Artificial Intelligence in Education II

Editors:
Erol KOÇOĞLU
Şule EGÜZ

PEGEMKÜLTÜR

PEGEMKÜLTÜR

Editors: Prof. Dr. Erol KOÇOĞLU • Assoc. Professor Şule EGÜZ

ARTIFICIAL INTELLIGENCE IN EDUCATION II

ISBN 978-625-7740-97-5

Responsibility of the contents belongs to its author.

© 2026, PEGEM AKADEMİ

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage or retrieval system, without prior permission in writing from the publishers. Pegem Academy Publishing Training and Consultancy Services Tic. Ltd. Şti.It is a publishing house founded in 1998 in Ankara/Turkey which has been operating regularly for 28 years. Published books, it is included in the catalogs of higher education institutions. Pegem Academy has over 2000 publications in the same field from different authors. Detailed information about our publications can be found http://pegem.net..

1st Edition: December 2026, Ankara

Publication-Project: Selcan Özgürel
Typesetter-Graphic Designer: Umutcan Çağlayan
Cover Design: Pegem Akademi

Printed by: Sayfa Basım Sanayi Ticaret Ltd. Şti.
İvedik Organized Industrial Zone, Printing Houses Site,
1514th Street Number, No: 23-25,
Yenimahalle/ANKARA

Publishing House Certificate Number: 51818
Printing House Certificate Number: 77079

Contact
Pegem Akademi: Shira Trade Center
Macun Neighbourhood 204th Street Number: 141/A-33 Yenimahalle/ANKARA
Publishing House: 0312 430 67 50
Distribution: 0312 434 54 24
Preparatory Courses: 0312 419 05 60
Internet: www.pegem.net
E-mail: yayinevi@pegem.net
WhatsApp Line: 0538 594 92 40

PREFACE

The second volume of the study entitled 'The New Paradigm of Education: Artificial Intelligence' serves as a continuation of the first volume and is based on an assessment of various fields of study within the context of artificial intelligence. In this context, the study which focuses on rewriting the future of education offers important insights into the extent to which humans and artificial intelligence will influence education in the future.

Based on this study, it is evident that as we transition from the information age to the age of artificial intelligence, education is facing one of the most comprehensive transformations in history. Traditional understandings of learning, teaching methods and education systems are being re-examined and reshaped in line with the new opportunities offered by artificial intelligence. The issue is no longer merely about integrating technology into education, but about redefining the meaning, purpose and future of education itself. This work offers a broad perspective, ranging from AI-supported teaching and learning processes to personalised education, from smart learning environments to assessment and evaluation, and from the transformation of the teaching profession to issues of ethics, equality and digital responsibility in education. Furthermore, by examining the educational boundaries, opportunities and potential of the interaction between humans and machines, it opens up new areas of discussion regarding the education systems of the future.

Volume II of the study entitled 'A New Paradigm in Education: Artificial Intelligence' examines the transformation brought about by artificial intelligence in the world of education from a multi-dimensional perspective, thereby forging a strong intellectual bridge between today's educational realities and the learning paradigms of the future. We would like to express our sincere thanks to all the academic authors who have contributed to this study with their chapters.

CHAPTERS AND AUTHORS

Editors: *Prof. Dr. Erol KOÇOĞLU - Assoc. Professor Şule EGÜZ*

Chapter 1: Academic Writing and Research in the Age of Artificial Intelligence: Human–AI Collaboration

Assoc. Professor Danyal TEKDAL, İnönü University
ORCID No: 0000-0002-7071-0548

Eyyüp KORKMAZ, İnönü University

Chapter 2: Artificial Intelligence-Based Autonomous Adaptive Learning Systems and Personalized Learning

Assoc. Professor H. Gülhan ORHAN KARSAK,
Kırklareli University
ORCID No: 0000-0001-5927-6341

Research Assistant Derya KARADENİZ, İnönü University
ORCID No: 0000-0002-1495-7896

Chapter 3: Artificial Intelligence and Ethics in Education: Foundations of Responsible Use

