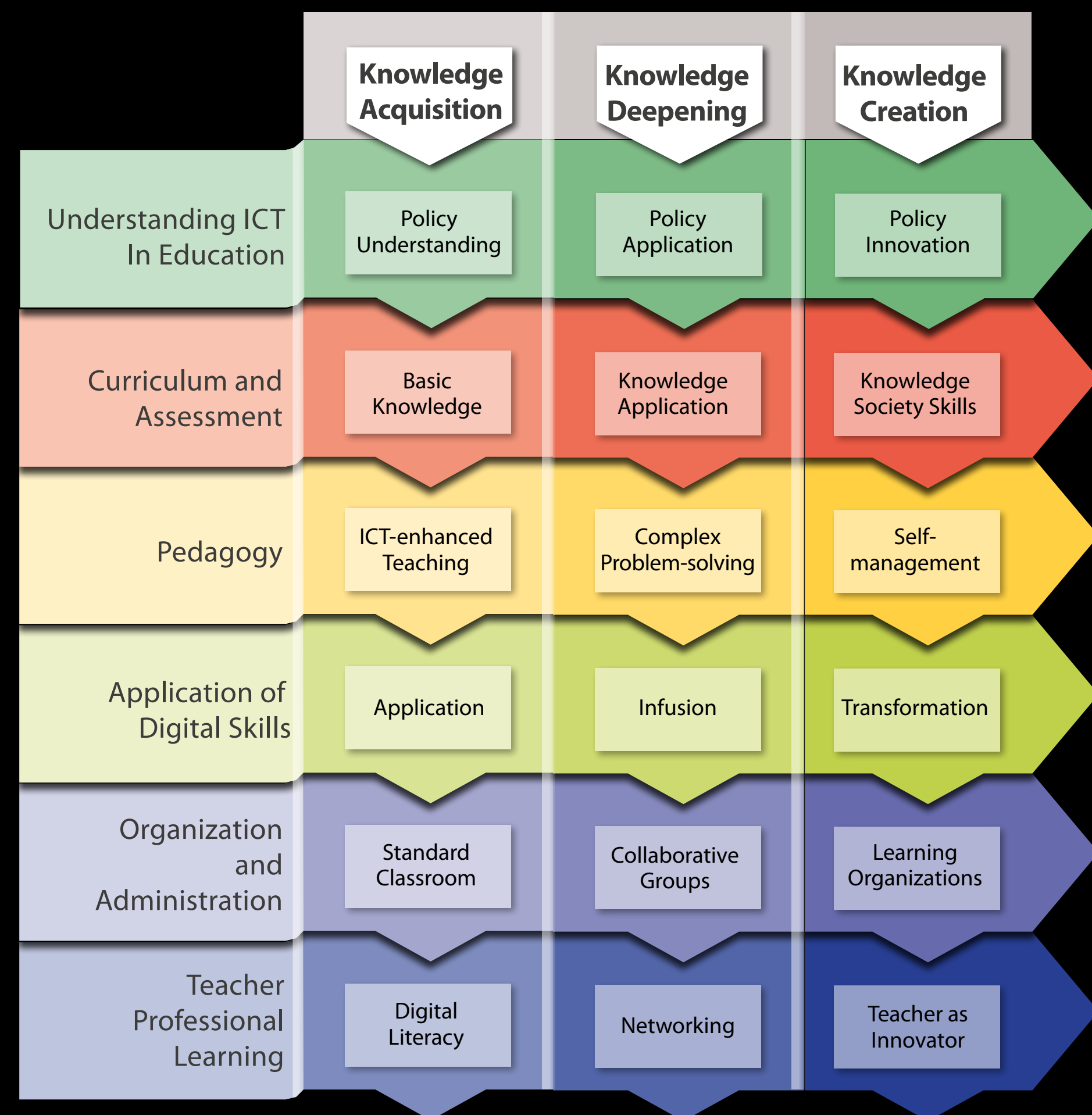
"encourage all members of society – irrespective of gender, language, age, background, location and differing abilities – to participate fully in society and influence the decisions that affect their lives; and – foster cross-cultural understanding, tolerance and the peaceful resolution of conflict." (p.7)



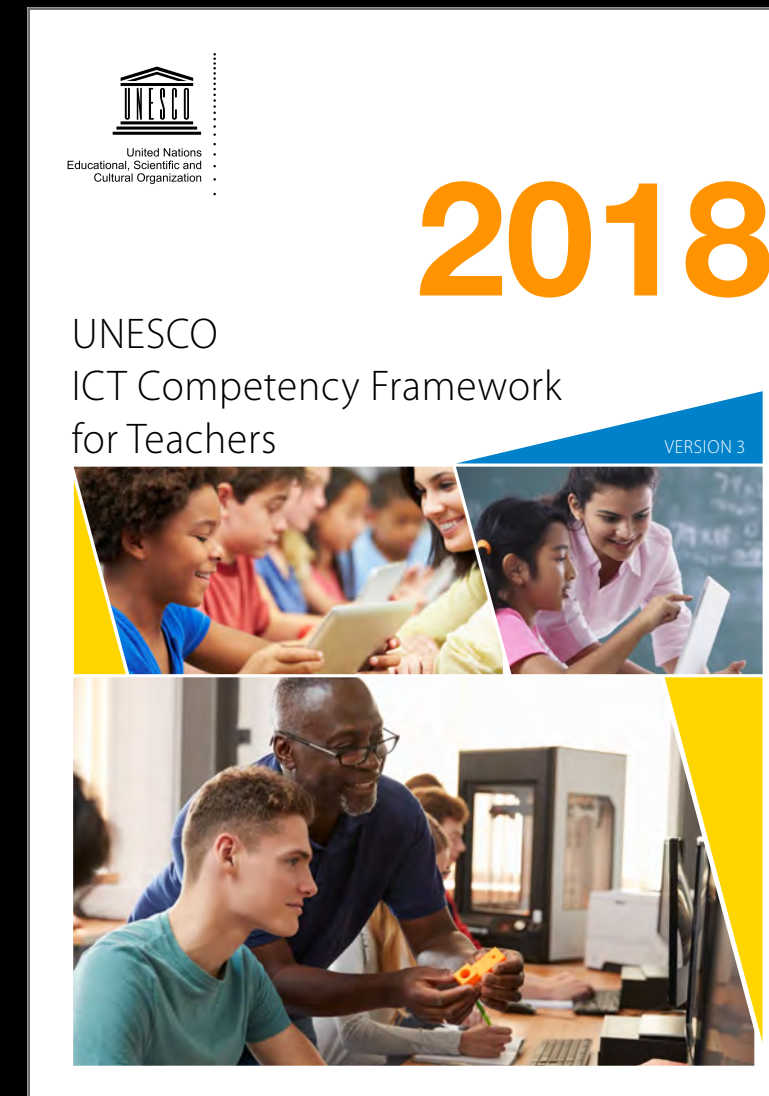
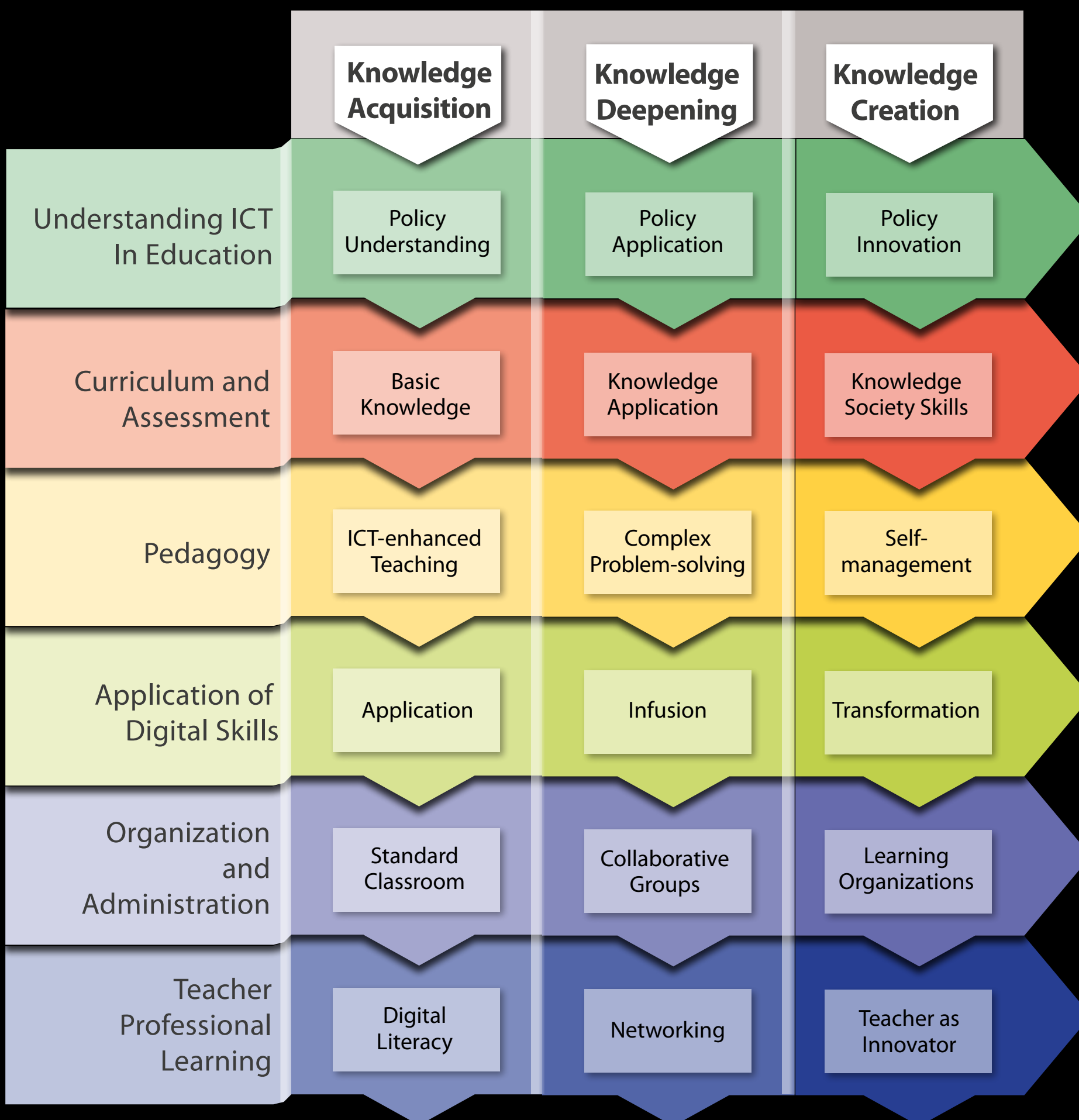
ICT in education no longer regarded as a specialized area only for ICT teachers, but understood under the premises of social and economic goals – „a key focus of education systems worldwide“ – such as:

"encourage all members of society – irrespective of gender, language, age, background, location and differing abilities – to participate fully in society and influence the decisions that affect their lives; and – foster cross-cultural understanding, tolerance and the peaceful resolution of conflict." (p.7)

„Indeed, schools are transformed into learning organizations in which all the members are involved in learning. Teachers can then be seen as master students and knowledge facilitators and producers, who are constantly engaged in educational experimentation and innovation in collaboration with their colleagues [...].“ (p. 24)



