
Contents

Preface	xiii
Pushan KUMAR DUTTA, Vasileios PALIKTZOGLOU and Sonal TRIVEDI	
 Part 1. Foundations of AI-Enabled Education Transformation	 1
 Chapter 1. From Automation to Augmentation: AI and the Human-centered Transformation of Education	 3
Doaa Sami KHAFAGA	
1.1. Introduction	4
1.2. Literature review	9
1.3. Discussion	13
1.4. Conclusion and future directions	19
1.5. References	20
 Chapter 2. Smart Classrooms, Wise Choices: AI, Ethics and Human–AI Collaboration in Education.	 25
Amal H. ALHARBI	
2.1. Introduction	26
2.2. Literature review	30
2.3. Discussion	34
2.4. Conclusion and future work	38
2.5. References	41

Chapter 3. AI and the Digital Drive in Higher Education: A Dual-Driven Framework for Innovation and Entrepreneurship Learning	45
Amel Ali ALHUSSAN	
3.1. Introduction	46
3.2. Literature review	49
3.3. Discussion	55
3.4. Conclusion and future work	58
3.5. References	60
 Chapter 4. From Static Classrooms to Living Systems: AI-Driven Digital Twins as the Backbone of Adaptive, Human-centric Education	63
Marwa M. EID	
4.1. Introduction	64
4.1.1. Contributions	68
4.2. Literature review	69
4.3. Discussion	74
4.4. Conclusion and future work	80
4.5. References	81
 Chapter 5. Exploring AI and Digital Divide in Education	85
Pushan KUMAR DUTTA, Saurabh CHANDRA and Bhupinder SINGH	
5.1. Introduction	85
5.1.1. Overview of AI in education	87
5.2. Digital divide in education: dimensions of the digital divide and access inequality: devices, connectivity and infrastructure	87
5.3. Impacts of AI on the digital divide: AI as a tool for personalized learning and inclusion	88
5.4. Bridging the AI-driven digital divide: strategies for expanding access to AI education and tools	89
5.5. Role of the government, institutions and private sector in digital education and the role of AI	91
5.6. Building digital literacy and AI competence in marginalized communities	93
5.7. Conclusion and future prospects	94
5.8. References	96

Part 2. AI-Driven Pedagogy, Learning Innovation and Digital Experiences 99

Chapter 6. AI-Driven Pedagogy in Education: A Bibliometric and Focused Analysis of the Impact of Integrating ChatGPT 101

Ayesha Mubarak ALDHABAH ALKETBI and Hassan ABUHASSNA

6.1. Introduction	101
6.2. Literature review	103
6.3. Methodology	104
6.3.1. Research design	104
6.3.2. Data source and search strategy	105
6.3.3. Screening, inclusion and exclusion criteria	106
6.3.4. Data extraction and bibliometric analysis	107
6.3.5. Thematic mapping with VOSviewer	107
6.3.6. PRISMA flow summary	108
6.4. Results	109
6.4.1. Publication trends by year	109
6.4.2. Publications by country	110
6.4.3. Publications by educational institutions	111
6.4.4. Top contributing authors	111
6.4.5. Trends and emerging themes	114
6.4.6. Comprehensive analysis of studies that address ChatGPT integration in teaching and learning	115
6.5. Discussion	118
6.6. Conclusion	119
6.7. References	120

Chapter 7. The Role of Generative AI in Higher Education: A Systematic Literature Review and Bibliometric Analysis of Opportunities, Challenges and Pedagogical Implications 123

Fatema AL NABHANI, Mahizer Bin HAMZAH and Hassan ABUHASSNA

7.1. Introduction	124
7.2. Materials and methods	125
7.2.1. Research design	125
7.2.2. Search strategy	126
7.2.3. Data synthesis and analysis	126
7.2.4. Inclusion and exclusion criteria	127
7.2.5. Critical appraisal and discussion	128
7.2.6. Quality assessment	128
7.3. Results	130

7.3.1. The first phase (bibliometric analysis)	130
7.3.2. The second phase (the SLR)	137
7.4. Discussion	150
7.4.1. Pedagogical opportunities and applications	151
7.4.2. Ethical, technical and institutional challenges	152
7.4.3. Redefining the roles of students and educators	152
7.4.4. Theoretical frameworks, pedagogical models and institutional policies	152
7.4.5. Interdisciplinary collaboration	152
7.4.6. Practical implications	153
7.4.7. Ethical considerations and future directions	153
7.5. Conclusion	153
7.6. References	154
 Chapter 8. Exploring AI-based E-Government Decision-Making for the Development of Education.	 159
Muhammad YOUNUS, Halimah Abdul MANAF, Andi ADAWIAH and Ni Putu Tirka WIDANTI	
8.1. Introduction	159
8.2. Literature review	161
8.3. Research method	166
8.4. Results and discussion	167
8.4.1. Publication by years	167
8.4.2. Publication by country	168
8.4.3. Publication by authors	169
8.4.4. Publication by affiliation	169
8.4.5. Publication by subject area	170
8.4.6. Publication by source	171
8.4.7. Publication by funding	172
8.4.8. Keyword wise cluster	172
8.4.9. Future directions and recommendations	177
8.5. Conclusion	178
8.6. References	179
 Chapter 9. AR and VR Enhanced Personalized Digital Education Fostering Sustainable Education System	 187
Bhupinder SINGH, Pushan KUMAR DUTTA and Saurabh CHANDRA	
9.1. Introduction	187
9.1.1. Combining STEM and professional training	188
9.2. Conceptual foundations of AR and VR in education	189

