

Guest editorial: Active and transformative learning in higher education in times of artificial intelligence and ChatGPT

1. Introduction to the theme

In the green and digital transition, new skills are required for the new labor markets. National education and training systems need to adapt to the new demands of companies and governments, providing workers, students and citizens with the valuable digital skills needed today. And at the same time, this digital transformation must ensure the transition toward a greener and more inclusive economy and society (Alkhaldi *et al.*, 2024, Alsaywid *et al.*, 2023a, 2023b, Ordóñez de Pablos *et al.*, 2020, 2022, 2023, 2024).

In the case of the European Union, the Digital Education Action Plan (2021–2027) “aims to support the adaptation of the education and training systems of Member States to the digital age.” It contributes to “the goals of the European Skills Agenda, the European Social Pillar Action Plan and the 2030 Digital Compass: the European way for the Digital Decade” (European Commission, 2024a, 2024b). This plan has two key priorities: “Priority 1: Fostering the development of a high-performing digital education ecosystem” and “Priority 2: Enhancing digital skills and competences for the digital transformation”. In the case of Priority 2, Action 8 focuses on AI and data-related skills (European Commission, 2024a, 2024b).

In the rapidly evolving landscape of higher education, the integration of artificial intelligence (AI) tools such as ChatGPT has reshaped the way educators and students approach learning (Brahimi and Sarirete, 2024, Lytras, 2023a, 2023b, 2023c, Lytras *et al.*, 2024, Rodrigues, 2023). This special issue on “Active and Transformative Learning in Higher Education in Times of Artificial Intelligence and ChatGPT” delves into the innovative ways AI technologies are revolutionizing traditional educational practices.

Active and transformative learning (ATL) are key strategies for engaging students in meaningful, deep learning experiences that transcend rote memorization and passive consumption of knowledge. AI, particularly tools like ChatGPT, offers a new frontier for enhancing these methods. With capabilities like natural language processing, predictive analytics and interactive simulations, AI allows for more personalized learning experiences and enables students to become cocreators of knowledge rather than passive recipients.

This special issue brings together a diverse array of research exploring various dimensions of AI’s role in higher education, including how AI tools can enhance learning, their adoption by educators, the ethical considerations they bring and their implications for specific fields such as engineering, management and medical education. Through these papers, the authors shed light on the potential of AI to foster a more dynamic, student-centered approach to education, promoting skills like critical thinking, creativity and problem-solving.

2. Agenda of the Special Issue

The special issue titled “*Active and Transformative Learning in Higher Education in Times of Artificial Intelligence and ChatGPT*” brings together research and insights from various domains, all focusing on the impact of AI tools like ChatGPT on educational practices. The



papers collectively reflect the transformative potential of AI in reshaping higher education, emphasizing active, collaborative and technology-enhanced learning.

The integration of AI tools in educational settings has been explored from multiple perspectives. Several studies highlight how educators and students are adapting to AI-driven technologies like ChatGPT. For example, Hidayat-ur-Rehman and Ibrahim investigate the factors influencing educators' adoption of ChatGPT, while Samsudeen Sabraz Nawaz *et al.* explore undergraduate students' acceptance of ChatGPT in Sri Lanka, identifying key predictors such as habit and performance expectancy. Similarly, Bhaskar and Gupta delve into the perspectives of educators in management education, revealing both the benefits and challenges of ChatGPT integration in teaching.

Moreover, this special issue also emphasizes the significance of AI in enhancing experiential and authentic learning. Salinas-Navarro *et al.* examine how generative AI can be used to design experiential learning activities and promote authentic assessment, while Sanabria-Z and Olivo propose a model for using AI to foster complex thinking and problem-solving in line with the Fourth Industrial Revolution (4IR). These papers underscore AI's ability to personalize learning experiences, stimulate reflective thinking and support active learning strategies.

In addition to these positive applications, the issue also addresses some of the ethical and practical challenges associated with AI in education. Spennemann *et al.* assess the risk of ChatGPT providing advice for academic misconduct, demonstrating both the tool's limitations and the need for vigilant oversight. Other studies, such as Marengo *et al.*'s systematic review of AI's educational value over the last decade, call for evidence-based approaches to guide the responsible implementation of AI in higher education.

