Challenges and Limitations of Generative AI in Education

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Seyfullah Gökoğlu
Bartin University
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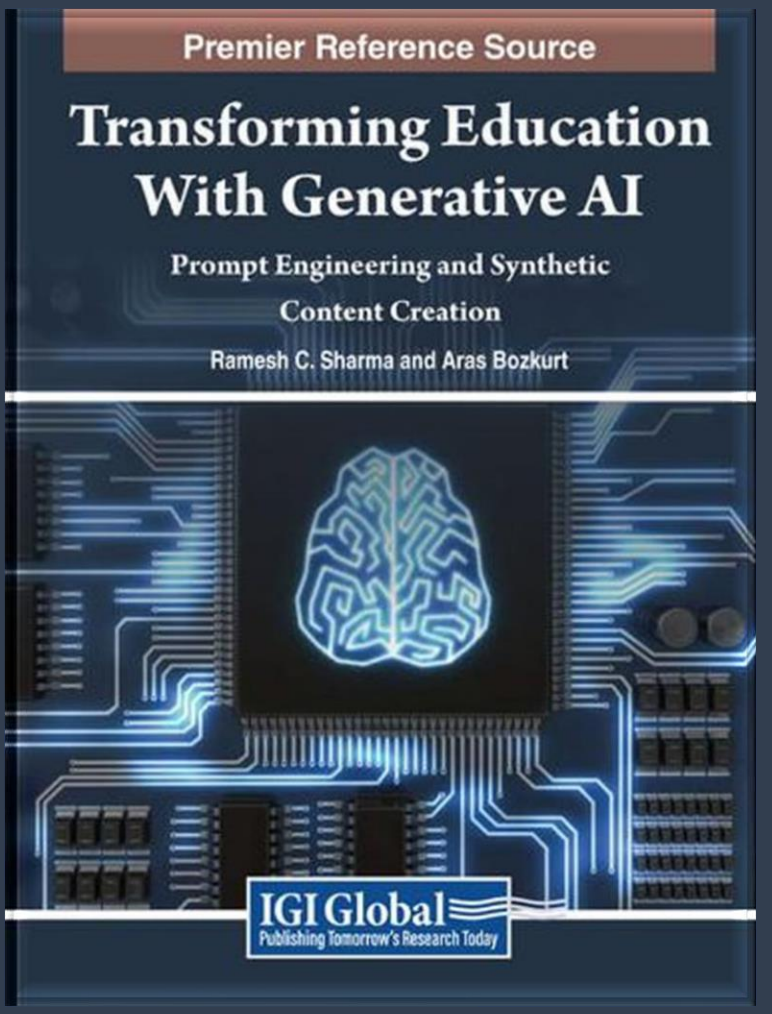
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Transforming Education With Generative AI
Prompt Engineering and Synthetic Content Creation
Ramesh C. Sharma and Aras Bozkurt
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Transforming Education With Generative AI:

Prompt Engineering and Synthetic Content Creation

Ramesh C. Sharma
Ambedkar University, Delhi, India

Aras Bozkurt
Anadolu University, Turkey

A volume in the Advances in Educational Technologies and Instructional Design (AETID) Book Series

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This book is dedicated to those who perceive learning as a lifelong journey and, therefore learn, unlearn, and relearn in order to constantly experience the unbearable lightness of learning.

Table of Contents

Detailed Table of Contents

ethical principles (i.e., autonomy, ethical design, and commercialization), however, were not emphasized in all the documents addressed. The results of the study are expected to provide valuable knowledge on how to use AI in education ethically and responsibly.

This chapter explores the potential of generative AI to transform education and empower teachers. It analyzes pedagogical enhancements enabled by these tools, including personalized and simulated learning, tailored assessments, teacher-student collaboration, and streamlined workflows. The author examines how AI's data-driven insights can boost responsiveness, motivation, inclusion, and experiential understanding. While promising, integrating AI demands thoughtful oversight to uphold humanistic values. The author emphasizes that teacher wisdom must direct implementation ethically, and learners need support developing AI literacy. Though rapidly advancing, generative tools should empower, not replace, educator and student agency. This chapter provides a balanced analysis of AI's possibilities and prudent perspectives for education. With ethical foundations uplifting expertise and learner voices alike, classrooms can judiciously leverage AI to expand responsive, enriched learning benefitting all.

This chapter aims to provide a practical guide for using prompt engineering in the educational setting. It will address the necessity of recognizing the reality of change throughout the history of educational practice & its connection to new methods and strategies that prompt engineering presents. Readers will learn how to assist students in generating effective prompts through using an effective prompt engineering model. Readers will then learn how to integrate learning theories with the prompt engineering model to best support student learning. Readers will learn how to connect prompt engineering in classroom teaching with educational standards to create effective learning objectives. The design of higher-level thinking and relevant assessments required by prompt engineering's use in schools, is outlined in detail. This chapter is written for educators, researchers, and students who are interested in learning how prompt engineering could be implemented in the classroom successfully at all levels.