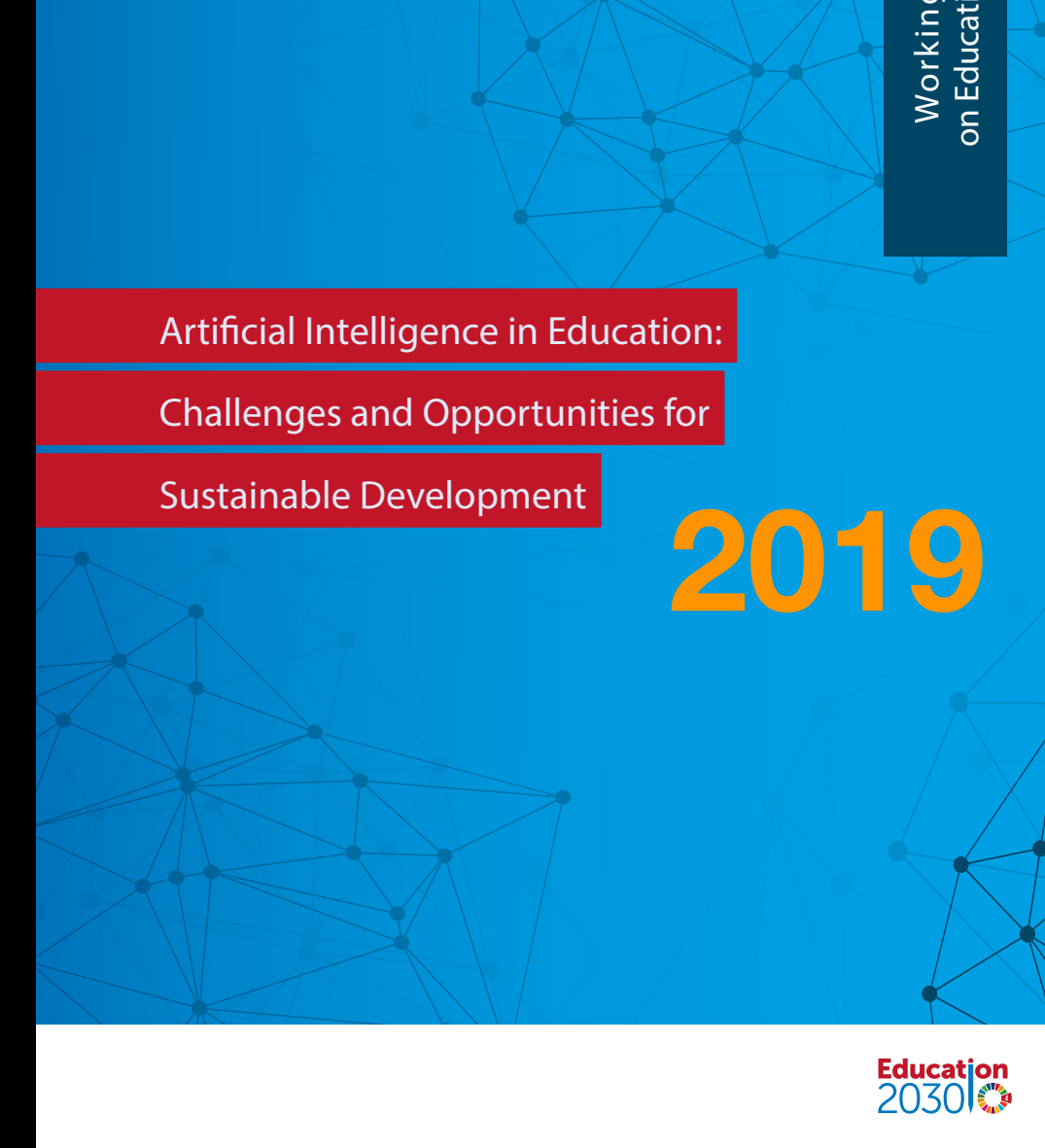
„AI is currently used in education in the form of customizable content through adaptive learning programmes and software, tracking and monitoring diagnostics, automation of grading and even AI tutors. It will continue to bring new opportunities for enhanced learning, new forms of learning and offer more flexible lifelong learning pathways. Nevertheless, there are rising concerns over the issues of ethics, data security and human rights alongside the penetration of AI in education.“ (p. 19)



„AI is currently used in education in the form of customizable content through **adaptive learning programmes and software, tracking and monitoring diagnostics, automation of grading and even AI tutors**. It will continue to bring new opportunities for enhanced learning, new forms of learning and offer more flexible lifelong learning pathways. Nevertheless, there are **rising concerns over the issues of ethics, data security and human rights** alongside the penetration of AI in education.“ (p. 19)

2018: **AI mainly perceived as a tool**, not as something that disruptively changes knowledge landscapes, scientific methods and research, media- and cultural production, informal learning, etc.

„the ways in which **AI could be used to improve learning and equity** in education in the developing world. The section addresses two main topics: one dedicated to improving **personalisation through AI** (pedagogical scale) and the other focused on **education management information systems** (systemic management scale)“ (p. 13)



„**AI to promote personalisation and better learning outcomes**“

„**Data analytics in Education Management Information Systems (EMIS) and the evolution to Learning Management Systems (LMS)**“

**First challenge:
a comprehensive public policy on AI for
sustainable development**

**Second challenge:
ensuring inclusion and equity in AI in
education**

**Third challenge:
preparing teachers for AI-powered education
and preparing AI to understand education**
participate in shaping the tool

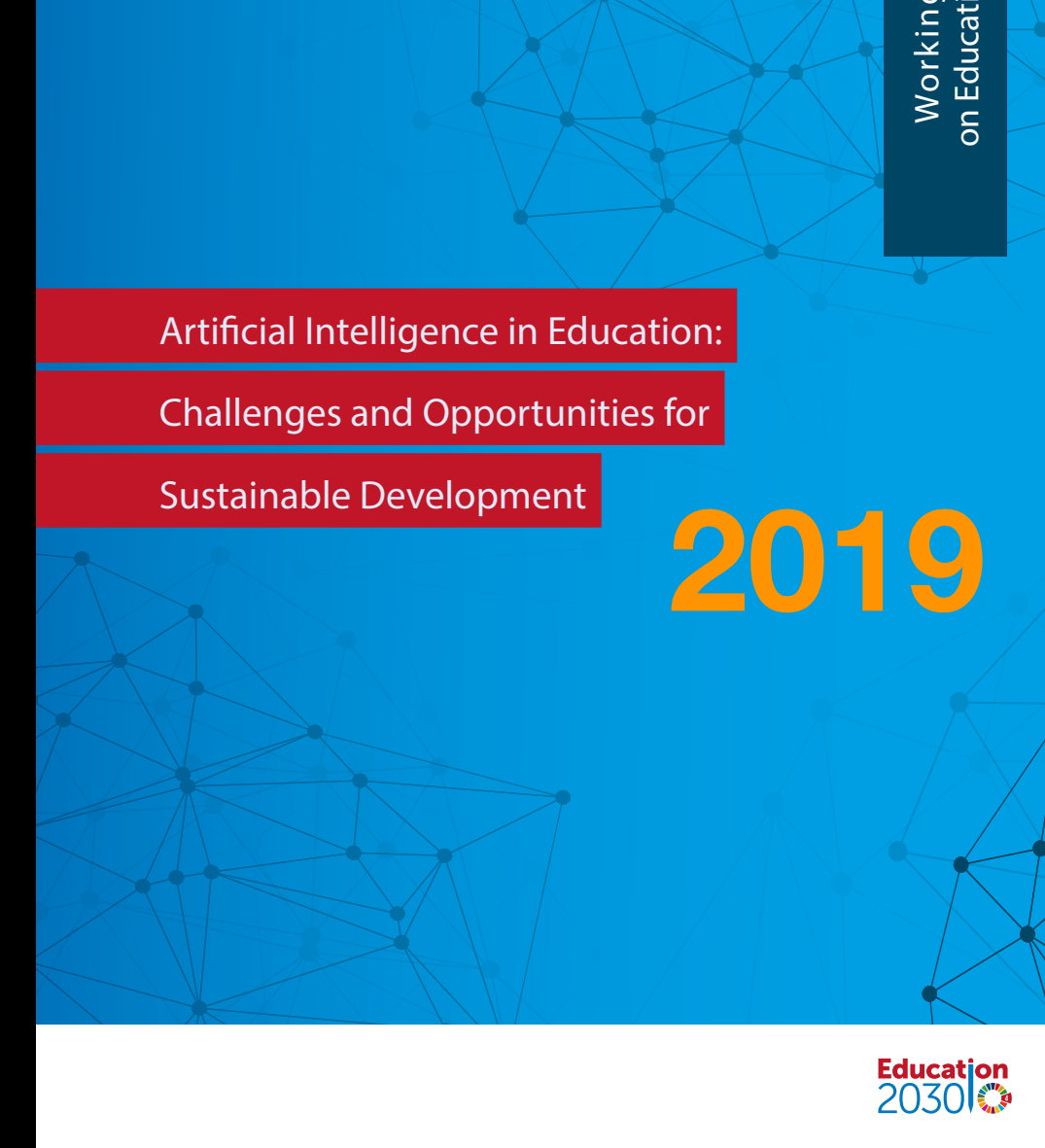
**Fourth challenge:
developing quality and inclusive data systems**

**Fifth challenge:
making research on AI in education significant**

**Sixth challenge:
ethics and transparency in data collection,
use and dissemination**

*Terms like „diversity“ and „culture“ not
mentioned in the paper; thus very limited
awareness of inherent cultural biases of AI.*

„Unfair discrimination. When Machine Learning algorithms are trained on a certain data set (let's say with students from a Western European country), then the result might not be directly applicable to students from other parts of the world. The training data set might be biased towards a certain group and therefore might discriminate unfairly when used on a different group.“ (p. 34)



Policy Recommendations

- Outcome of the Beijing International Conference on Artificial Intelligence (AI) and Education 16 to 18 May 2019
- Participants including 50 government ministers and vice ministers,
- as well as around 500 international representatives from more than 100 Member States, United Nations agencies, academic institutions, civil society and the private sector.
- Referring to the **Qingdao Declaration (2015)**

Government/state level

- Planning AI in education policies: SDG4, LLL
- AI for education management and delivery
- AI to empower teaching and teachers
- AI for learning and learning assessment
- Development of values and skills for life and work in the AI era
- Promoting equitable and inclusive use of AI in education
- Ensuring ethical, transparent and auditable use of education data and algorithms
- Monitoring, evaluation and research



Organizations

- Monitor and assess the **impact of the AI divide and disparities in AI development** across countries
- promote the **equitable use of AI in education** in the context of the global and regional Education 2030 architecture
- provide **platforms for international exchange**
- ...

Director-General of UNESCO

- **Establish an 'AI for Education' platform** to act as a clearinghouse for open-source AI courses, AI tools, examples of AI in education policies
- Develop guidelines and resources in consultation with Member States to support the development of policies and strategies
- Support the **integration of AI skills into ICT competency frameworks** for teachers
- ...