Assoc. Professor Emine KARASU AVCI, Kastamonu University
ORCID No: 0000-0002-3135-2557

Chapter 4: Artificial Intelligence, Data, and Privacy: Secure Digital Ecosystems in Education

Prof. Dr. Hasan AYDEMİR, İnönü University
ORCID No: 0000-0002-3073-9194

Dr. Ömer Varol PALANCIOĞLU, Ministry of Education
ORCID No: 0000-0003-3858-3486

Chapter 5: Artificial Intelligence and Algorithmic Fairness in Education: From Equality to Inclusion
Assoc. Professor Şule EGÜZ, İnönü University
ORCID No: 0000-0002-3633-8957

Sinan BAYRAK, Afyonkarahisar Provincial Directorate of National Education

Chapter 6: Artificial Intelligence and Interdisciplinary Learning: New Approaches in Various Fields
Prof. Dr. Cemil ORUÇ, İnönü University
ORCID No: 0000-0002-9870-8597

Research Assistant Hülya BAŞTÜRK, İnönü University
ORCID No: 0000-0002-3587-6024

Chapter 7: Artificial Intelligence and Inclusive Education: New Opportunities for Diverse Learners
Prof. Dr. İsmail Hakan AKGÜN, Adıyaman University

Dr. Muhterem AKGÜN, Adıyaman University

Chapter 8: Artificial Intelligence, Environment and Sustainability Education: Future Learning Approaches
Dr. Muhterem AKGÜN, Adıyaman University

Chapter 9: Artificial Intelligence and Lifelong Learning: New Learning Opportunities in a Changing World
Dr. Selda AKSÜT, Independent Researcher

Chapter 10: Classroom Management in Artificial Intelligence–Enhanced Education
Dr. Suat ŞEHİR, Ministry of National Education
Dr. Mehmet DEMİRKOL, Dicle University
ORCID No: 0000-0002-0258-4666

Chapter 11: Trust and Human Oversight in Education in the Age of Artificial Intelligence: Transparency, Accountability, and Authorship Responsibility
Prof. Dr. İsmail ŞAN, İnönü University
ORCID No: 0000-0003-0780-0169

Chapter 12: Academic Integrity in the Age of Artificial Intelligence: Originality, Authorship, and Responsibility for Learning
Prof. Dr. İsmail ŞAN, İnönü University
ORCID No: 0000-0003-0780-0169

Chapter 13: Education Based on Artificial Intelligence and Computational Thinking
Dr. Sultan ŞAN, Ministry of National Education

CONTENTS

Preface iii
Chapters and Authors iv

CHAPTER 1

ACADEMIC WRITING AND RESEARCH IN THE AGE OF ARTIFICIAL INTELLIGENCE: HUMAN–AI COLLABORATION

Introduction 1
Academic Writing and Research in the Age of Artificial Intelligence 3
Artificial Intelligence-Supported Academic Writing Tools 15
Human–AI Collaboration 18
Conclusion 20
References 22

CHAPTER 2

ARTIFICIAL INTELLIGENCE-BASED AUTONOMOUS ADAPTIVE LEARNING SYSTEMS AND PERSONALIZED LEARNING

Introduction 26
Key Concepts 28
The Concept of Autonomy from the Perspectives of the Learner and the Artificial Intelligence System 29
The Historical Transition from Rule-Based Systems to AI-Based Autonomous Learning Systems 31
The Theoretical Foundation of Autonomous Learning Systems 32
Areas of Application for AI-Based Autonomous and Adaptive Learning Systems 34
From Fully Autonomous Systems to Cognitive Enhancers in Education 35
The Impacts of AI-Based Autonomous Adaptive Learning Systems in Education 37
Risks Associated with Artificial Intelligence-Based Autonomous Adaptive Learning Systems 43
Personalized Learning and Its Core Components 44
Core Technologies and Environments Supporting Personalized Learning 46
Ethical, Pedagogical, and Practical Challenges for Personalized Learning 48