AI can generate and provide customized, inclusive, and engaging learning experiences. This chapter emphasizes the collaborative partnership between human educators and AI systems, highlighting its crucial role in maximizing AI's potential. Educators provide context and guidance through adaptive learning platforms, AI-powered feedback, and AI-enhanced content creation to ensure students receive a personalized, contextually relevant education. Human knowledge, including pedagogical insight and ethical considerations, complements the capabilities of artificial intelligence. AI promises personalized perpetual learning, enhanced accessibility, and dynamic curriculum design in the future. This vision of

collaboration promotes critical thinking, problem-solving, and inclusiveness. Educators, institutions, policymakers, and AI developers must ensure that education remains empowering, inclusive, and excellent for AI to be integrated responsibly. By embracing this partnership, education becomes more accessible, individualized, and influential.

In today's dynamic landscape of higher education, the pervasive issue of faculty burnout has emerged as a pressing concern, casting a shadow over the well-being of educators and the overall quality of instruction. This chapter proposal embarks on an exploration of how generative artificial intelligence (AI) can act as a transformative force within higher education, specifically focusing on its potential to empower faculty members, enhance pedagogical practices, and mitigate the alarming prevalence of burnout. The chapter's central objectives are multifaceted, commencing with a comprehensive examination of the multifaceted phenomenon of faculty burnout. This includes an analysis of the contributing factors such as the escalating workloads, the shift towards online and blended learning modalities, and the overwhelming administrative duties that educators must shoulder. The aim here is to illuminate the multifaceted nature of burnout, thereby fostering an enhanced understanding of its urgency and the critical need for sustainable solutions.

This chapter examines the role of generative AI (GenAI) and robotics in special education, particularly for autism spectrum disorder (ASD). It highlights the revolutionary impact of GenAI and AI-powered educational technologies (AIEd) in early diagnosis, personalized learning, and fostering independence in individuals with ASD. Additionally, robotics is presented as a vital tool for enhancing social and communication skills. The integration of these technologies in education requires addressing ethical, privacy, and security concerns. The chapter emphasizes technological literacy, including prompt engineering, to optimize the use of GenAI and robotics. It also explores the unique relationship between individuals with ASD and robots, suggesting a promising future for these technologies in special education. The conclusion calls for ongoing research and development to create more equitable and accessible educational systems, harnessing the power of GenAI and robotics for individuals with ASD.

With the development of technology, AI has been the subject of intense research in the field of education, with ChatGPT, the adoption of generative AI in education. But generative AI has only gained attention in the last few years. Therefore, there are not many research results on the application of generative AI in

flipped classrooms, and there are many questions that need to be explored and verified by researchers. In this study, a flipped classroom combined with generative AI tools to promote personalized learning was studied. A theme in the music course was selected for course design and a pilot study was conducted. The results show that teachers and students have very different views on this research, and this phenomenon is summarized and analyzed, and finally some suggestions are made to help better use generative AI tools to promote personalized learning in the flipped classroom.

The aim of this chapter is to provide university educators with a range of ideas and alternatives for the use of artificial intelligence (AI) tools in their teaching to integrate concepts of sustainability, which are currently highly demanded in the professional activity. Artificial intelligence has revolutionized many areas of economic activity, offering new solutions and/or optimizing certain processes. Training students in these tools is essential for successful integration into the labor market in a technologically evolving era. This training must be carried out in coordination with educational policies, and within a teaching program that includes ethical aspects in the handling of these tools. Artificial intelligence can be key to improving sustainability in multiple areas of engineering as shown in various examples and ideas in this work.

Generative AI systems are increasingly present in our daily lives, helping us make crucial decisions. They use machine learning algorithms and tools, fed with millions of data collected from the web, producing entirely new information and generating variations. And this is not just limited to texts — it can produce images, audio, videos, even code, or new programming languages. There are several fields where generative AI can have a considerable impact in the coming years. In this context, the issues proposed in this chapter are: What is generative AI? What is prompt engineering? How to transform education using generative AI and prompt engineering in creating synthetic content? To respond to the research problem, the following objective will be achieved: Investigate how to transform education using generative AI and prompt engineering in the creation of synthetic content. It is concluded that generative AI tools can also help create more efficient exercises. Teachers and educators can use technology to create instructional materials and present summaries of concepts.

Preface

As we stand at the precipice of a new era in education, *Transforming Education with Generative AI: Prompt Engineering and Synthetic Content Creation* emerges as a beacon of knowledge, providing profound insights into the intricate relationship between education, generative AI, and prompt engineering. This tome is a comprehensive exploration of the revolutionary changes generative AI introduces to the educational landscape, aiming to redefine our understanding and application of this technology in learning environments.