Qingdao Declaration (2015)

leverage ICT for learning is
no longer a specialized skill

access to digital
learning tools for all

teacher
professionalization

ethical use of data, including
safeguarding the privacy and
confidentiality

build bridges between formal, non-
formal and informal learning

open access strategies



Qingdao Declaration (2015)

leverage ICT for learning is
no longer a specialized skill

access to digital
learning tools for all

teacher
professionalization

ethical use of data, including
safeguarding the privacy and
confidentiality

build bridges between formal, non-
formal and informal learning

open access strategies



Beijung Consensus (2019)

human-centered, human-controlled AI
→ human interaction must remain at
the core of education
AI as a competitor to human decision-making

responsibly develop innovative AI
solutions, where the benefits of AI use
clearly outweigh the risks
risks = central aspect

introduce new models for delivering
education and training

prepare teachers to work effectively in
AI-rich education settings

develop AI applications in education free from
gender bias, based on gender-sensitive data
participate in shaping the tool

adopt AI platforms & data-based learning
analytics for integrated lifelong learning

effective inclusion: impairment,
disabilities, non-native speakers

Qingdao Declaration (2015)

leverage ICT for learning is
no longer a specialized skill

access to digital
learning tools for all

teacher
professionalization

ethical use of data, including
safeguarding the privacy and
confidentiality

build bridges between formal, non-
formal and informal learning

open access strategies

human-
centered

risks

bias at the
core of
technology

Beijing Consensus (2019)

human-centered, human-controlled AI
→ human interaction must remain at
the core of education
AI as a competitor to human decision-making

responsibly develop innovative AI
solutions, where the benefits of AI use
clearly outweigh the risks
risks = central aspect

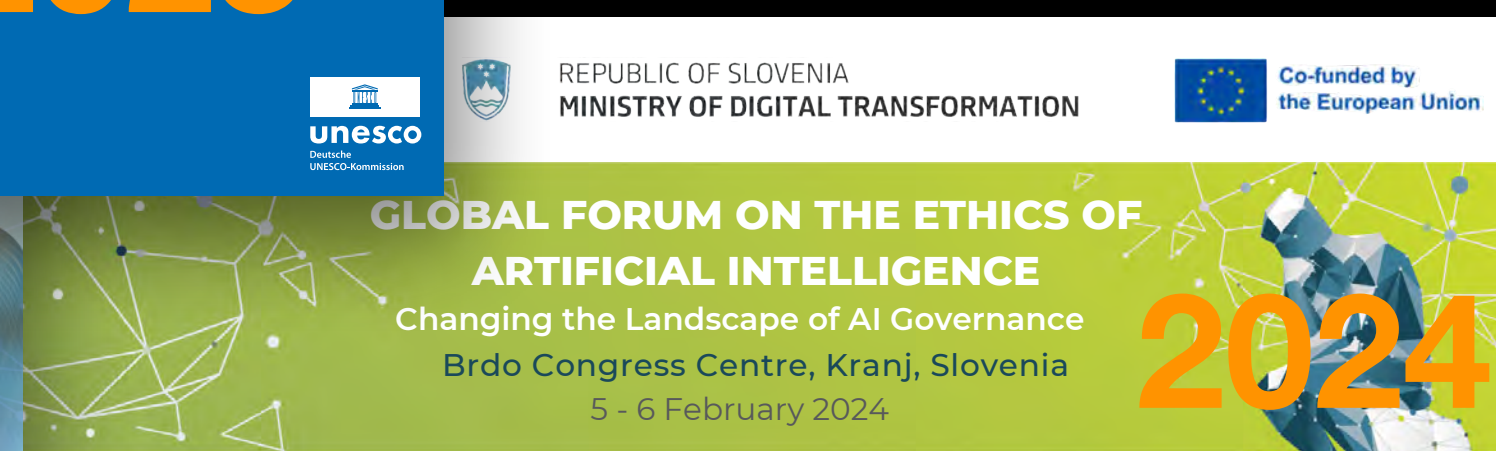
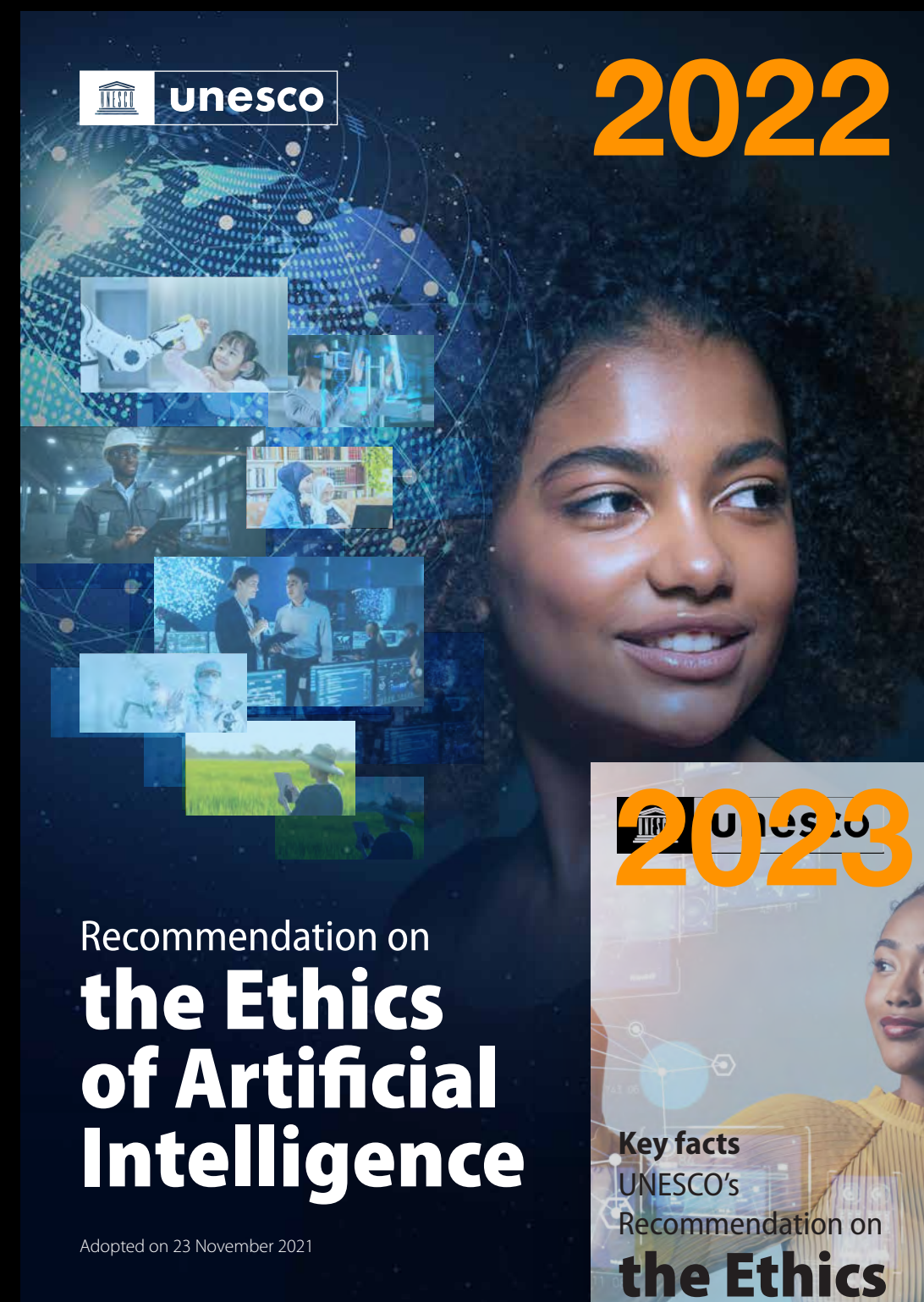
introduce new models for delivering
education and training

prepare teachers to work effectively in
AI-rich education settings

develop AI applications in education free from
gender bias, based on gender-sensitive data
participate in shaping the tool

adopt AI platforms & data-based learning
analytics for integrated lifelong learning

effective inclusion: impairment,
disabilities, non-native speakers



**2022**



Recommendation on
**the Ethics
of Artificial
Intelligence**

Adopted on 23 November 2021

**2023**



UNESCO-
Empfehlung
zur Ethik
Künstlicher
Intelligenz

Bedingungen zur Implementierung
in Deutschland

**2023**

Key facts
UNESCO's
Recommendation on
**the Ethics
of Artificial**

**REPUBLIC OF SLOVENIA
MINISTRY OF DIGITAL TRANSFORMATION**

**GLOBAL FORUM ON THE ETHICS
OF ARTIFICIAL INTELLIGENCE**

Changing the Landscape of AI Governance
Brdo Congress Centre, Kranj, Slovenia
5 - 6 February 2024

VALUES

1

RESPECT, PROTECTION AND
PROMOTION OF HUMAN RIGHTS
AND FUNDAMENTAL FREEDOMS
AND HUMAN DIGNITY

2

LIVING IN PEACEFUL, JUST, AND
INTERCONNECTED
SOCIETIES

4

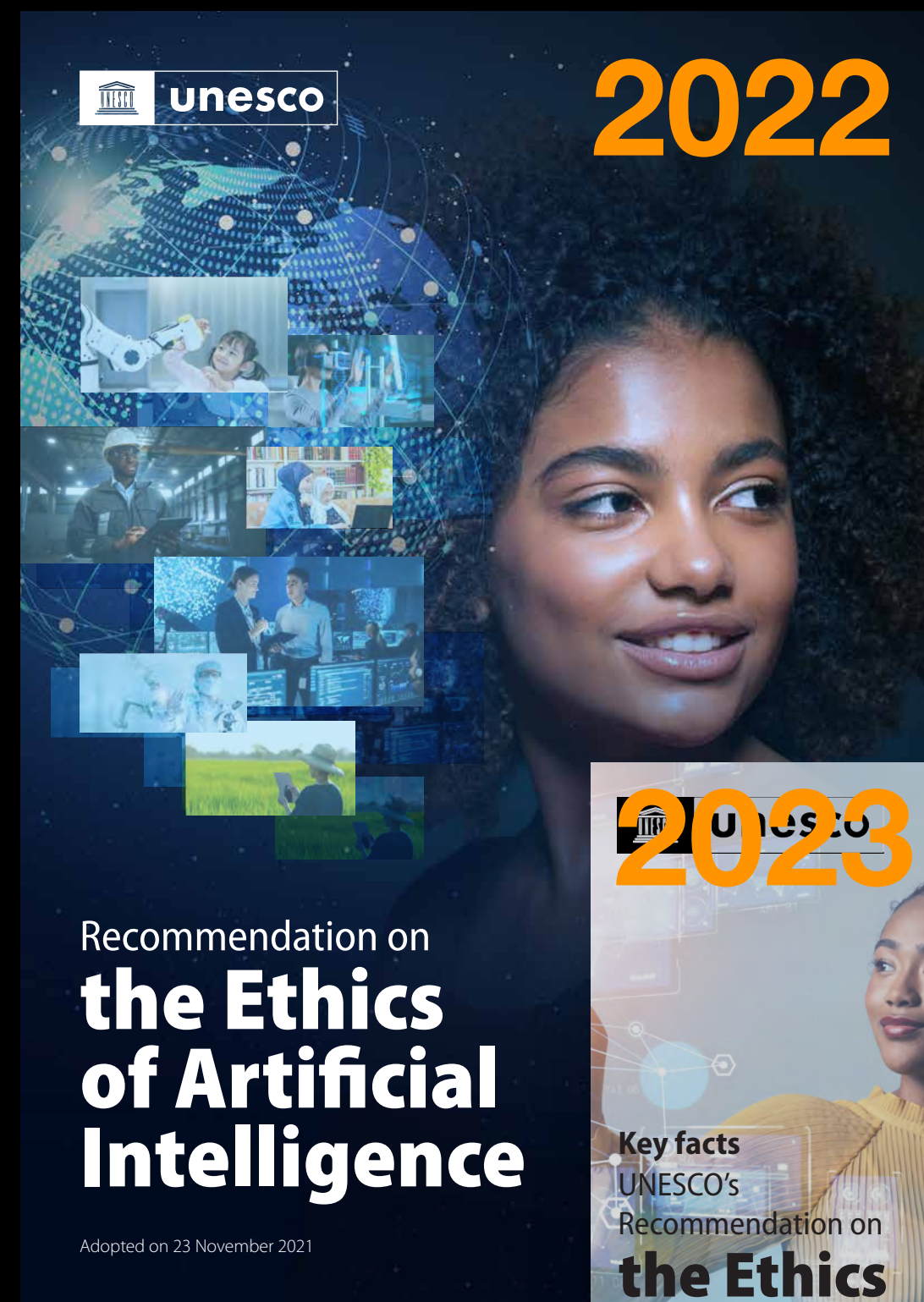
ENVIRONMENT AND
ECOSYSTEM FLOURISHING

3

ENSURING DIVERSITY
AND INCLUSIVENESS

1. Proportionality and Do No Harm
2. Safety and Security
3. Fairness and non-discrimination
4. Sustainability
5. Right to Privacy, and Data Protection
6. Human oversight and determination
7. Transparency and explainability
8. Responsibility and accountability
- 9. Awareness and literacy**
10. Multi-stakeholder and adaptive governance and collaboration

„Public awareness and understanding of AI technologies and the value of data should be promoted through **open and accessible education**, civic engagement, **digital skills and AI ethics training, media and information literacy** and training led jointly by governments, intergovernmental organizations, civil society, academia, the media, community leaders and the private sector, and considering the existing linguistic, social and cultural diversity [...]“ (p. 23)