9.3. Personalization through AI-driven adaptive learning	190
9.4. Immersive sustainability education	192
9.5. Enhancing accessibility and inclusion	194
9.6. Incorporation in STEM and professional training	195
9.7. Challenges and ethical considerations	196
9.8. Conclusion	197
9.9. Future scope	197
9.10. References	198

Part 3. Applications and Socio-Economic-Global Perspectives. 201

Chapter 10. Advancing Academic Research and Student Scholarship through AI 203

R.G. ABASZADE, V.H. ABDULLAYEV and I.X. NORMATOV

10.1. Introduction	203
10.2. AI technologies in academic research	204
10.2.1. AI for data acquisition and processing	204
10.2.2. AI in experimental design and modeling	205
10.2.3. AI in academic writing and publishing	206
10.3. AI applications in students' scholarly work	206
10.4. Conclusion	207
10.5. References	208

Chapter 11. Critical Digital Literacy and AI Training for Faculty and Students: Building Competence, Ethics and Resilience in Higher Education. 213

Saed Adnan MUSTAFA, Abdallah ALTRAD and Aseel ABUHAJJA

11.1. Introduction	214
11.2. Theoretical foundations	215
11.2.1. Evolution of digital literacy	215
11.2.2. Critical digital literacy	216
11.2.3. Critical pedagogy and transformative learning	217
11.2.4. Technology acceptance models relevant to AI adoption	217
11.2.5. Global institutional perspectives: UNESCO, EU and OECD	218
11.3. Current landscape of AI use in higher education	218
11.3.1. AI tools adopted by universities	218
11.3.2. How faculty engage with AI	219
11.3.3. Student interaction with AI tools	220

11.3.4. Institutional responses and challenges	220
11.3.5. Global case examples of AI use in higher education	221
11.4. Critical issues in AI-inspired higher education	221
11.4.1. Ethical risks of AI adoption	222
11.4.2. Data privacy and surveillance	222
11.4.3. Digital inequity and access gaps	223
11.4.4. Over automation and loss of human judgment	223
11.4.5. Academic integrity and the generative AI challenge	224
11.4.6. Institutional ethical responsibilities	225
11.5. Multilevel framework for critical AI literacy (CALF model)	225
11.5.1. Faculty development level	226
11.5.2. Student literacy level	227
11.5.3. Institutional level of governance	228
11.6. Practical recommendations	229
11.6.1. Curriculum redesign for AI-integrated learning	229
11.6.2. Ethical and responsible use guidelines	230
11.6.3. Faculty support and training mechanisms	231
11.6.4. Cross-disciplinary collaboration	231
11.6.5. Strengthening equity and inclusion	232
11.6.6. Institutional policy templates	233
11.7. Future directions and conclusions	233
11.7.1. Building resilience in AI-driven educational ecosystems	234
11.7.2. Preparing for advanced AI systems (AGI, multimodal AI and beyond)	234
11.7.3. The future of teaching and learning	235
11.7.4. Concluding argument: toward ethical, equitable and future-ready higher education	235
11.8. References	236
 Chapter 12. The Future of AI in Education	 239
Tareq N. HASHEM, Kuldeep BHALERAO, Sunday CLEMENT and Asokan VASUDEVAN	
12.1. Introduction	239
12.1.1. Theoretical background for AI in E-learning	240
12.1.2. Constructivist and socio-constructivist foundations	240
12.1.3. Data-driven decisions and learning analytics	240
12.1.4. Generative AI and the creativity thesis	241
12.1.5. Ethical and responsible AI frameworks	241
12.1.6. Technology acceptance and adoption models	241
12.2. Literature review	242
12.2.1. AI and personalized learning	242
12.2.2. Automated assessment and feedback	243

12.2.3. AI and creative learning	243
12.2.4. Ethical, social and governance concerns	243
12.2.5. AI, equity and accessibility	244
12.2.6. Teacher roles and professional identity in AI-enhanced classrooms	244
12.3. Methodology	245
12.4. Findings and discussion	245
12.5. Conclusion	246
12.6. References	246
List of Authors	249
Index	253