The emergence of generative AI signifies a pivotal evolution in the field of human-machine interaction, particularly by focusing on prompt engineering. This book delves deep into the heart of this transformative phenomenon, meticulously unraveling the intricacies of prompt engineering and synthetic content creation in the educational landscape.

In an age where digital technologies permeate every aspect of our lives, understanding and leveraging generative AI in education is crucial. In this context, the book *Transforming Education with Generative AI: Prompt Engineering and Synthetic Content Creation* presents a total of 22 chapters that collectively explore the multifaceted impacts of generative AI in education. The chapters cover a broad spectrum of topics including the historical evolution and positive aspects of generative AI, its role in teacher training, empowering educators through generative AI tools, the art of co-creation, and the ethical considerations in AI implementation. The book also delves into specific applications such as AI's role in special education, challenges in AI integration, the potential of AI in flipped classrooms, and the future of curriculum development. Each chapter contributes unique insights into how generative AI is reshaping the educational landscape, highlighting its potential, challenges, and implications.

This book stands as a comprehensive guide, illuminating pathways for harnessing the potential of generative AI in education. It equips readers with the necessary knowledge to navigate this novel terrain and significantly contributes to the discourse on AI's transformative role in educational paradigms.

In all, the book serves as an essential resource for understanding and shaping the future of education in the age of AI. It invites readers to embark on a journey of discovery and innovation, fostering an educational landscape continually enhanced by the boundless possibilities of generative AI.

Acknowledgment

In their book, editors Dr. Ramesh C. Sharma and Dr. Aras Bozkurt offer a profound acknowledgment to the visionaries who laid the foundations of artificial intelligence. They express gratitude towards John McCarthy, Marvin L. Minsky, Nathaniel Rochester, and Claude E. Shannon for their groundbreaking proposal that first conceptualized the term artificial intelligence, or AI as it is often called. The influence of Isaac Asimov, particularly through his imaginative *Three Laws of Robotics*, is hailed for its significant impact on AI exploration and human-machine interaction. Additionally, they emphasize Alan Turing's pivotal contributions, notably his provocative inquiry, "Can machines think?" and his innovative Turing Test, which continue to shape and inspire the field of AI studies. This work is a testament to their legacy. And finally, we dedicate this book to all artificial intelligence researchers who have contributed to the transformation of what was once fiction into reality by travelling beyond the dreams of mankind.

About the Contributors

Ramesh Sharma, Ph.D., is currently working as Director of Human Resource Development Centre at Dr B R Ambedkar University Delhi, India. Previously he has served as an Associate Professor of Educational Technology and Learning Resources in the Educational Technology Unit at Wawasan Open University, Malaysia; Visiting Professor at University of Fiji, Fiji; Commonwealth of Learning as Director of the Commonwealth Educational Media Centre for Asia, New Delhi; Indira Gandhi National Open University, India; and University of Guyana, Guyana, South America. He is the co-Editor of the 'Asian Journal of Distance Education'. In addition, he has been associated with peer reviewed journals as Reviewer, Editor and Editorial Advisory Board member in the field of Open and Distance Learning such as "Distance Education", " International Review of Research in Open and Distributed Learning (IRRODL)", "International Journal of Distance Education Technologies (IJDET)", and "Indian Journal of Open Learning (IJOL)". He is also on the Editorial Advisory Board and an author for the "Encyclopedia of Distance Learning (4 volumes), 2005".

Aras Bozkurt is a researcher and faculty member at Anadolu University, Türkiye. With MA and PhD degrees in distance education, Dr. Bozkurt's work focuses on empirical studies in areas such as distance education, online learning, networked learning, and educational technology. He applies critical theories like connectivism, rhizomatic learning, and heutagogy to his research. Dr. Bozkurt is also interested in emerging research paradigms, including social network analysis, sentiment analysis, and data mining. Dr. Bozkurt's studies also cover the integration of artificial intelligence technologies into educational processes in the axis of human-machine interaction. His dedication to advancing the field is reflected in his editorial roles as the Editor-in-Chief of Open Praxis and Asian Journal of Distance Education, as well as his roles as an associate editor for prestigious journals like Higher Education Research and Development, Online Learning, eLearn Magazine, and Computer Applications in Engineering Education.

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Muhammad Waleed Afzal is Head of School for Engineering programs of Liverpool John Moores University UK and Pearson UK, being offered at Beaconhouse International College Pakistan. He has directly supervised the establishment of Engineering programs including Labs, Resource management and curriculum delivery mechanisms at the colleges in Islamabad, Lahore and Faisalabad. He has also stayed closely associated with research at his parent university and collaborated on many projects across different institutes and researchers.

Ömer Akkaş graduated from Gazi University, Faculty of Education, Foreign Languages Education and is currently pursuing a master's degree in Educational Technology at the Institute of Educational Sciences at the same university. He is currently working as a lecturer at Ankara Yıldırım Beyazıt University. Devoted to the realms of artificial intelligence and educational tools, he is focused on in-depth research to contribute valuable insights and advancements to both fields.