11 Policy Areas – some, directly, some indirectly addressing education



POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND STEWARDSHIP

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: GENDER

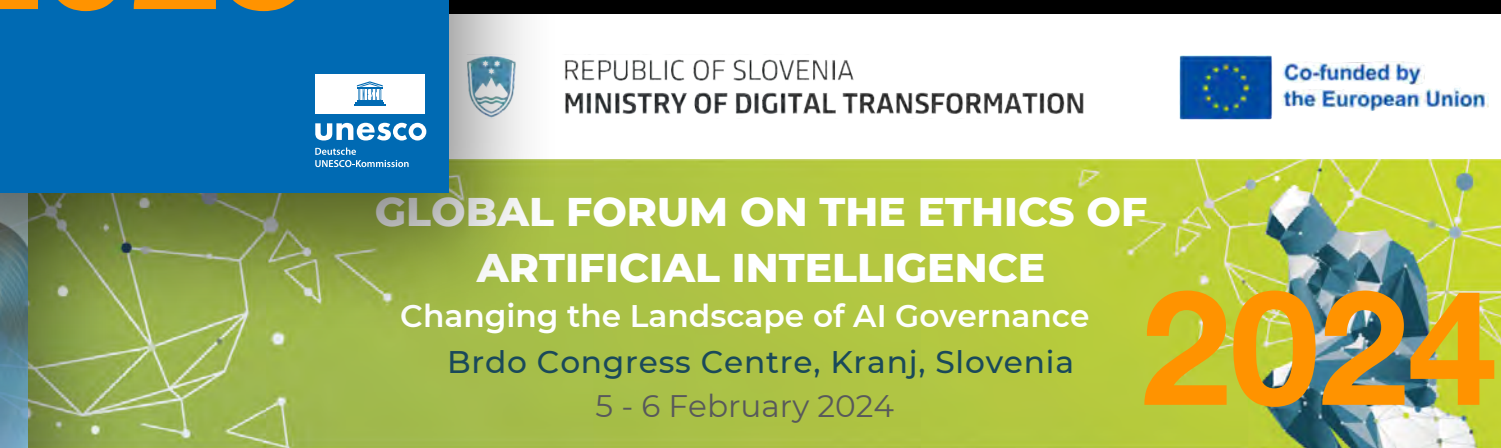
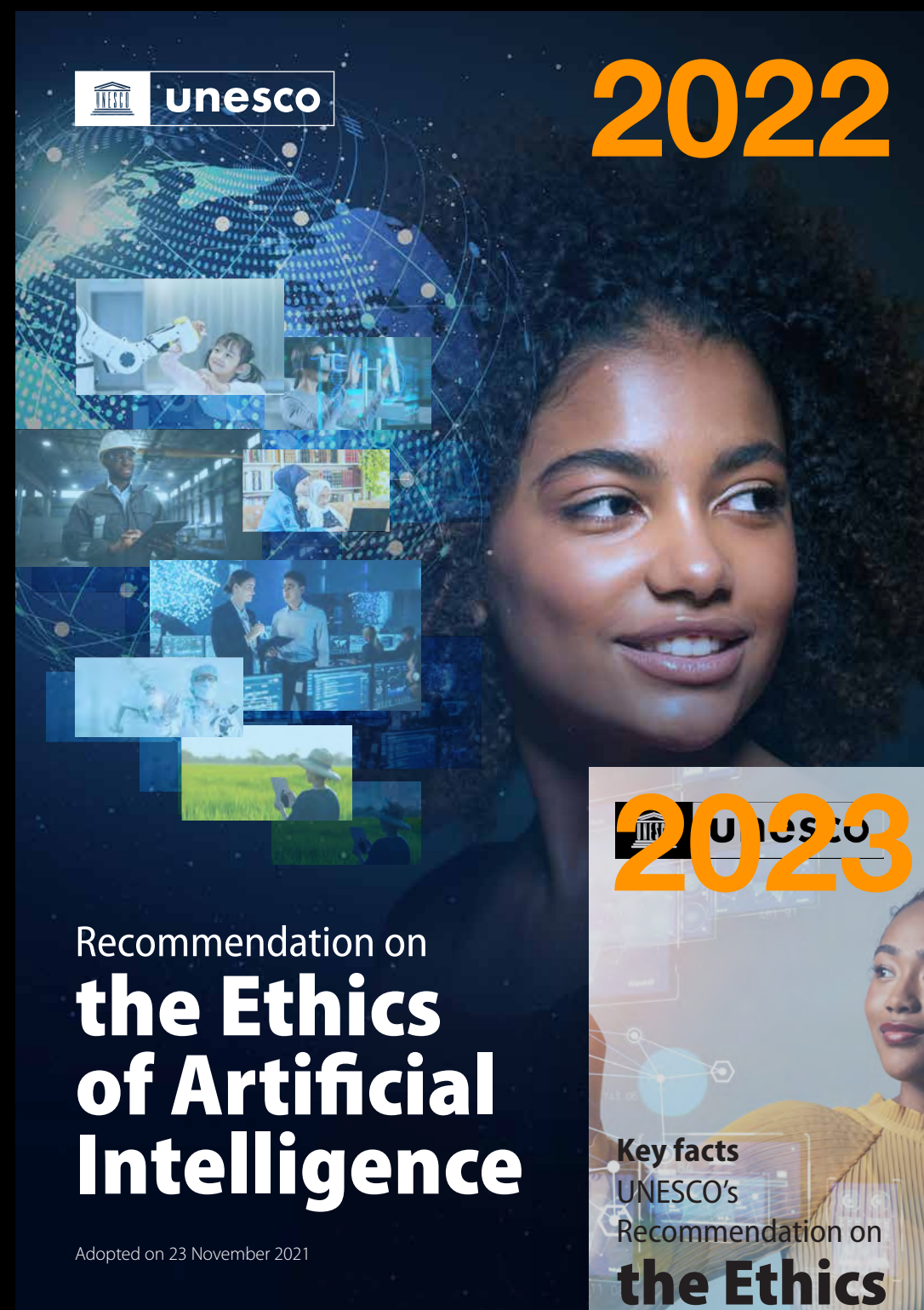
POLICY AREA 7: CULTURE

POLICY AREA 8: EDUCATION AND RESEARCH

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT

POLICY AREA 5: ENVIRONMENT

POLICY AREA 6: GENDER

POLICY AREA 7: CULTURE

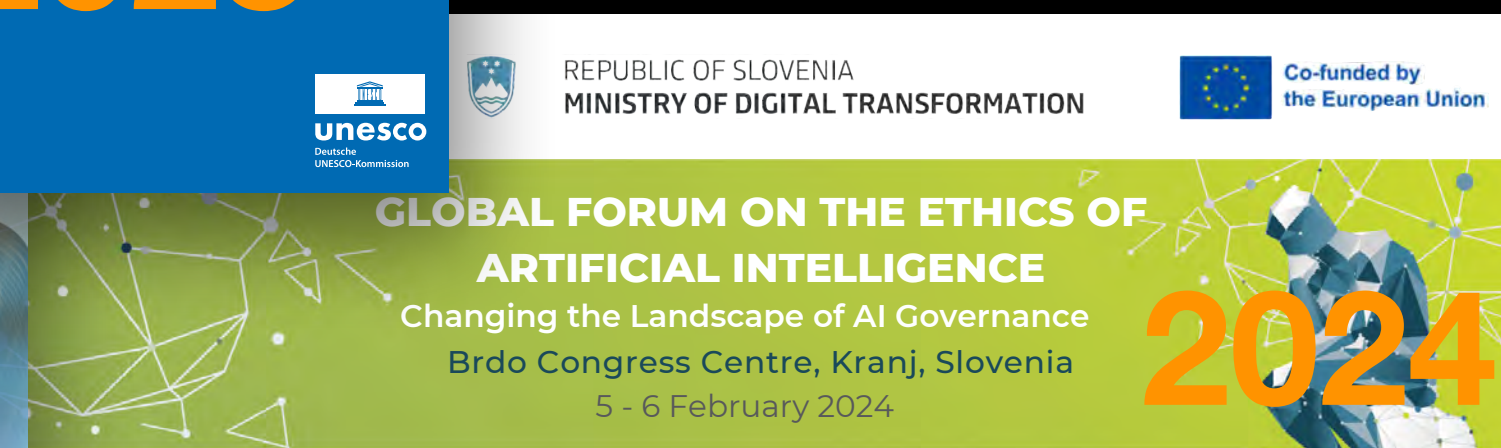
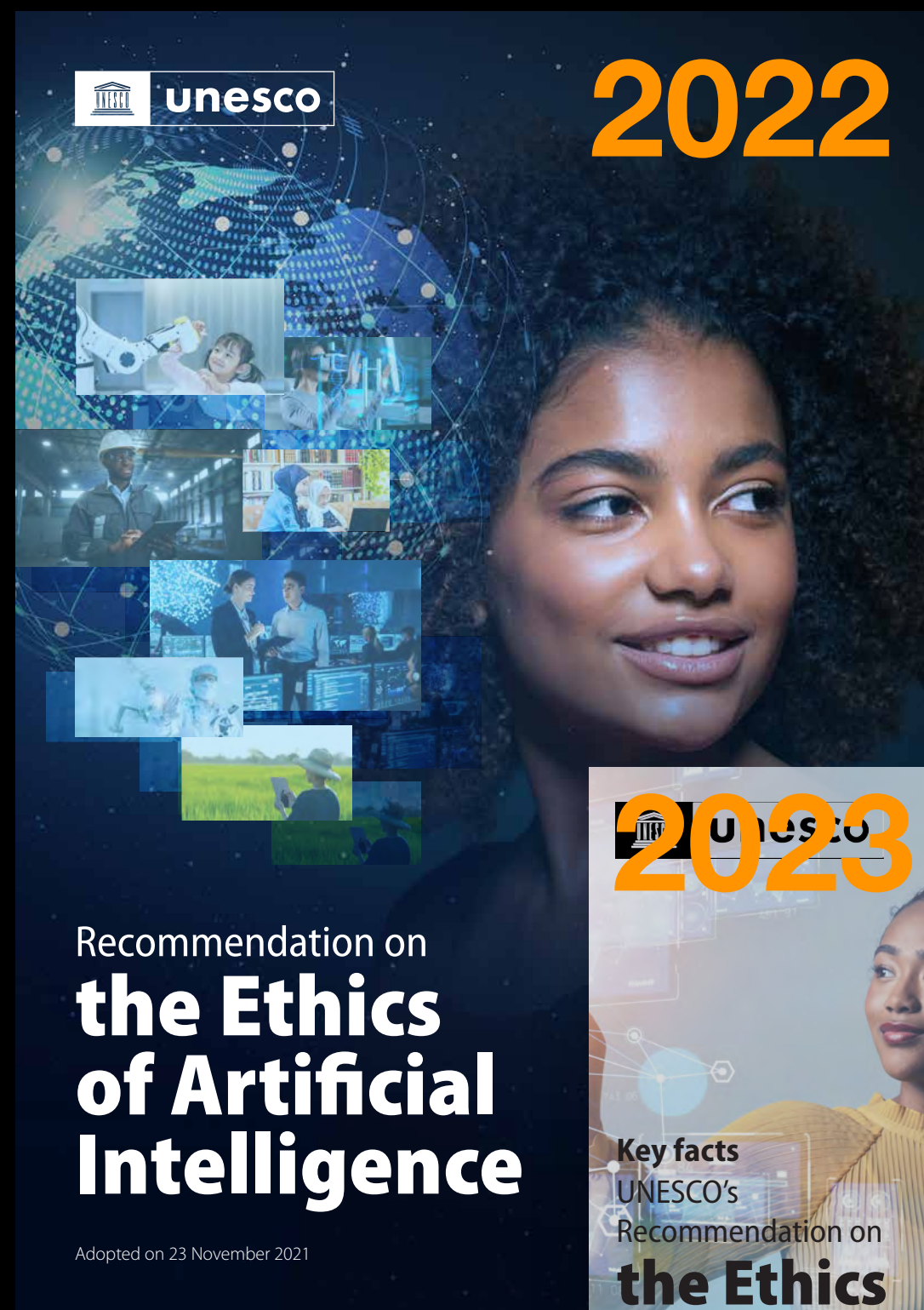
POLICY AREA 8: EDUCATION AND RESEARCH