The Impacts of AI-Based Personalized Learning Systems in Education 49
Conclusion 52
References 53

CHAPTER 3

ARTIFICIAL INTELLIGENCE AND ETHICS IN EDUCATION: FOUNDATIONS OF RESPONSIBLE USE

Introduction 59
The Rise of Artificial Intelligence in Education and Transforming Educational Practices 62
Conceptual Foundations of Artificial Intelligence Ethics 66
Ethical Risks of Using Artificial Intelligence in Education 69
Fundamental Principles of Responsible Artificial Intelligence Use in Education 71
The Roles of Teachers and Students in Responsible Artificial Intelligence Use 75
Practices and Case Examples of Ethical Artificial Intelligence Use in Educational Settings 78
- Use of Artificial Intelligence in Educational Practices 78
- Addressing AI Ethics in the Educational Process 79
- Ethical Use of Artificial Intelligence in Teacher Education 80
- Artificial Intelligence in Assessment and Evaluation 80
- Brief Case Examples 81

Conclusion 82
References 85

CHAPTER 4

ARTIFICIAL INTELLIGENCE, DATA, AND PRIVACY: SECURE DIGITAL ECOSYSTEMS IN EDUCATION

Introduction 87
AI Ecosystems and Data in Education 93
- The Changing Nature of Educational Data 93
- Student and Teacher Data in AI-Supported Educational Environments 99
- Learning Analytics and Educational Data Mining 108
- Generative AI and Data Privacy Risks 115
- Algorithmic Fairness, Discrimination, and Equity in Education 120

Privacy, Personal Data Protection, and Ethical Principles in the Use of AI in Education 123
The Right to Privacy and Personal Data Protection 123
Data Minimisation, Purpose Limitation, and Data Retention Periods 129
Third-Party AI Services and Data Sharing 135
Entering Student Data into Generative AI Tools 140
Data Security, Cyber Risks, and Security in AI Systems 144
Conclusion 151
References 153

CHAPTER 5

ARTIFICIAL INTELLIGENCE AND ALGORITHMIC FAIRNESS IN EDUCATION: FROM EQUALITY TO INCLUSION

Introduction 158
The Concept of Artificial Intelligence in the Educational Journey 161
The Conceptual and Historical Foundations of Education 161
The Historical Development of Artificial Intelligence 162
Applications of Artificial Intelligence in Contemporary Education 164
Artificial Intelligence and Algorithmic Justice/Injustice 164
'The Rule of 1s and 0s': Algorithmic Decision-Making 164
Equality, Fairness and Inclusion 166
Measures of Algorithmic Justice 167
Sources of Algorithmic Injustice: A Classification 168
Algorithmic Injustice Arising from Data and Representation Gaps 169
Algorithmic Injustice Arising from Measurement and Labelling 173
Algorithmic Injustice Arising from Design and Optimisation 176
Algorithmic Injustice Arising from the Developer and Organisational Structure 178
Algorithmic Injustice Arising from Feedback Loops 180
Documented Examples of Algorithmic Injustice in Education 183
Ways to Prevent Algorithmic Injustice 184
International and National Legal Regulations 185
Auditable and Explainable Algorithmic Systems 188
AI Literacy for Data Justice 190

Conclusion 192
References 195

CHAPTER 6

ARTIFICIAL INTELLIGENCE AND INTERDISCIPLINARY LEARNING: NEW APPROACHES IN VARIOUS FIELDS

Introduction 203
Interdisciplinary Learning 204
Artificial Intelligence-Supported Interdisciplinary Learning 211
AI-Supported Interdisciplinary Learning Process: A Proposal for Implementation 216
Pedagogical Opportunities, Limitations and the Teacher's Role 227
    Pedagogical Opportunities 228
    Limitations and Risks 231
    The Role of the Teacher 234
Conclusion 236
References 238