2.1 Thematic grouping of papers

The papers in this special issue can be categorized into several thematic areas relevant to *active and transformative learning (ATL)* in the era of AI and ChatGPT:

- (1) Adoption and acceptance of AI tools:
 - Papers exploring the factors influencing the adoption and acceptance of AI technologies by educators and students. This includes studies by Hidayat-ur-Rehman and Ibrahim, Samsudeen Sabraz Nawaz *et al.*, Bhaskar and Gupta and Tapas Sudan *et al.*
- (2) AI-enhanced experiential and authentic learning:
 - Research focused on using AI to enhance experiential learning, problem-solving and authentic assessments. Examples include the works of Salinas-Navarro *et al.* and Sanabria-Z and Olivo, who present models for integrating AI in learning environments to foster creativity and critical thinking.
- (3) Educational quality, inclusion and collaboration through AI:
 - Papers such as Mujtaba Asad and Malik highlight how hybridized learning models incorporating AI can promote educational inclusion and improve quality, aligning with sustainable development goals (SDG 4) by preparing learners for global challenges.
- (4) Ethical considerations and challenges in AI usage:
 - Ethical challenges surrounding AI usage are discussed in papers such as Spennemann *et al.*, which examines the potential for AI misuse in academic cheating, and Marengo *et al.*, which calls for a more rigorous, evidence-based approach to AI implementation in education.

This special issue aims to provide educators, policymakers and institutions with critical insights into how AI tools like ChatGPT can transform higher education. By addressing both opportunities and challenges, the contributions in this issue underscore the need for strategic planning, training and guidelines to ensure that AI is used effectively and ethically to support ATL experiences in the digital age.

3. Papers published

3.1 *Exploring factors influencing educators' adoption of ChatGPT: a mixed-method approach*

Imdadullah Hidayat-ur-Rehman, Yasser Ibrahim.

This study explores the factors shaping educators' intention to adopt AI-enabled chatbot technology, specifically focusing on ChatGPT. Using a mixed-method approach, the authors developed an "Educators' Adoption of ChatGPT" model by integrating the unified theory of acceptance and use of technology with the status quo bias framework. Through a quantitative analysis of 243 survey responses, they found that factors like effort expectancy, autonomous motivation and learners' AI competency positively influence chatbot adoption. Conversely, concerns about unfair evaluation, student overreliance and inaccuracies increase resistance to adoption. Interestingly, perceived fraudulent use was found insignificant in educators' resistance to ChatGPT.

3.2 *Adopting artificial intelligence-driven technology in medical education*

Mohammadhiwa Abdekhoda, Afsaneh Dehnad.

This study identifies the determinant factors for adopting AI-driven technology in medical education. Using a descriptive-analytical approach, the research assessed the intentions of 163 faculty members at Tabriz University of Medical Sciences through a task-technology fit (TTF) model. The findings revealed that "technology characteristics," "task characteristics" and the overall TTF significantly impact AI adoption in medical education, explaining 37% of the variance in faculty intentions. The study offers a practical model to guide authorities and policymakers in successfully integrating AI into medical education.

3.3 *Acceptance of ChatGPT by undergraduates in Sri Lanka: a hybrid approach of SEM-ANN*

Samsudeen Sabraz Nawaz, Mohamed Buhary Fathima Sanjeetha, Ghadah Al Murshidi, Mohamed Ismail Mohamed Riyath, Fadhilah Bt Mat Yamin, Rusith Mohamed.

This study investigates the acceptance of ChatGPT among undergraduates in Sri Lanka using the UTAUT2 model, incorporating personal innovativeness as a dependent and moderating factor. A survey of 500 students from 17 government universities was analyzed using partial least squares structural equation modeling (PLS-SEM) and a two-stage artificial neural network analysis. The findings confirmed that habit, performance expectancy and perceived ease of use significantly influenced students' behavioral intentions, with personal innovativeness affecting use behavior but not as a moderator. The study highlights key factors shaping students' acceptance of AI in education, emphasizing the need for implementation strategies and continuous training.

3.4 AI platform model on 4IR megatrend challenges: complex thinking by active and transformational learning

Jorge Sanabria-Z, Pamela Geraldine Olivo.

This study proposes a model for a technological platform aimed at developing complex thinking through cocreation, specifically addressing challenges related to Fourth Industrial Revolution (4IR) megatrends. The model, developed using participatory action research and user-centered design (UCD) methodologies, is framed within active and transformational learning (ATL). The platform integrates AI to foster personalized learning, collaboration and creativity, allowing users to develop innovative solutions to real-world problems. The research highlights the importance of equipping students with essential competencies for the technology-driven world and offers a unique model that combines ATL with AI for 21st-century skill development.