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING

PA1: „implement appropriate measures to **monitor all phases of an AI system life cycle**, including the functioning of algorithms used for decision-making, the data, as well as AI actors involved in the process, especially in public services and where direct end-user interaction is needed, as part of ethical impact assessment“ (p. 26)



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND

POLICY AREA 3: DATA POLICY

PA2: „ensure that harms caused through AI systems are investigated and redressed, by **enacting strong enforcement mechanisms and remedial actions**“ (p. 27)

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: GENDER

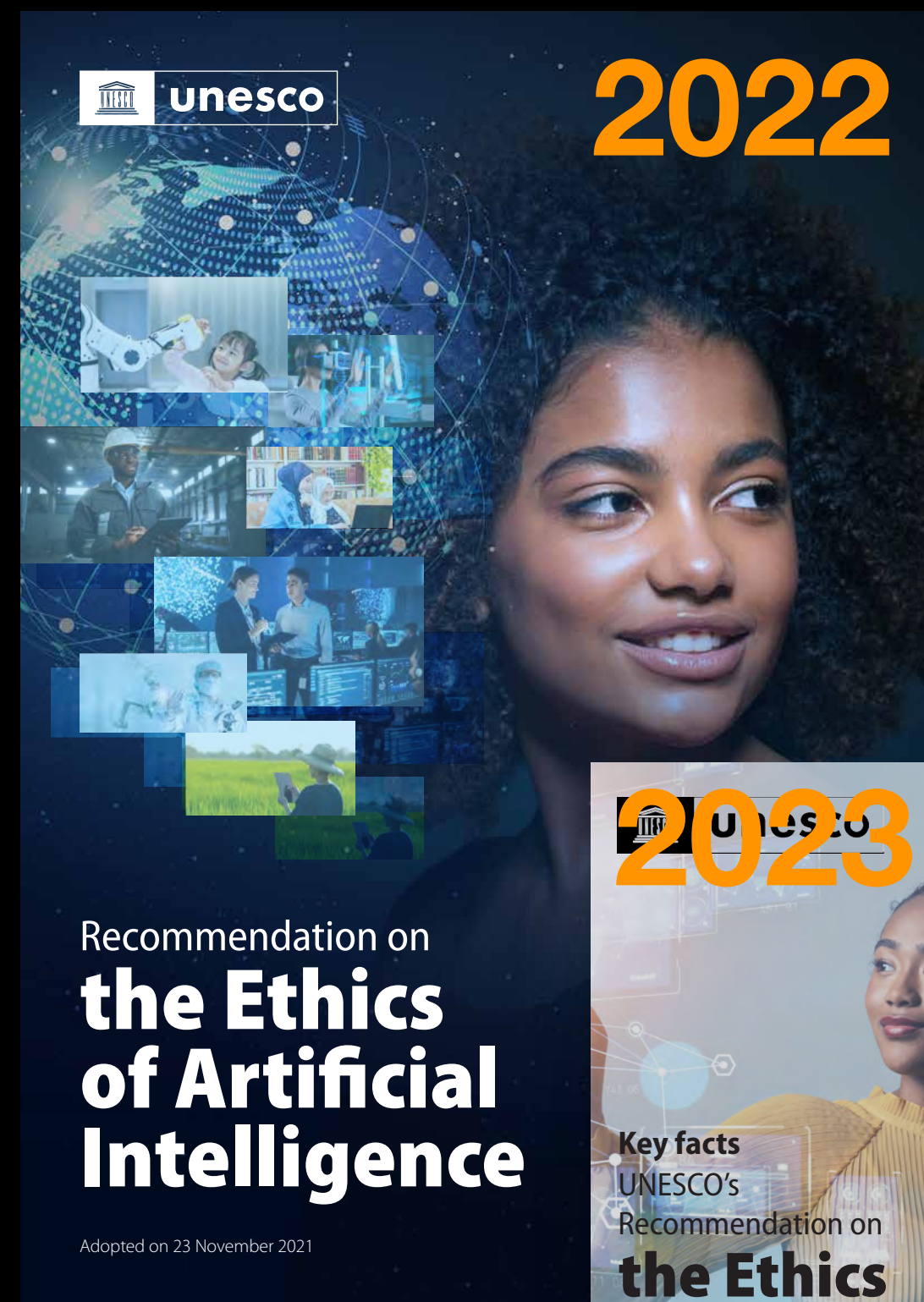
POLICY AREA 7: CULTURE

POLICY AREA 8: EDUCATION AND RESEARCH

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND STEWARDSHIP

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: SOCIETY

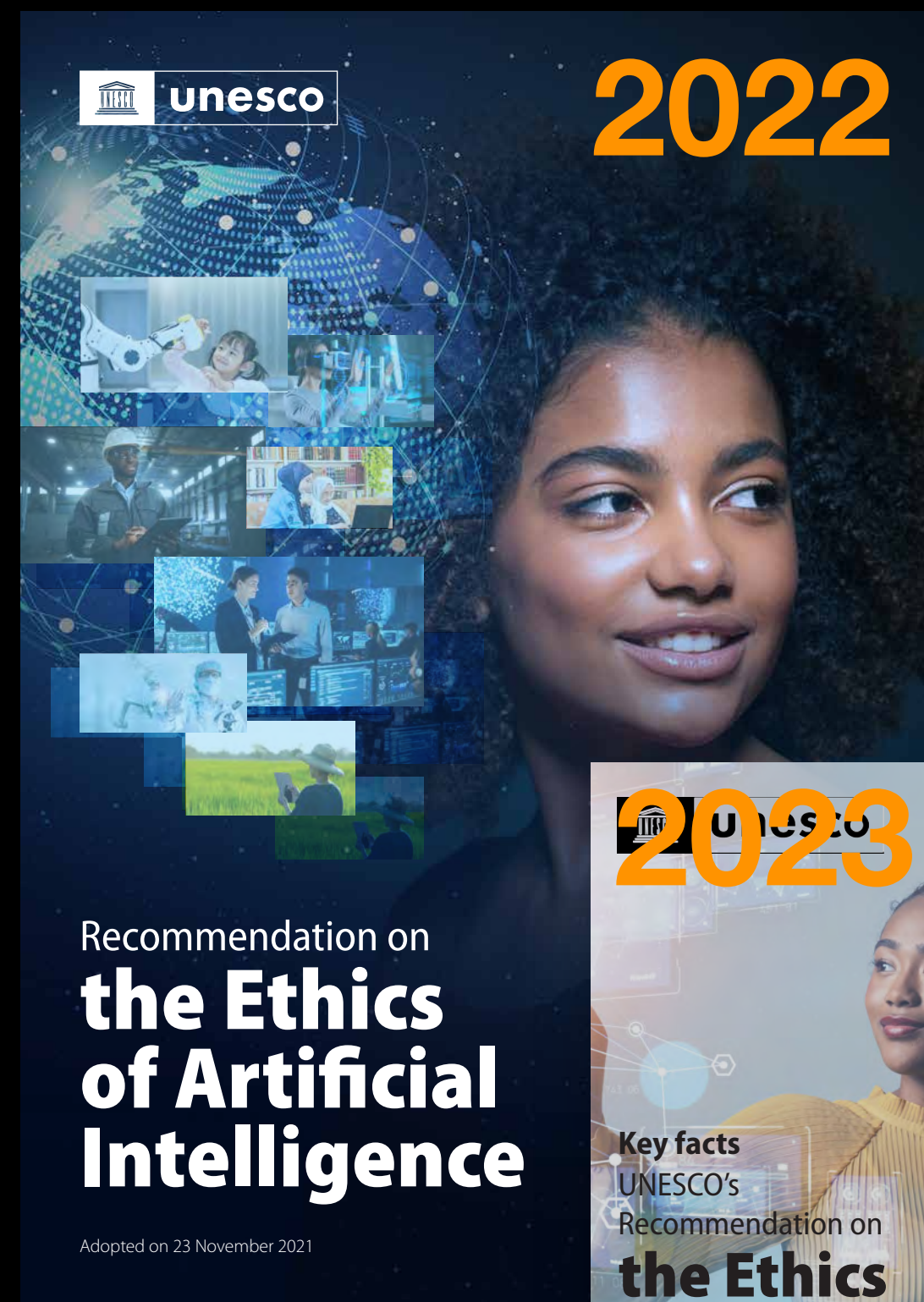
PA5: carbon footprint, material resources, energy consumption of AI systems

POLICY AREA 8: EDUCATION AND RESEARCH

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND STEWARDSHIP

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: GENDER

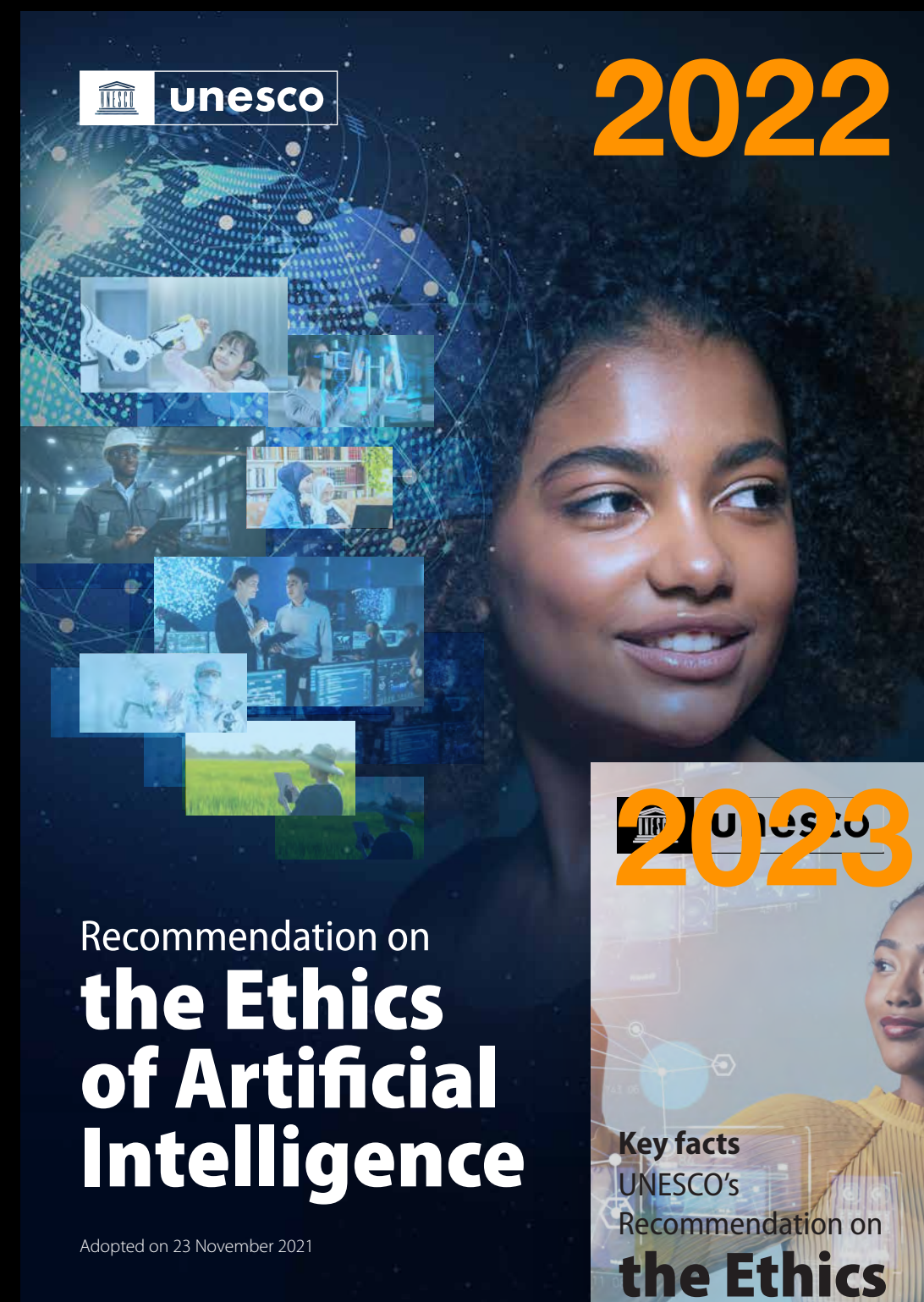
PA6: equality, vs. gender bias, prevent violations of safety