Tutaleni Asino is an associate professor of Learning, Design, and Technology in the school of educational studies in the College of Education and Human Sciences at Oklahoma State University. His areas of research, writing, and presentations include: Open Access, diffusion of innovation, organizational development, adoption and use of emerging technologies and learning environments, Mobile Learning, Comparative International Education, indigenous knowledge, and the role of culture in the development and evaluation of learning technologies. He is an active member of the Comparative International Education Society (CIES), Association for Educational Communications and Technology (AECT), and Society for Information Technology and Teacher Education (SITE).

Nafees Ayub, a dynamic force in the realm of Computer Science education, has charted an illustrious journey through the corridors of academia. As a seasoned lecturer at Government College University, Faisalabad, Mr. Nafees Ayub has not only been a beacon of knowledge but a catalyst for transformation in the lives of countless students.

Şener Balat is an educational technologies specialist working at Bingöl University. Holding a Ph.D. in computer and instructional technologies education, Balat has conducted research in areas such as distance education, artificial intelligence in education, e-learning, remote on-the-job training, and metaverse technologies in education. Focused on making a significant contribution to the higher education sector through his academic career, Balat works towards providing students with an effective learning experience and integrating technology into educational processes.

Rosa María Benavente is a University Professor in the area of Agroforestry Engineering, teaching subjects related to electrical engineering. Participates in educational innovation projects to improve teaching in the field of engineering.

Anselm Böhmer, Dr., is a professor of General Education at Ludwigsburg University of Education, Germany. He received his Doctorate at Freiburg University of Education in 2001. He published eight books and seven edited volumes, also more than 80 articles and book chapters. His main areas of research are education in late modernity, global education, diversity, social differences, migration, and culturalization.

Stephen Bolaji, Ph.D., is a research active academic and teaches graduate programs and secondary curriculum humanities units in the Discipline of Education, Faculty of Arts and Society, Charles Darwin University, Australia. Prior to joining CDU, he was a lecturer at the Department of Educational Foundations and Counselling, Faculty of Education, University of Lagos, Nigeria. His research interest is in Educational foundations – Comparative, Sociology, History, Philosophy and Policy studies in education.

Sarinporn Chaivisit, aka Yam, is a lecturer of Educational Technology in the Faculty of Education at Kasetsart University, Thailand. Her research interests include artificial intelligence, augmented and virtual reality, design and development of multimedia instructions, e-learning, emerging technologies in education, gamification, and innovative learning environments.

Lay Kee Ch'ng is a learning designer and a registered Professional Technologist with the Malaysia Board of Technologists (MBOT). She has vast experience in creating and producing digital instructional learning materials for higher education institutions and business enterprises. Her research and writing interests are rooted in digital learning, educational technology, and instructional design.

Rui Cruz is Assistant Professor at Universidade Europeia (Laureate International) in Lisbon, since 2001. PhD in Management and Marketing from the University of Sevilla, Spain, also has a DEA from the same university and an MBA in Strategic Foresight at IESFF, Lisbon. With over 30 years teaching experience at the service of several higher education institutions in the public and private sector, actually teaches academic master's and global graduate programs taught in English in the areas of marketing, logistics and supply chain. Advisor and Tutor in master´s dissertations in the areas of marketing, digital marketing and entrepreneurship his research interests are in the areas of business strategy, strategic marketing, industrial and services marketing and relationship marketing and has scientific articles and books published national and internationally. He worked in the field of advertising for large international agencies such as Publicis, ITT marketing services and BBDO in Portugal and abroad, throughout the 80´s. Was also marketing director of one of the largest Portuguese banking groups and business consultant in the areas of strategy and innovation.

Gökhan Demirdöken is an independent researcher. He taught Aviation English for more than four years. He received his MA in English Language and Teaching from Bahçeşehir University in 2019. His master's thesis reported on ESP needs analysis of prospective pilots studying in a military higher education institution in Turkey and taking the Aviation English course. He is now a PhD candidate in Bahçeşehir University Department of English Language Teaching, and his dissertation focuses on a simulation-based ESP Aviation English training as well as the assessment of student pilots' readback performance. He has published high-quality SSCI-indexed articles, and he is a member of IESPTA (International ESP Teachers' Association).