3.5 Bard, ChatGPT and 3DGPT: a scientometric analysis of generative AI tools and assessment of implications for mechanical engineering education

Khameel B. Mustapha, Eng Hwa Yap, Yousif Abdalla Abakr.

This study examines the impact of generative AI (GenAI) tools on mechanical engineering education and practices. Through a scientometric analysis of recent literature and experimentation with tools like Bard, ChatGPT, DALL.E and 3DGPT, the authors highlight both opportunities and limitations of these technologies. While GenAI offers valuable insights for tasks such as product design, manufacturing and technical documentation, the study identifies issues with analytical reasoning (e.g. errors in unit conversions) and image generation (e.g. poor symmetry). This is the first in-depth assessment of GenAI tools in the context of mechanical engineering, providing guidelines for their effective deployment.

3.6 The educational value of artificial intelligence in higher education: a 10-year systematic literature review

Agostino Marengo, Alessandro Pagano, Jenny Pange, Kamal Ahmed Soomro.

This systematic literature review consolidates empirical studies from 2013 to 2022 to investigate the impact of AI in higher education. Analyzing 44 peer-reviewed studies, the review highlights a recent increase in AI-related research, though many studies are theoretical rather than empirical. The findings emphasize areas where empirical evidence supports AI's applications in academia, offering insights into its promises and challenges. The review calls for more evidence-based research to guide AI implementation in higher education, helping stakeholders make informed decisions. This work provides a comprehensive understanding of the evolving AI landscape in academia.

3.7 Delving into educators' perspectives on ChatGPT in management education: a qualitative exploration

Preeti Bhaskar, Puneet Kumar Gupta.

This study explores the perspectives of educators on the integration of ChatGPT into management education in India. Using interpretative phenomenological analysis, the research gathered insights from 57 educators, identifying nine subthemes related to the benefits and six subthemes about the limitations of using ChatGPT. The study also highlighted strategies for enhancing ChatGPT, organized into seven subthemes. While the research emphasizes ChatGPT's advantages, such as facilitating student engagement, it also notes limitations like potential overreliance on AI. The findings provide valuable insights for

improving ChatGPT's use in management education and guiding its implementation in Indian higher education.

3.8 Educational quality and inclusion through collaborative hybridized cybergogy: transformative learning horizons in Pakistani universities

Muhammad Mujtaba Asad, Aisha Malik.

This study investigates how hybridized cybergogy, a blend of physical and digital learning environments, can foster collaborative learning and improve educational quality in Pakistani universities. Using an exploratory qualitative approach, the authors collected data from 60 prospective teachers through semistructured interviews. The findings reveal that collaborative cybergogy enhances access to learning resources, critical thinking and inclusion, aligning with SDG 4 (Quality Education). The study offers practical recommendations for stakeholders in higher education to integrate these methods into curricula, equipping learners with essential 21st-century skills for global challenges.

3.9 ChatGPT giving advice on how to cheat in university assignments: how workable are its suggestions?

Dirk H.R. Spennemann, Jessica Biles, Lachlan Brown, Matthew F. Ireland, Laura Longmore, Clare L. Singh, Anthony Wallis, Catherine Ward.

This study assesses the extent to which ChatGPT can offer advice on avoiding detection when submitting contract-written assignments. Despite ChatGPT's ethical programming, the authors prompted it to provide responses with inverted moral valence, generating 30 essays discussing cheating techniques. The findings suggest that while most strategies proposed by ChatGPT are unlikely to avoid detection, certain techniques related to plagiarism obscuration and content blending show a higher chance of success. The study concludes that ChatGPT can be used as a brainstorming tool for unethical purposes, but the effectiveness depends on both the marker's vigilance and the student's discernment of viable cheating options.

3.10 Designing experiential learning activities with generative artificial intelligence tools for authentic assessment

David Ernesto Salinas-Navarro, Eliseo Vilalta-Perdomo, Rosario Michel-Villarreal, Luis Montesinos.

This study explores the use of generative artificial intelligence (GenAI) in experiential learning and authentic assessment in higher education. Using "thing ethnography" and "incremental prompting," the authors examined ChatGPT 3.5's potential to enhance reflective thinking, hands-on learning and authentic assessment. The findings highlight GenAI's ability to contribute positively to experiential learning but also stress the importance of responsible use. The study provides insights into how GenAI can be integrated into educational settings, particularly in operations management and lean health care, while proposing directions for future research on its educational applications.