ARCH

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND STEWARDSHIP

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

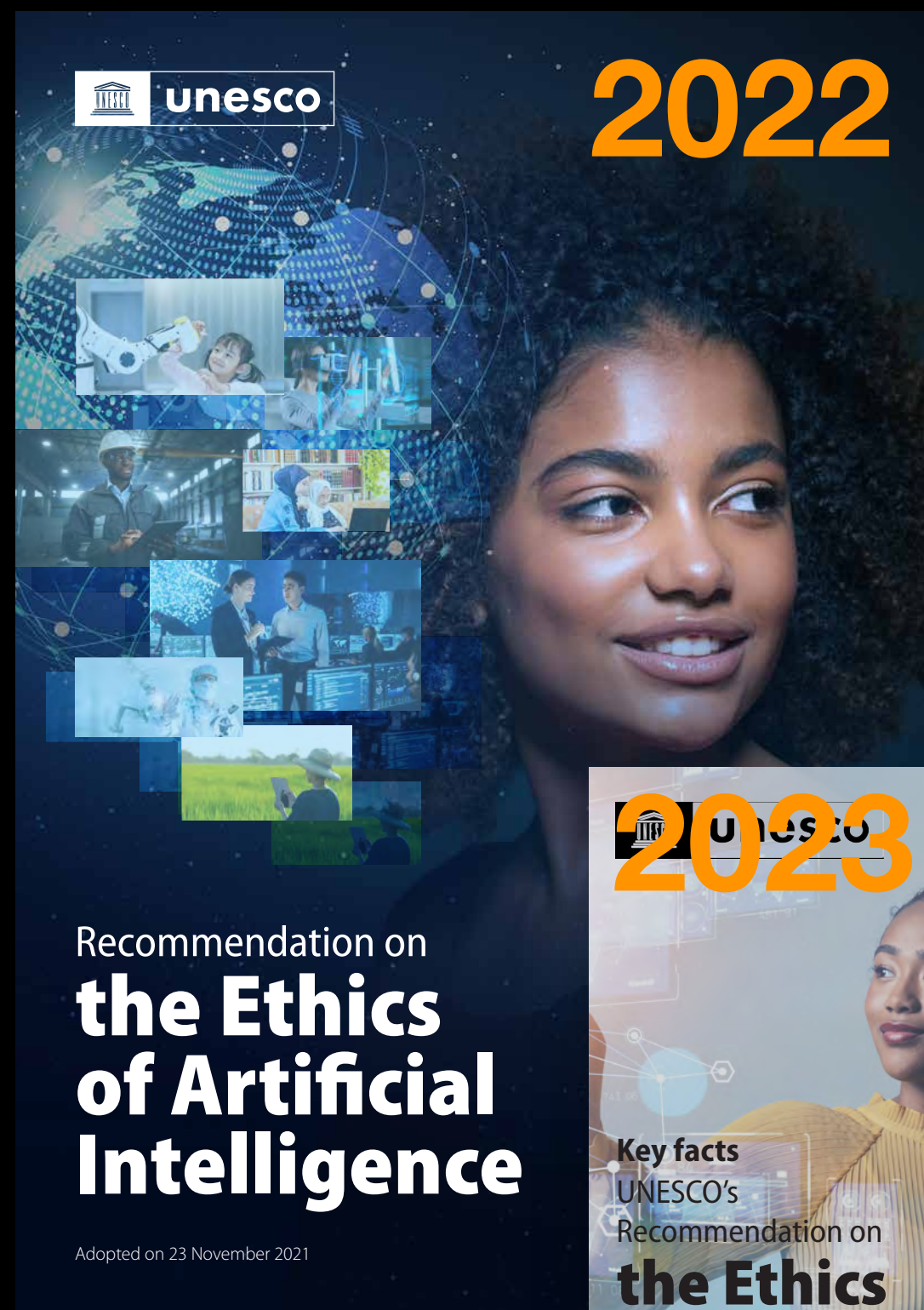
POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: GENDER

POLICY AREA 7: CULTURE

PA7: „preservation, enrichment, understanding, promotion, management and accessibility of tangible, documentary and intangible cultural heritage“

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



11 Policy Areas – some, directly, some indirectly addressing education

POLICY AREA 1: ETHICAL IMPACT ASSESSMENT

POLICY AREA 2: ETHICAL GOVERNANCE AND STEWARDSHIP

POLICY AREA 3: DATA POLICY

POLICY AREA 4: DEVELOPMENT AND INTERNATIONAL COOPERATION

POLICY AREA 5: ENVIRONMENT AND ECOSYSTEMS

POLICY AREA 6: GENDER

POLICY AREA 7: CULTURE

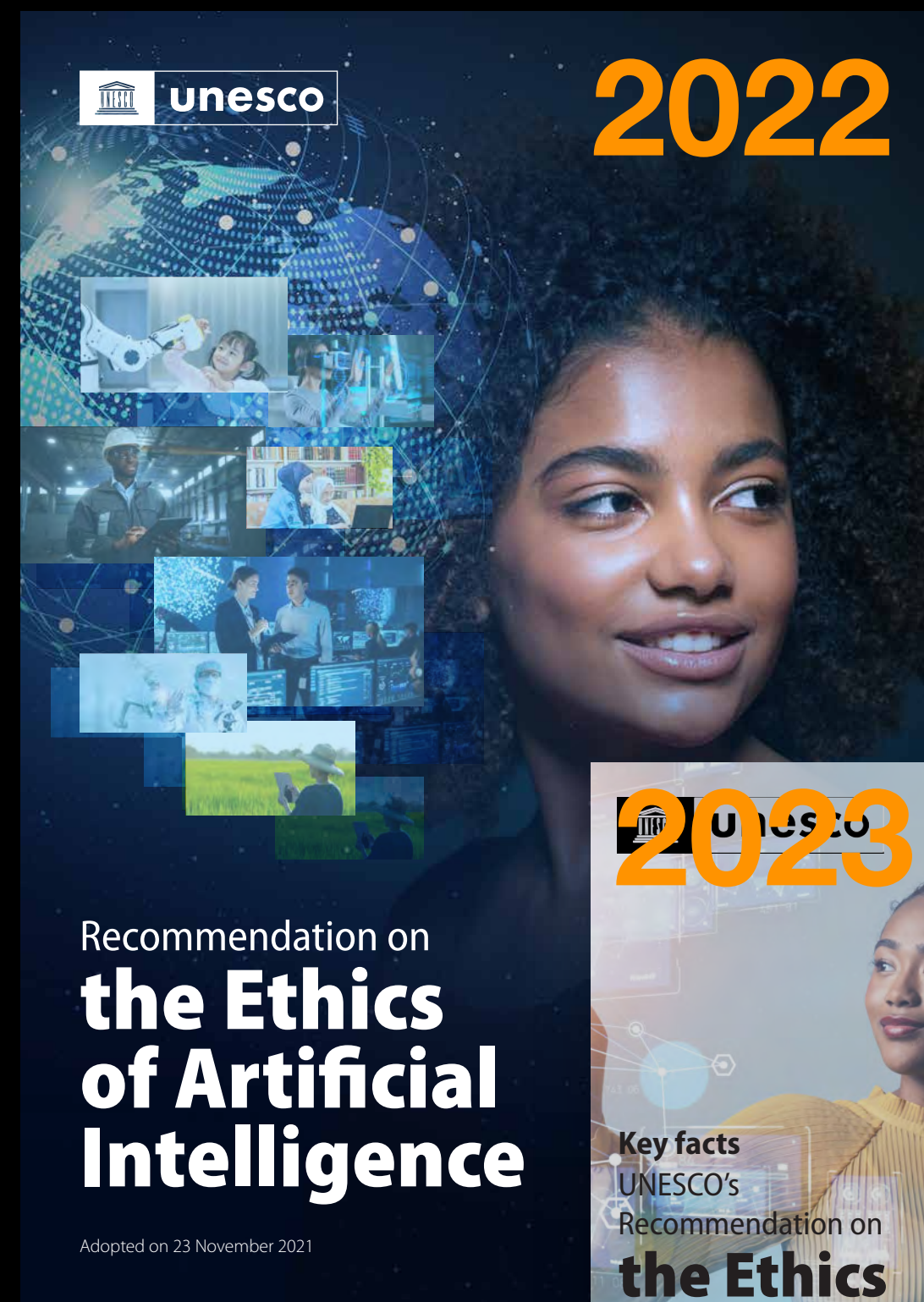
POLICY AREA 8: SCIENCE

PA9: media, ICT, AI literacy;
communication skills

POLICY AREA 9: COMMUNICATION AND INFORMATION

POLICY AREA 10: ECONOMY AND LABOUR

POLICY AREA 11: HEALTH AND SOCIAL WELLBEING



POLICY AREA 8: EDUCATION ...

- **LITERACY** provide adequate AI literacy education to the public; promote the acquisition of “prerequisite skills” for AI education, such as basic literacy, numeracy, coding and digital skills, and media and information literacy as well as critical and creative thinking, teamwork, communication, socio-emotional and AI ethics skills (p. 33)
- **DIVERSITY** promote the participation and leadership of girls and women, diverse ethnicities and cultures, persons with disabilities, marginalized and vulnerable people (p. 34)
- **ETHICS** develop AI ethics curricula for all levels (p. 35)
- **HUMAN-CENTERED** AI should support the learning process without reducing cognitive abilities and without extracting sensitive information (p. 34)
- **GOVERNANCE/CONTROLLING** AI systems used in learning should be subject to strict requirements when it comes to the monitoring, assessment of abilities, or prediction of the learners’ behaviours (p. 34)