Ajita Deshmukh is currently the Program Leader of MSc eLearning, a unique Program she played a key role in developing at School of Education and Research, MIT-ADT University. She is a Chemistry Educator turned Education Technologist who seeks to make education accessible and fun. Her popular podcast titled "Che-Mystery" has been awarded at the 25th National AICEAVF. Her expertise makes her a popular face for NCERT sessions and HRDC of various Universities. Her sessions about online pedagogy and social media in education can be found at NCERT Official channel as well as other institutional channels on YouTube. She is a mentor and Hub coordinator for OER4BW (Open Education for Better World), a UNESCO project by University of Nova Gorica, Slovenia. She has previously worked as an Assistant Professor (ICT) at CIET, NCERT and as a Training Coordinator at Teaching-Learning Center, SNDT Women's University, Mumbai. She has contributed as a Co-Instructor, Resource Person and Teaching Associate for NPTEL-SWAYAM and other reputed institutions. Her areas of interest are Online education, particularly Open Education and her PhD brought out how to leverage Social Media, particularly Facebook in Education.

Marcella Dillig is a researcher and lecturer at the Ludwigsburg University of Education, Germany. She studied Philosophy, Politics, Economics, and Law at the University of Stuttgart and the Leuphana University Lüneburg. Her interdisciplinary research encompasses the philosophy of artificial intelligence and social justice.

Nazmi Dinçer is a dedicated English instructor at the Turkish National Defence University, Air Force Academy and a Ph.D. candidate in Educational Technology at Bahçeşehir University. With years of experience in the Department of Foreign Languages, he specializes in training prospective pilots to communicate effectively with air traffic controllers in accordance with ICAO standards. His research is rooted in the intersection of educational technology and foreign language education, delving into areas such as distance education, multimedia learning, artificial intelligence, and game-based learning

Elif Elumar-Efe is a faculty member and researcher at Pamukkale University, Faculty of Education, Department of Special Education. Elumar-Efe's research interests are autism spectrum disorder and the use of advanced technologies in special education.

Arda Eren is a graduate student at Gazi University, Institute of Educational Sciences, Department of Social Studies Education. His research focuses on virtue epistemology and vice epistemology and its relation to social studies education.

José Luis García is a Professor in the Department of Agroforestry Engineering, he is the coordinator of the Educational Innovation Group in Electrical and Automation Technologies for Rural Engineering. He has participated in numerous educational innovation projects aimed at improving learning and assessment systems. His teaching focuses on electrical installations and energy optimization in agro-industrial facilities.

Şahin Gökçearslan completed his undergraduate education at Hacettepe University, Department of Computer Education and Instructional Technology (CEIT) in 2002. He completed his master's degree (2005) at the same university and department, and received his doctoral degree (2013) in Ankara University Educational Technology program with a thesis on teaching computer programming through distance education. In July 2018, he was awarded the title of Associate Professor. He has participated in national projects as well as internationally supported projects. His research interests include computer programming teaching, Internet of Things (IoT), generative artificial intelligence, problematic technology use, distance education, individual characteristics and learning.

Seyfullah Gökoğlu received his Ph.D. in Computer Education and Instructional Technology from the Karadeniz Technical University in 2019. He received the degree of Associate Professor in 2023 and is currently a faculty member of Bartın University, Department of Computer Technology & Information Systems. He researches and publishes widely on artificial intelligence and virtual reality in education.

Natasha Gomes is a language researcher, cultural mediator and game enthusiast with over a decade of teaching experience in India and France. Her doctoral thesis focuses on the cultural contextualisation of French language textbooks published in India. As a Teach For India Alumna, she is passionate about educational equity, creation of contextualized Teaching-Learning Materials and the use of active learn-

ing techniques to improve learning outcomes. She has co-curated and co-created over 100+ OERs in French for DIKSHA, has been a Teaching Associate in 5 MOOCs offered on SWAYAM and is EdTech Society's certified Trainer in Discussion Forum moderation and engagement. She was conferred the Exceptional French Language Teacher Award 2021 by the French Embassy in India and the Indian Association of Teachers of French. She currently works as an Assistant Professor at Shenoi Goembab School of Language and Literature, Goa University, India.

Scott Gregory is an Assistant Professor of Teacher Education at Fort Hay State University. He earned his Ed.D. degree from the University of Nebraska-Lincoln in 2023. Dr. Gregory's research interests include curriculum & instruction, social foundations of education, and teacher preparation.

Ercenk Hamarat is a faculty member at Gazi University, Gazi Faculty of Education, Department of Social Studies Education. While his MA (from Balıkesir University in 2011) is about attitudes toward information and communication technologies, his PhD (from Gazi University in 2014) is about the philosophy of social studies education. He continues his theoretical and practical research on teacher training within the main topics of education, philosophy, and technology.

Illie Isso has been working as a research assistant at the Ludwigsburg University of Education (LUE) in the DAAD-funded IQ-Lab project since April 2023. Since May 2021, he is also a doctoral candidate in history at the Ludwigsburg University of Education. Previously, he completed his teaching degree in history, ethics, technology, and physical education with the first state exam. His research interests include history, education in the context of social inequality, diversity, inclusion, and migration.