3.11 Transformative learning with ChatGPT: analyzing adoption trends and implications for business management students in India

Tapas Sudan, Arjun Hans, Rashi Taggar.

This study examines the adoption of ChatGPT among business and management students in India, focusing on factors from the unified theory of acceptance and use of technology 2 (UTAUT2). Data from 638 students were analyzed using IBM SPSS and AMOS, revealing that habit is a strong predictor of ChatGPT use, while traditional factors like performance

expectancy and social influence were insignificant. The study highlights the perceived benefits of ChatGPT in educational settings but challenges conventional views on effort expectancy. The findings underscore the need for guidelines to ensure responsible use of ChatGPT in education, as its integration requires careful planning.

4. Discussion

The papers in this special issue collectively emphasize the transformative potential of AI in higher education, particularly through its integration with active learning methodologies. AI tools like ChatGPT enable educators to create more dynamic, interactive and personalized learning environments, helping students develop critical 21st-century skills:

- Need for ATL in higher education: AI's potential to foster ATL is clear, particularly in promoting engagement, personalized feedback and adaptive learning experiences. This calls for a shift from traditional lecture-based teaching to more interactive, student-centered approaches.
- Need for training and competence building: For AI to be fully harnessed, there is an urgent need to provide adequate training for both faculty and students. This includes familiarizing them with AI tools and best practices for integrating these technologies into the classroom.
- New creative modes of learning exploration: AI encourages the exploration of new learning modalities, such as gamified learning environments, immersive simulations and AI-driven tutoring systems, which can cater to different learning styles and preferences.
- Resource allocation for AI in higher education: Institutions must allocate sufficient resources to support the integration of AI tools into their pedagogical frameworks, including investments in infrastructure, faculty development and student support systems.
- A robust, resilient plan for ATL with AI: The successful implementation of AI in higher education requires a well-thought-out plan that incorporates flexibility, inclusivity and resilience. Institutions should ensure that AI is used ethically and responsibly, with a focus on enhancing learning outcomes and maintaining academic integrity.

4.1 Model for active and transformative learning in higher education (ATL-HE) with AI integration

4.1.1 *Inputs*. These are the foundational elements that set the stage for implementing ATL:

- AI and generative tools: Technologies such as ChatGPT, Bard, DALL.E and other AI-driven platforms that enhance personalized learning, problem-solving and creative collaboration. These tools provide the resources and infrastructure necessary for supporting ATL.
 - Reference: Research by Sanabria-Z and Olivo, Salinas-Navarro *et al.* and Mustapha *et al.* highlight how AI tools can foster creativity and enhance experiential learning.
- Educators' and students' readiness: The adoption of AI in education depends heavily on the readiness and competence of educators and students to engage with these

technologies. Training in AI tools, digital literacy and pedagogical innovation is crucial.

- Reference: Studies by Hidayat-ur-Rehman and Ibrahim and Samsudeen Sabraz Nawaz *et al.* reveal the factors influencing AI adoption and the importance of readiness.
- Institutional support and policy: Institutions must allocate resources, provide training programs and create policies that ensure the ethical and responsible use of AI tools while promoting ATL.
 - Reference: Papers by Marengo *et al.* and Mujtaba Asad and Malik emphasize the need for institutional guidance and support to integrate AI for quality education and inclusion.

4.1.2 *Processes.* These are the mechanisms through which ATL is implemented and facilitated within higher education, leveraging AI tools:

- Personalized and experiential learning: AI tools like ChatGPT enable tailored learning experiences that adapt to individual student needs, offering real-time feedback and helping students engage in reflective and experiential learning activities.
 - Reference: Salinas-Navarro *et al.* and Sanabria-Z and Olivo demonstrate how AI can create hands-on, authentic assessments and support problem-solving through personalized learning.
- Collaborative and cocreative learning environments: AI facilitates collaboration among students and between students and educators. Cocreation, where learners work together to solve real-world problems, is enhanced by AI's capacity to provide diverse perspectives and innovative solutions.
 - Reference: Studies like Mujtaba Asad and Malik highlight the role of collaborative hybridized cybergogy in promoting inclusion, while Mustapha *et al.* discuss AI's contributions to professional and educational collaboration in fields like engineering.
- Continuous feedback and adaptive assessment: AI tools provide continuous, personalized feedback, which is key to transforming traditional assessments into authentic and formative experiences. Adaptive learning models, where AI adjusts the difficulty and content based on learner responses, help reinforce skills in real time.
 - Reference: The work of Salinas-Navarro *et al.* on authentic assessments using AI and Tapas Sudan *et al.* on habit-driven adoption illustrate how AI supports active learning and assessments.