... AND RESEARCH

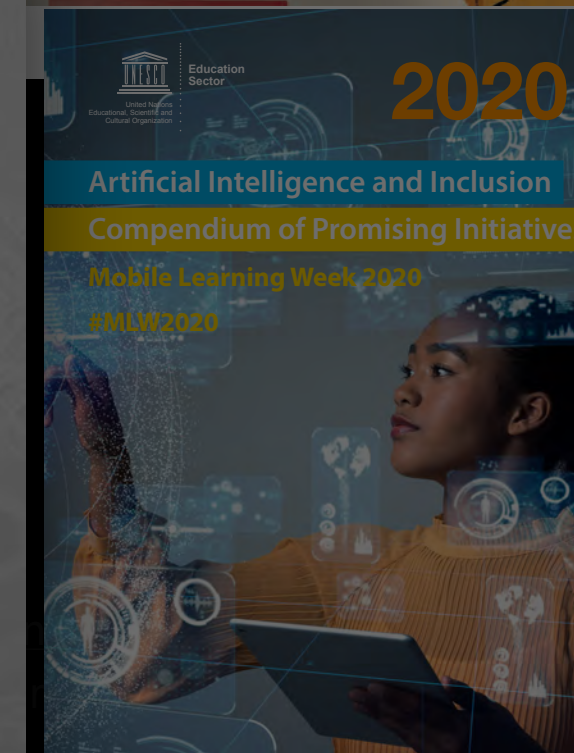
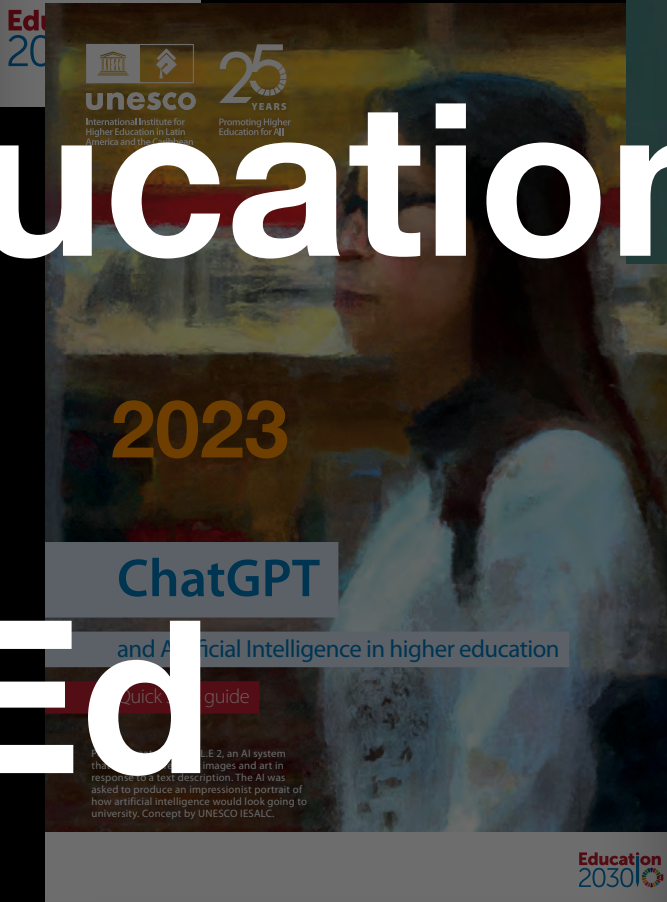
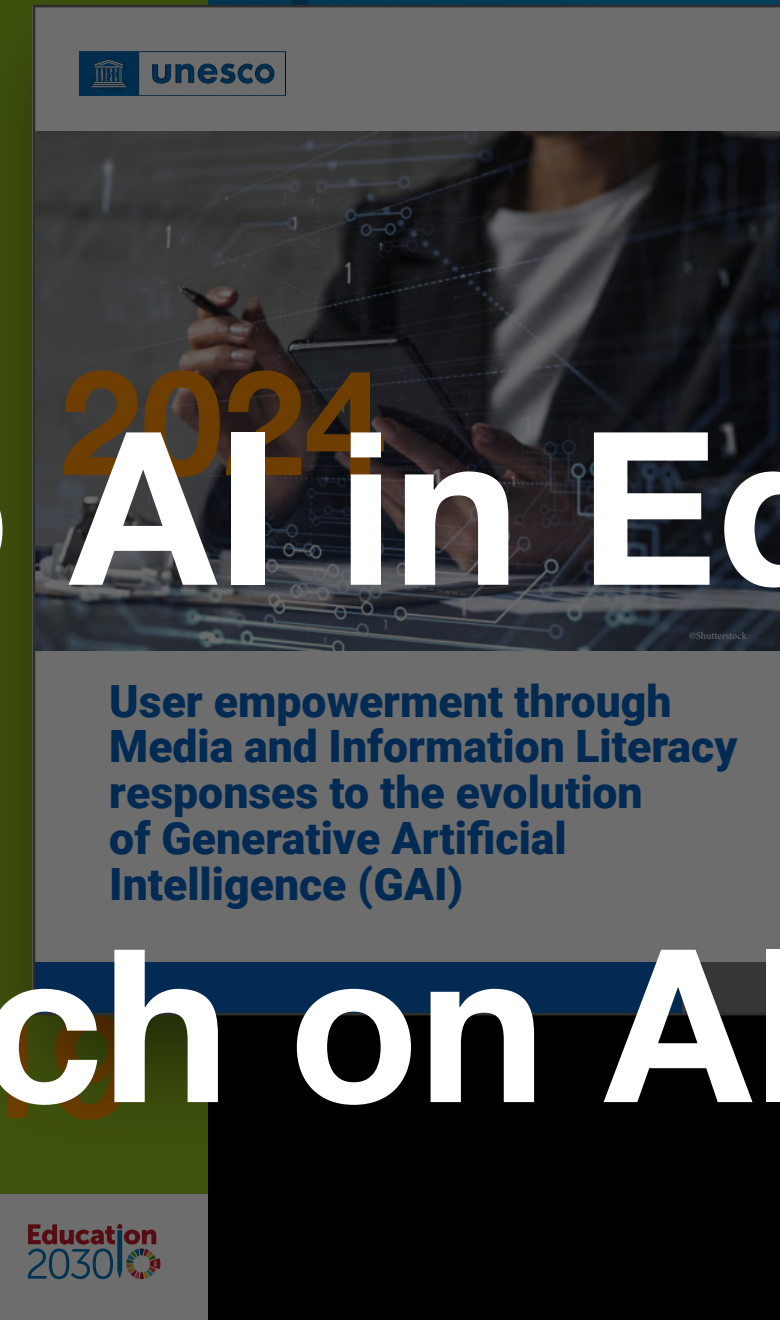
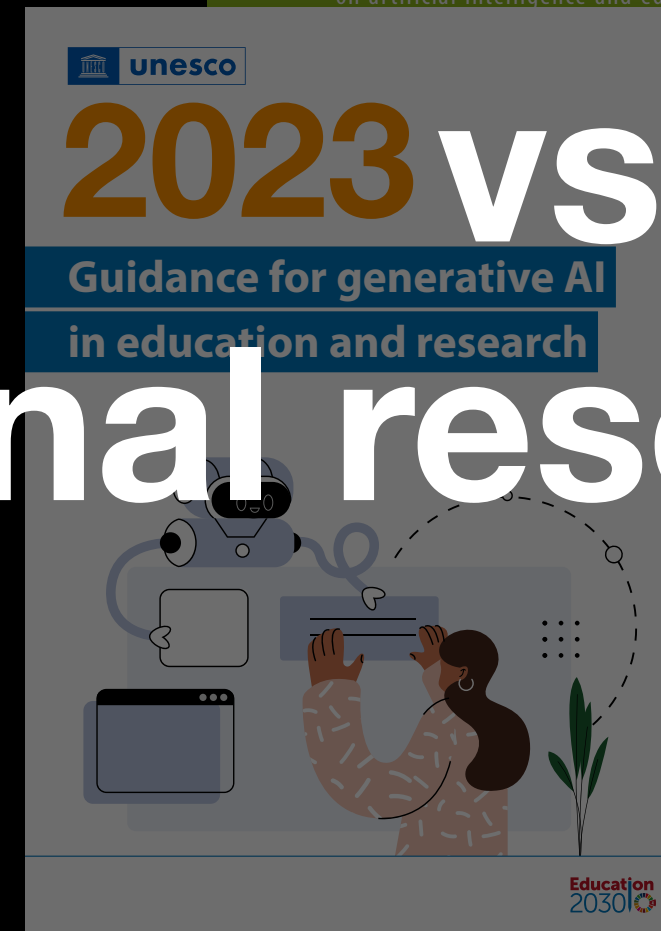
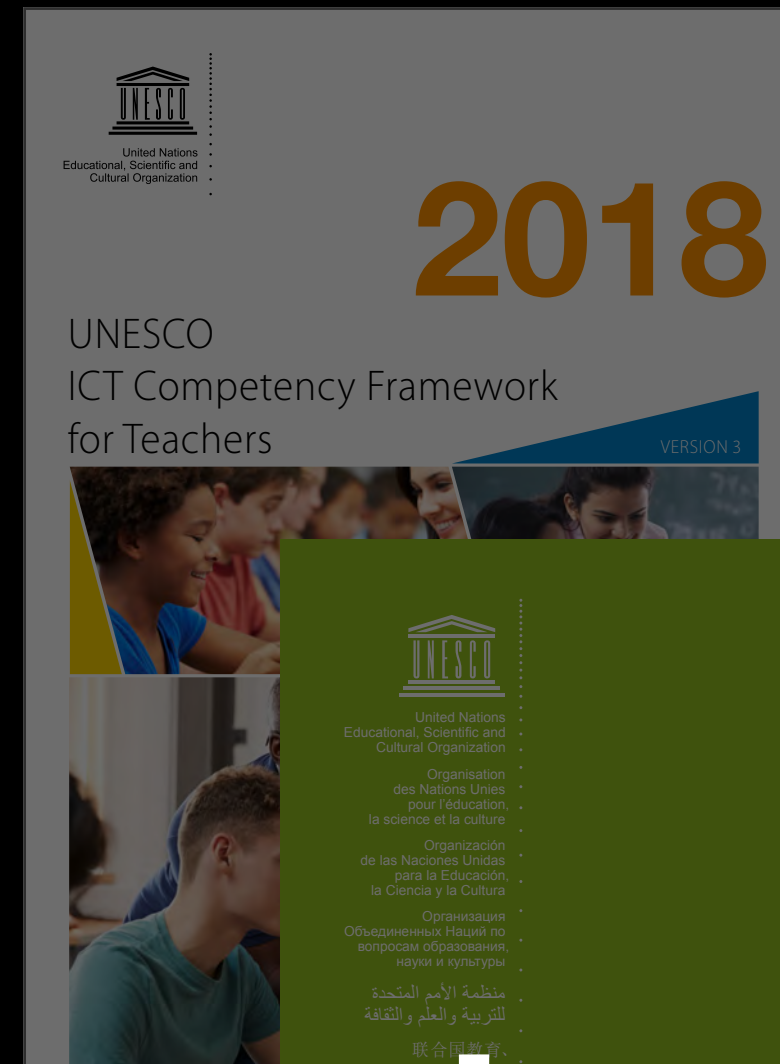
- **PROMOTE RESEARCH** encourage research initiatives on the responsible and ethical use of AI technologies in teaching, teacher training and e-learning p. 34); promote and support AI research, notably AI ethics research (p. 35)
- **RESEARCH-BASED DEVELOPMENT** ensure that any future developments with regards to AI technologies should be based on rigorous and independent scientific research (p. 35)
- **CULTURAL, EDUCATIONAL, ETHICAL EXPERTISE IN RESEARCH** include cultural studies, education, ethics, international relations, law, linguistics, philosophy, political science, sociology and psychology (p. 35); ensure that AI researchers are trained in research ethics and require them to include ethical considerations in their designs, products and publications (p. 35)
- **CRITICAL METHODOLOGICAL AWARENESS** encourage scientific communities to be aware of the benefits, limits and risks of their use (p. 35)