Sukanda Jongsermtrakoon is a lecturer in the Department of Educational Technology in the Faculty of Education at Kasetsart University. Additionally, she holds the role of an Educational Technology Consultant, providing her expertise to various public and private organizations in Thailand. Her areas of research interests encompass Personal Learning Networks, Open Educational Resources, Massive Open Online Courses, e-learning, classroom innovation and technology integration, teacher professional development, and Learning Experience Design.

Ilker Kayabas is a graduate of Anadolu University's Computer Education and Instructional Technology Department in 2004, has had a notable career in educational technology. Kayabas earned his master's and doctorate from Anadolu University's Distance Education Department. He was appointed as a RA and later as an assistant professor in the same department. He served as the Assistant Director at the Anadolu University Open Education Faculty Learning Technologies Research and Development Centre from 2004 to 2015. Kayabas has designed and developed various educational technologies, including web applications, learning management systems, interactive e-course software, e-exam interfaces, and e-portfolio applications for organizations like universities, ministries of the Turkish government, and businesses. He founded My Work Passport (in 2017) and UTEx (in 2019) e-learning initiatives. His research interests include artificial intelligence, e-learning experience design, learning analytics, gamification and game development, UX/UI design, full-stack web development, and mobile development, with a current focus on AI-powered learning technologies.

Bünyami Kayalı completed his undergraduate education at Erzincan University, Department of Elementary Mathematics Teaching. He completed his master's and doctoral studies at Atatürk University, Department of Computer and Instructional Technologies. He is still working as a lecturer at Bayburt University, Vocational School of Technical Sciences, Department of Computer Technologies. His research interests include digital transformation, distance education and artificial intelligence.

Mustafa Kayyali, Ph.D., is an ardent advocate for excellence in higher education, driven by a relentless pursuit of quality, recognition, and innovation. As the Manager of HE Higher Education Ranking, he leads initiatives that play a crucial role in shaping the landscape of academia. Having earned a Master's in Quality Management and Evaluation in Higher Education from Universitat Oberta de Catalunya, followed by a Ph.D. in Quality Management from Azteca University, his academic pursuits have laid a strong foundation for his expertise in Accreditation, Quality Assurance, and Higher Education Rankings. Dr. Kayyali has made significant contributions to academic literature, boasting more than 30 published papers and 10 book chapters. Additionally, he takes pride in his role as a translator, having translated 5 books, thus bridging language gaps and promoting knowledge exchange on a global scale. In recognition of his expertise, Dr. Kayyali holds key affiliations with esteemed institutions. He is privileged to be a part of the British Accreditation Council's Accreditation Committee, the Slovenian Quality Assurance Agency as an International Expert, and the Agency for Control and Quality Assurance of Higher Education AKOKVO as an Accreditation Expert. His international engagements also include being an expert for the Kosovo Accreditation Agency KAA and the ECBE - European Council for Business Education, as well as serving as a Lead Auditor at the Centre of Assessments for Excellence (COAE). As an entrepreneur, researcher, translator, and publisher, Dr. Kayyali is deeply involved in various facets of the academic world. His diverse interests encompass Management, Translation, Interpretation, and Academic consulting, contributing to a well-rounded understanding of the industry.

Serpil Koçdar is an associate professor at Anadolu University, Türkiye. With a background in economics, she holds a master's degree and a PhD in distance education. Her research focuses on quality assurance, e-assessment, instructional design, and new learning technologies in ODL.

Aslihan Kuraner is a Bachelor's student on the teaching profession programme at Ludwigsburg University of Education and an education research assistant. Her main research interests encompass storytelling, intercultural studies, and digital technologies in education.

Andréia de Bem Machado has a PhD in Engineering and Knowledge Management. Postdoctoral fellow at the Federal University of Santa Catarina. Evaluator of the National Institute of Educational Studies and Research Anísio Teixeira (Ministry of Education Brazil). She is an Ad Hoc evaluator of National and International Journals. Evaluator in the PNLD Infantile Education program. Consultant in the production of low vision UNESCO teaching material. She has been working in the educational field for over 25 years. She is part of the scientific committee of national and international journals. Currently the areas of study are: innovation, innovation in the public sector, entrepreneurship, smart cities, education, special education and digital pedagogical model. She likes to innovate in the art of researching and disseminating knowledge.

Jon Mason, Ph.D, is an Associate Professor in Education at Charles Darwin University in Australia where he lectures in the broad area of digital technology in education. He also holds adjunct positions at Korea National Open University and East China Normal University. Since 2000 he has led delegations from Standards Australia to ISO/IEC JTC 1/SC36 focused on standardization of IT for learning, education, and training. In 2022 he became chair for this international committee. His research encompasses most things where digital technology and learning intersect with a keen interest in question formulation, sense-making, artificial intelligence, and the role of wisdom in education.