4.1.3 *Outputs.* These are the outcomes achieved from the ATL process in a higher education context with AI integration:

- Enhanced critical thinking and problem-solving skills: Students develop complex thinking skills and are better equipped to tackle 21st-century challenges by working on real-world problems, supported by AI-generated insights and tools.
 - Reference: Sanabria-Z and Olivo highlight the development of critical thinking through AI platforms, while Marengo *et al.* emphasize the need for evidence-based applications of AI.

- Inclusive and collaborative learning environments: AI facilitates more inclusive learning experiences by offering students from diverse backgrounds equal access to learning resources and fostering collaboration across various educational levels and fields.
 - Reference: Mujtaba Asad and Malik's study on inclusion through cybergogy and Bhaskar and Gupta's research on ChatGPT in management education reveal the impact of AI on creating equitable, inclusive environments.
- Ethical and responsible AI Use: Educators and institutions need to ensure that AI tools are used ethically and responsibly, focusing on enhancing educational outcomes without promoting academic misconduct or dependency.
 - Reference: Spennemann *et al.* discuss the risks of AI misuse and provide insights into how educators can safeguard against academic dishonesty while integrating AI into education.

4.2 The ATL-HE model framework (Table 1)

Table 1. The ATL-HE model framework

Stage	Components	Description
Input	AI tools (ChatGPT, bard, etc.), educators'/ students' readiness, institutional support	Foundational elements required for AI-driven ATL: technology resources, competency building and institutional policy
Process	Personalized learning, collaborative learning, continuous feedback, cocreation	Core ATL activities facilitated by AI: tailored learning experiences, hands-on collaboration and adaptive assessments
Output	Critical thinking, inclusion, ethical AI use	Desired learning outcomes: enhanced skills for problem-solving, inclusive environments and ethical AI integration

4.3 Key themes in ATL-HE model

- Personalization: AI supports tailored learning pathways.
- Collaboration: AI fosters cocreative learning environments.
- Critical thinking: AI encourages complex problem-solving and innovation.
- Inclusion: AI promotes equitable access and collaborative learning for diverse learners.
- Ethics: Institutions must ensure responsible and ethical use of AI technologies.