UNESCO approaches to AI in Education

2018 vs. 2024

educational research on AIEd



education enhancing benefits of ai



ai enhancing education and learning

ICT-literacy
ai literacy
ai awareness

critical thinking
creative thinking
communications skills
teamwork
socio-emotional skills

educational governance
assessment
individualizing learning
data-enhanced education

adaptive learning
personalization
lifelong learning
advance collaborative learning
accessibility (e.g. DIVA)

inclusion
& equity

gender
disability
migration
vulnerability

conditions (UNESCO VALUES)

human centeredness teacher professionalization fairness robustness security

avoiding biases accountability transparency

ethics explainability

human control AI ethics policies privacy data quality data protection actually addressing issues

education enhancing
benefits of ai



ai enhancing education
and learning

impact (UNESCO GOALS)

enhanced sustainability
(indirect, eg. less poverty)

enhanced sustainability
(due to ai-based optimization)

societal participation raising own voice

economic participation inclusive growth smart xyz cultural expression informed decision making

overcoming western &
chinese dominance of AI
system production

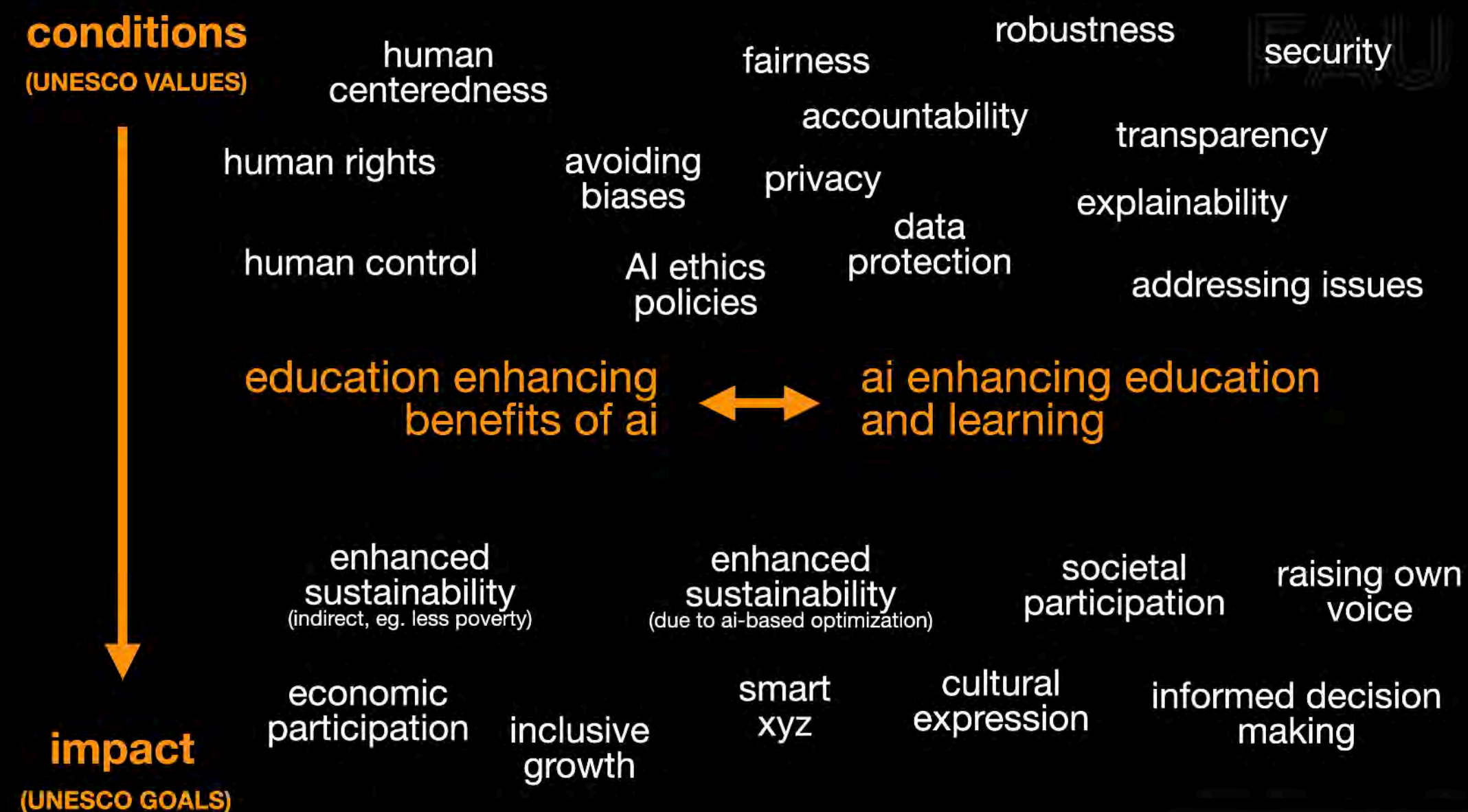
need of collaboration on *all levels of society*

public policy
processes

need of *international collaboration*

human rights

need to include *social, cultural, and
educational sciences* in design
processes



	epistemology postcolonial decolonial	equity, equality, justice, fairness	sustainability, climate change SDG, ESD	SUMME
Feng and Law - 2021	0	0	0	0
Tahiru - 2021	0	0	1	1
Talan - 2021	0	0	0	0
Zhang and Aslan - 2021	0	1	0	1
Pua et al. - 2021	0	1	0	1
Alhazmi et al. - 2023	0	0	1	1
Bahroun et al. - 2023	0	5	61	66
Nemorin et al. - 2023	2	6	2	10
Bond et al. - 2024	0	3	3	6
Martin et al. - 2024	0	6	0	6
SUMME	2	22	68	92
Durchschnitt	0,20	2,20	6,80	

Alhazmi, A. K., Alhammadi, F., Zain, A. A., Kaed, E., & Ahmed, B. (2023). AI’s Role and Application in Education: Systematic Review. In A. K. Nagar, D. Singh Jat, D. K. Mishra, & A. Joshi (Hrsg.), *Intelligent Sustainable Systems* (S. 1–14). Springer Nature. https://doi.org/10.1007/978-981-19-7660-5_1

Bahroun, Z., Anane, C., Ahmed, V., & Zacca, A. (2023). Transforming Education: A Comprehensive Review of Generative Artificial Intelligence in Educational Settings through Bibliometric and Content Analysis. *Sustainability*, 15(17), Article 17. <https://doi.org/10.3390/su151712983>

Bond, M., Khosravi, H., De Laat, M., Bergdahl, N., Negrea, V., Oxley, E., Pham, P., Chong, S. W., & Siemens, G. (2024). A meta systematic review of artificial intelligence in higher education: A call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education*, 21(1), 4. <https://doi.org/10.1186/s41239-023-00436-z>

Feng, S., & Law, N. (2021). Mapping Artificial Intelligence in Education Research: A Network-Based Keyword Analysis. *International Journal of Artificial Intelligence in Education*, 31(2), 277–303. <https://doi.org/10.1007/s40593-021-00244-4>

Martin, F., Zhuang, M., & Schaefer, D. (2024). Systematic review of research on artificial intelligence in K-12 education (2017–2022). *Computers and Education: Artificial Intelligence*, 6, 100195. <https://doi.org/10.1016/j.caeai.2023.100195>

Nemorin, S., Vlachidis, A., Ayerakwa, H. M., & Andriotis, P. (2023). AI hyped? A horizon scan of discourse on artificial intelligence in education (AIED) and development. *Learning, Media and Technology*, 48(1), 38–51. <https://doi.org/10.1080/17439884.2022.2095568>

Pua, S., Ahmad, N. A., & Khambari, M. N. M. (2021). Identification and Analysis of Core Topics in Educational Artificial Intelligence Research: A Bibliometric Analysis. *Cypriot Journal of Educational Sciences*, 16(3), 995–1009.

Tahiru, F. (2021). AI in Education: A Systematic Literature Review. *Journal of Cases on Information Technology*, 23, 1–20. <https://doi.org/10.4018/JCIT.2021010101>

Talan, T. (2021). Artificial Intelligence in Education: A Bibliometric Study. *International Journal of Research in Education and Science*, 7(3), 822–837.

Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence*, 2, 100025. <https://doi.org/10.1016/j.caeai.2021.100025>

Digitalisierung und KI aus UNESCO-Perspektive: Ethische und pädagogische Zielsetzungen im Spiegel der Forschung zu „AI in Education“

DGfE-Kongress 2024, 12.3.2024

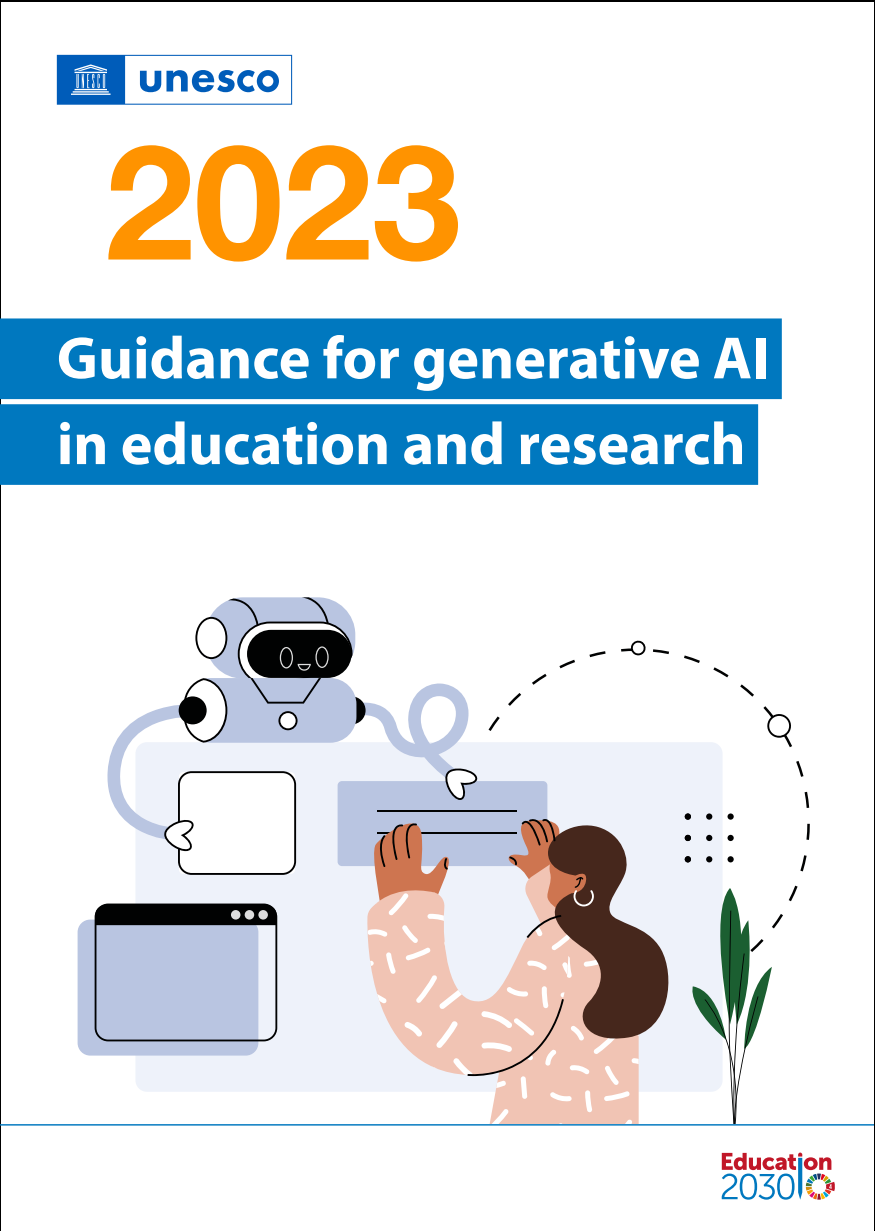


2. Controversies around generative AI and their implications for education

- 2.1 Worsening digital poverty
- 2.2 Outpacing national regulatory adaptation
- 2.3 Use of content without consent
- 2.4 Unexplainable models used to generate outputs
- 2.5 AI-generated content polluting the internet
- 2.6 Lack of understanding of the real world
- 2.7 Reducing the diversity of opinions and further marginalizing already marginalized voices
- 2.8 Generating deeper deepfakes

5. Facilitating creative use of GenAI in education and research

- 5.1 Institutional strategies to facilitate responsible and creative use of GenAI
- 5.2 A ‘human-centred and pedagogically appropriate interaction’ approach
- 5.3 Co-designing the use of GenAI in education and research
 - 5.3.1 Generative AI for research
 - 5.3.2 Generative AI to facilitate teaching
 - 5.3.3 Generative AI as a 1:1 coach for the self-paced acquisition of foundational skills
 - 5.3.4 Generative AI to facilitate inquiry or project-based learning
 - 5.3.5 Generative AI to support learners with special needs



6. GenAI and the future of education and research

- 6.1 Uncharted ethical issues
- 6.2 Copyright and intellectual property
- 6.3 Sources of content and learning
- 6.4 Homogenized responses versus diverse and creative outputs
- 6.5 Rethinking assessment and learning outcomes
- 6.6 Thinking processes