Fernando Mazarrón - Contributing Author| **Fernando Mazarrón** is Professor in the Department of Agroforestry Engineering, researches in renewable energy sources. His teaching focuses on subjects related to energy optimization in agri-food industries. He has a wide teaching career, participating in numerous educational innovation projects.

Fatemeh Rezaie Navaie is a doctoral student of Learning, Design, and Technology at Oklahoma State University (OSU). Her research interest is in the use of artificial intelligence (AI) in the field of education, and how integrating AI into curriculums affects learning. She enjoys learning about AI and exploring how AI can be used to enhance Non-Native English Speakers in their academic writing process. Her other interests include eLearning, organizational development, and Instructional Design in education and corporate training.

Alicia Perdigones is a Full Professor in the Universidad Politécnica de Madrid, since 2006 and coordinator of the Educational Innovation Group Projects. She teaches subjects related to electrical installations and machinery, conducting educational innovation activities in these same areas.

António Sacavém currently works at the Faculty of Social Sciences and Technology, at Universidade Europeia. António's research interests are leadership, management, communication, and digital transformation.

Alperen Sağdıç is the Director of Education at Sobe Foundation. Alperen Sağdıç's research interests are autism spectrum disorder, applied behavioural analysis, assistive technologies and the use of advanced technologies in special education.

Hilal Sahin is a Master's student on the teaching profession programme at Ludwigsburg University of Education and an education research assistant. Her main research areas are communications, education policies, and digital technologies in education.

Sunagül Sani-Bozkurt is a faculty member and researcher at Anadolu University, Education Faculty, Department of Special Education. Dr Sani-Bozkurt's research interests are autism spectrum disorder, assistive technologies, evidence-based practices, technology supported environment design and applications in the field of special education.

João Rodrigues dos Santos is a University Professor at IADE / European University. He has a PhD in Economics and Management (Universidad Europea de Madrid) and a Master's Degree in Geography and Territorial Planning (Universidade Nova de Lisboa). As a researcher, he is a member of the Center for

Transdisciplinary Development Studies (University of Trás-os-Montes and Alto Douro) and the Center for Studies and Opinion Polls of the Portuguese Catholic University. He is the author of two books (in the areas of Economics and Territorial Management) and frequently publishes chapters and articles of an academic, technical and scientific nature. Currently, João Rodrigues dos Santos is also a permanent contributor to CNN Portugal, analyzing and commenting on national and international economic news.

Dilek Şenocak is an instructor at Anadolu University, School of Foreign Languages. She holds an MA in distance education from Anadolu University. As a PhD candidate, she has been recently focusing on artificial intelligence in education. She is also interested in gamification, adaptive learning, open and distance learning.

Ranjit Singha is a Doctorate Research Fellow at Christ (Deemed to be University) and a distinguished American Psychological Association (APA) member. His expertise lies in research and development across various domains, including Mindfulness, Addiction Psychology, Women Empowerment, UN Sustainable Development Goals, and Data Science. He has earned certifications from renowned institutions, including IBM and The University of Oxford Mindfulness Centre, UK, in Mindfulness. Additionally, he holds certifications as a Microsoft Innovative Educator, Licensed Yoga Professional, Certified Mindfulness Teacher, and CBCT Teachers Training from Emory University, USA. Mr Ranjit's educational qualifications include PGDBA (GM), MBA (IB), MSc in Counseling Psychology, and completion of a Senior Diploma in Tabla (Musical Instrumentation). His dedication to continuous learning is evident through his involvement in the SEE Learning® (Social, Emotional, and Ethical) Learning program. As a committed researcher and educator, Mr Ranjit focuses on mindfulness and compassion-based interventions. He has an impressive publication record, having authored twenty-three research papers, ten chapters, four books, and five edited books. His research interests encompass various aspects of mindfulness, such as assessment, benefits of mindfulness-based programs, change mechanisms, professional training, mindfulness ethics, cognitive and neuropsychology, and studies related to high-risk behaviours. Apart from his research endeavours, Mr Ranjit has extensive teaching experience, instructing courses in diverse subjects like Forensic Psychology, Positive Psychology, Organizational Planning, Strategic Management, Psycho Metric Tests, Counseling Skills, Disaster Management, Basic Computer Science, Business Planning, Business Law, and Auditing. He has mentored numerous Postgraduate and undergraduate research projects, demonstrating his commitment to nurturing young minds in psychology. Ad Hoc Reviewer at International Journal of Cyber Behavior, Psychology and Learning (IJCBPL), Reviewer and author at IGI Global, and Editor and Reviewer at TNT Publication. Furthermore, Mr Ranjit actively provides personal counselling services, showcasing his genuine concern for his students' well-being and academic success. His unwavering dedication to research and education has solidified his position as a valuable contributor to psychology.