CHAPTER 7

ARTIFICIAL INTELLIGENCE AND INCLUSIVE EDUCATION: NEW OPPORTUNITIES FOR DIVERSE LEARNERS

Introduction 244
Inclusive Education 245
    Key Dimensions of Inclusive Education 250
Artificial Intelligence and Education 250
Artificial Intelligence and Inclusive Education 251
    AI-Based Adaptive Learning 252
    Innovative AI-Based Inclusive Education Tools 254
Conclusion 261
References 262

CHAPTER 8

ARTIFICIAL INTELLIGENCE, ENVIRONMENT AND SUSTAINABILITY EDUCATION: FUTURE LEARNING APPROACHES

Introduction 264
Sustainability and Sustainable Development Goals 265
Sustainable Development Education 268
Sustainability Competency 269
Sustainability Literacy 271
Artificial Intelligence and Education 272
Artificial Intelligence and the Environment 273
Sustainability and Artificial Intelligence 275
Conclusion 277
References 278

CHAPTER 9

ARTIFICIAL INTELLIGENCE AND LIFELONG LEARNING: NEW LEARNING OPPORTUNITIES IN A CHANGING WORLD

Introduction 281
Artificial Intelligence 284
Artificial Intelligence in Education 287
Lifelong Learning 293
Artificial Intelligence and Lifelong Learning 297
New Learning Opportunities in a Changing World 302
Personalized Learning 306
Accessibility 309
Data Analysis and Feedback 311
Adaptability 314
Conclusions 316
References 318

CHAPTER 10

CLASSROOM MANAGEMENT IN ARTIFICIAL INTELLIGENCE–ENHANCED EDUCATION

Introduction 326
Theoretical Foundations of AI-Supported Classroom Management 335
- Traditional Approaches to Classroom Management and Artificial Intelligence 337
- Proactive Approaches to Classroom Management and Artificial Intelligence 338
- Developmental (Humanistic and Student-Centred) Approaches to Classroom Management and Artificial Intelligence 339
- Holistic (Systemic and Hybrid) Approaches to Classroom Management and Artificial Intelligence 340

Integration of Classical and Contemporary Classroom Management Theories with Artificial Intelligence 342
Applications of Artificial Intelligence in Classroom Management 344
- Automation of Administrative and Routine Tasks 345
- Personalised Learning Management and Real-Time Feedback 346
- Monitoring Student Behaviour and Proactive Intervention 348
- Supporting Students' Social-Emotional Development 350

The Role of Teachers and Human–AI Collaboration in AI-Supported Classroom Management 352
- The Evolving Role of Teachers 353
- Balancing Algorithmic Recommendations and Human Judgement: A Human-in-the-Loop Approach 356

Establishing Participatory Digital Classroom Norms 359
- Continuous Professional Development of Teachers 360
- A Human-Centred Hybrid Model for Future Classroom Management 362

References 364

CHAPTER 11

TRUST AND HUMAN OVERSIGHT IN EDUCATION IN THE AGE OF ARTIFICIAL INTELLIGENCE: TRANSPARENCY, ACCOUNTABILITY, AND AUTHORSHIP RESPONSIBILITY

Introduction 382
Theoretical Framework: Transformation, Learning Responsibility, and Post-Plagiarism 385
- Artificial Intelligence and Learning Theories 385
- Learning Responsibility, Cognitive Load, and Creative Agency 386
- From Plagiarism to Post-Plagiarism and the Evolution of Institutional Responses 387

Trust, Transparency, and Explainability 388
Human Oversight, Agency, and Accountability 392
Authorship and Publication Ethics: Non-Delegable Human Responsibility 395
Originality and the Detection Problem: The Limits of Tools and the Equity Dilemma 398
- Conceptual and Technical Limitations of Detection Tools 398
- Human Evaluator Fallibility and Automation Bias 399

Ethics, Bias, Privacy, and Equity 400
Learning Processes, Analytics, and Assessment 404
- Cognitive Effects and Self-Regulation 404
- Learning Analytics and Predictive Modelling 406
- Feedback and Assessment Design 408

Policy, Governance, and Institutional Capacity 410
Perception, Acceptance, and Adoption 415
Evidence Base, Limitations, and Research Agenda 416
Conclusion 418
References 422

CHAPTER 12

ACADEMIC INTEGRITY IN THE AGE OF ARTIFICIAL INTELLIGENCE: ORIGINALITY, AUTHORSHIP, AND RESPONSIBILITY FOR LEARNING

Introduction 433
Theoretical Framework: Responsibility for Learning from Plagiarism to Post-Plagiarism 434
Authorship and Responsibility: Non-Transferable Human Agency 441
Originality and the Detection Problem: The Limits of Tools and the Fairness Dilemma 447
The Surveillance Regime and the Fallacies of Human Evaluators 452
Assessment Design, Institutional Governance, and Research Integrity 459
Synthesis and Evaluation 464
Research Gaps and Future Directions 472
Conclusion 476
References 479

CHAPTER 13

EDUCATION BASED ON ARTIFICIAL INTELLIGENCE AND COMPUTATIONAL THINKING

Introduction 485
The Conceptual Foundations of Computational Thinking and Debates Over Its Definition 486
- Historical Origins and the Evolution of the Definition: From Papert to Wing 486
- Dimensions and Sub-skills of CT and Its Delimitation from Other Types of Thinking 488
- Conceptual Boundaries Between CT, Programming, and Coding 489

The Conceptual and Functional Relationship Between Computational Thinking and Artificial Intelligence 490
- Reciprocal Relationship, Overlapping Components, and Forms of Integration 490
- The Conceptual Intersection Between AI Literacy and CT and the Prerequisite Debate 491
- Conceptual Overlaps Between Prompt Engineering and CT Elements 492

Measurement Instruments in Computational Thinking and Artificial Intelligence and Construct Validity Issues 493
CT Measurement Instruments: Performance Tests, Self-Report Scales, and Product Assessments 493
AI Literacy and Attitude Scales: Psychometric Properties and Adaptation Processes 495
Construct Validity Issues, Measurement Traditions, and the Redesign of Assessment Approaches 497
AI-Supported Computational Thinking Instruction: Pedagogical Models, Practices, and Contradictory Effects 498
AI-Supported Instructional Practices: Scaffolding, Prompt Engineering, and Adaptive Feedback 498
Cognitive Offloading, Overreliance, and the Contradictory Effects of Generative AI 500
Pedagogical Models: Project-Based Learning, Flipped Classroom, Gamification, and Collaborative Learning 501
Distribution of Computational Thinking and Artificial Intelligence Studies by Educational Level and the Generalizability of the Evidence Base 503
CT and AI Education in Early Childhood and Primary School 503
CT and AI Practices in Middle and High School 504
CT and AI in Higher Education 505
Educational Levels 506
Holistic Analysis 507
The CT-AI Relationship and Pedagogical Implications 507
Methodological Evaluation and Limitations 508
Dimensions of Equity and Inclusion 509
Research Gaps and Future Directions 510
Theoretical and Conceptual Gaps 510
Methodological and Measurement Gaps 511
Pedagogical and Policy Gaps 511
Conclusion 512
References 516

CHAPTER 1

ACADEMIC WRITING AND RESEARCH IN THE AGE OF ARTIFICIAL INTELLIGENCE: HUMAN–AI COLLABORATION

Assoc. Professor Danyal TEKDAL, İnönü University
ORCID No: 0000-0002-7071-0548

Eyyüp KORKMAZ, İnönü University

Introduction

From the past to the present, a variety of tools have been utilised to enhance the quality and effectiveness of education. One of the most significant of these tools is artificial intelligence, the use of which is becoming increasingly widespread both in education and in all areas of life. With the rise in internet usage and digitalisation, the integration of artificial intelligence into daily life and its correct use have become increasingly important. This is because artificial intelligence is becoming an increasingly preferred tool in education, as it not only offers a personalised, individualised learning environment but also eliminates the need to rely on a specific teacher or fixed timetable.

By synthesising data such as human knowledge, experience and life experiences to answer questions, encourage new teaching and learning methods, assist in problem-solving