Surjit Singha is an academician with a broad spectrum of interests, including UN Sustainable Development Goals, Organizational Climate, Workforce Diversity, Organizational Culture, HRM, Marketing, Finance, IB, Global Business, Business, AI, K12 & Higher Education, Gender and Cultural Studies. Currently a faculty member at Kristu Jayanti College, Dr. Surjit also serves as an Editor, reviewer, and author for prominent global publications and journals, including being on the Editorial review board of Information Resources Management Journal and contributor to various publications. With over 13 years of experience in Administration, Teaching, and Research, Dr. Surjit is dedicated to imparting knowledge

and guiding students in their research pursuits. As a research mentor, Dr. Surjit has nurtured young minds and fostered academic growth. Dr. Surjit has an impressive track record of over 75 publications, including articles, book chapters, and textbooks, holds two US Copyrights, and has successfully completed and published two fully funded minor research projects from Kristu Jayanti College.

Mete Sipahioglu is a researcher and lecturer at Samsun University and he works as the Coordinator of European Mobility in the International Relations Office. Previously, he has served as a teacher of English in many educational institutions at different levels. He holds a Ph.D. in Educational Administration and Supervision with a specialization in internationalization in higher education institutions and completed his Erasmus exchange mobility at the University of London, Institute of Education (UK). Throughout his career, he has participated more than 50 seminars, courses, and projects at national and international level. His major research interests lie in the area of Teacher Education, Educational Leadership and Policies and Internationalization of Higher Education Institutions. Currently, he is a member and stakeholder advisor for WG3 at ENIS (COST Action 20115) which focuses on European Network on International Students Mobility: Connecting Research and Practice.

Sutithep Siripipattanakul is an associate professor of Educational Technology in the Faculty of Education at Kasetsart University, Thailand. His research interests involve computer education, technology and educational communication, information technology, vocational education, educational administration, management information systems, e-learning, educational assessment, and blended learning.

Mirona Stanescu, Ph.D, is senior lecturer and head of the Department of Pedagogy and Didactics in German at the Faculty of Psychology and Educational Science, Babes-Bolyai University Cluj (Romania). She is a graduate in German and English Language and Literature and in Pedagogy. She has a PhD in Drama in Education from the University of Education Ludwigsburg (Germany). Her main fields of interests include drama in education, diversity and equity in education, intercultural education, communication, and children's literature. She is a trained primary school teacher for bilingual education and worked for 12 years at the German school in Cluj-Napoca.

Penny Thompson is an Associate Professor of Learning, Design, and Technology at Oklahoma State University. Her research interests include communication and learning in online, blended, and flipped learning environments. She is also interested in all areas where technology and cognition intersect, including both the design of technology to support cognition and the ways immersion in digital technology may or may not be changing habits of mind and attitudes toward learning.

Cansel Tosun, who received her bachelor's degree from Ondokuz Mayıs University Early Childhood Education Programme, continues her master's degree in the field of Educational Technologies at Gazi University Graduate School of Educational Sciences. Her research areas are on early childhood education, technology and artificial intelligence.

Wan Ahmad Jaafar Wan Yahaya is the Director of the Centre for Instructional Technology and Multimedia (PTPM), Universiti Sains Malaysia (USM), Penang, Malaysia. He is also the President of the Malaysian Educational Technology Association (META). His specialty is associated with teaching and creative and innovative multimedia.

Mehmet Yavuz completed his undergraduate education at Fırat University, Department of Computer Education. He completed his master's and doctoral studies at Atatürk University, Department of Computer and Instructional Technologies. He is still working as an Assistant Professor at Bingöl University, Faculty of Economics and Administrative Sciences, Department of Management Information Systems. His research interests include digital transformation, distance education and artificial intelligence.

Stacy Ybarra Evans is a 2022 Ricardo Salinas Aspen Fellow first generation Latina from the Southside of San Antonio. She currently serves as the Director of the Center for Teaching Excellence at Our Lady of the Lake University. She works to develop students' academic skills as a first-year seminar instructor at San Antonio College of the Alamo Colleges District where she worked for 20 years. During her tenure at ACD, she received the Starfish award as a college advisor at Palo Alto College. She is also a current researcher with the Texas Association of Community Colleges helping analyze focus group information on guided pathways, basic student needs and teaching and learning practices. As a contractor with Quality Matters, the leading organization in instructional design standards, she has led teams nationally to get online courses approved. As an ACUE facilitator she works to encourage new teaching practices at San Antonio College from 2021 to present. She graduated from Palo Alto College with an associate degree, Texas A&M University - San Antonio for her bachelor's and master's degree and Capella University where she conferred her doctorate degree in 2019. She has also brought her voice to bring attention to gender diversity in leadership by participating in leadership programs such as the San Antonio Hispanic Chamber's Latina Leadership Institute, Leadership SAISD and South San Antonio Chamber's City South Leadership program.

Huixin Zhen is the Phd of the Centre for Instructional Technology and Multimedia (PTPM). Unversiti Sains Malaysia (USM).Penang, Malaysia.