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References

- Alkhaldi, A., Malik, S. and Lytras, M.D. (2024), “Transformative leadership in Kuwait direct investment promotion authority: investing in talent, innovation and the next generation”, Baroudi, S. and Lytras, M.D. (Eds), *Transformative Leadership and Sustainable Innovation in Education: Interdisciplinary Perspectives (Emerald Studies in Higher Education, Innovation and Technology)*, Emerald Publishing Limited, Leeds, pp. 27-38, doi: [10.1108/978-1-83753-536-120241003](https://doi.org/10.1108/978-1-83753-536-120241003).
- Alsawyid, B.S., Alajlan, S.A. and Lytras, M.D. (2023a), “Transformative learning as a bold strategy for the vision 2030 in Saudi Arabia: moving higher health care education forward”, in Vaz de Almeida, C. and Lytras, M.D. (Eds), *Technology-Enhanced Healthcare Education: Transformative Learning for Patient-Centric Health (Emerald Studies in Higher Education, Innovation and Technology)*, Emerald Publishing Limited, Leeds, pp. 187-207, doi: [10.1108/978-1-83753-598-920231014](https://doi.org/10.1108/978-1-83753-598-920231014).
- Alsawyid, B.S., Alajlan, S.A., Almaddah, T.O., Al Mutairi, E. and Lytras, M.D. (2023b), “Transformative active learning in the Saudi National Institute of Health: promoting education and research skills capability”, in Lytras, M.D. (Ed.), *Active and Transformative Learning in STEAM Disciplines (Emerald Studies in Active and Transformative Learning in Higher Education)*, Emerald Publishing Limited, Leeds, pp. 41-59, doi: [10.1108/978-1-83753-618-420231003](https://doi.org/10.1108/978-1-83753-618-420231003).
- Brahimi, T. and Sarirete, A. (2024), “Transforming learning in STEAM: How AI tools and language models catalyze educational advancement”, in Baroudi, S. and Lytras, M.D. (Eds), *Transformative Leadership and Sustainable Innovation in Education: Interdisciplinary Perspectives (Emerald Studies in Higher Education, Innovation and Technology)*, Emerald Publishing Limited, Leeds, pp. 39-58, doi: [10.1108/978-1-83753-536-120241004](https://doi.org/10.1108/978-1-83753-536-120241004).
- European Commission (2024a), “Digital Education Action Plan (2021-2027)”, available at: <https://education.ec.europa.eu/focus-topics/digital-education/action-plan> (accessed 19 September 2024).
- European Commission (2024b), “Digital Education Action Plan – Action 8”, available at: <https://education.ec.europa.eu/focus-topics/digital-education/action-plan> (accessed 19 September 2024).
- Lytras, M.D. (2023a), “Forty definitions and metaphors for active and transformative learning in ChatGPT times: ChatGPT as an active and transformative technology enhanced learning boost in health care education”, in Vaz de Almeida, C. and Lytras, M.D. (Eds), *Technology-Enhanced Healthcare Education: Transformative Learning for Patient-Centric Health (Emerald Studies in Higher Education, Innovation and Technology)*, Emerald Publishing Limited, Leeds, pp. 19-34, doi: [10.1108/978-1-83753-598-920231002](https://doi.org/10.1108/978-1-83753-598-920231002).
- Lytras, M.D. (2023b), “Active and transformative learning (ATL) in higher education in times of artificial intelligence and ChatGPT: investigating a new value-based framework”, in Lytras, M.D. (Ed.), *Active and Transformative Learning in STEAM Disciplines (Emerald Studies in Active and Transformative Learning in Higher Education)*, Emerald Publishing Limited, Leeds, pp. 5-23, doi: [10.1108/978-1-83753-618-420231001](https://doi.org/10.1108/978-1-83753-618-420231001).
- Lytras, M.D. (2023c), “Introduction: Active and transformative learning (ATL) as a new higher educational paradigm”, in Lytras, M.D. (Ed.), *Active and Transformative Learning in STEAM Disciplines (Emerald Studies in Active and Transformative Learning in Higher Education)*, Emerald Publishing Limited, Leeds, pp. 1-4, doi: [10.1108/978-1-83753-618-420231016](https://doi.org/10.1108/978-1-83753-618-420231016).
- Lytras, M.D., Alkhaldi, A. and Malik, S. (2024), “Transformative leadership [TL] and sustainable innovation in higher education [HE]: setting the context”, in Baroudi, S. and Lytras, M.D. (Eds), *Transformative Leadership and Sustainable Innovation in Education: Interdisciplinary Perspectives (Emerald Studies in Higher Education, Innovation and Technology)*, Emerald Publishing Limited, Leeds, pp. 211-229, doi: [10.1108/978-1-83753-536-120241014](https://doi.org/10.1108/978-1-83753-536-120241014).

- Ordóñez de Pablos, P., Almunawar, N. and Anshari, M. (2023), *Developing Skills and Competencies for Digital and Green Transitions*, IGI-Global, doi: [10.4018/978-1-6684-9089-1](https://doi.org/10.4018/978-1-6684-9089-1).
- Ordóñez de Pablos, P., Almunawar, N. and Anshari, M. (2024), *Harnessing Green and Circular Skills for Digital Transformation*, IGI-Global, doi: [10.4018/979-8-3693-2865-1](https://doi.org/10.4018/979-8-3693-2865-1).
- Ordóñez de Pablos, P., Lytras, M.D. and Xi, Z. (2020), *IT and the Development of Digital Skills and Competencies in Education*, IGI-Global, doi: [10.4018/978-1-7998-4972-8](https://doi.org/10.4018/978-1-7998-4972-8).
- Ordóñez de Pablos, P., Zhang, X. and Almunawar, M. (2022), *Handbook of Research on Education Institutions, Skills and Jobs in the Digital Era: Towards a More Inclusive and Resilient Society*, IGI-Global, doi: [10.4018/978-1-6684-5914-0](https://doi.org/10.4018/978-1-6684-5914-0).
- Rodrigues, A.L. (2023), "Innovative hybrid learning: a new paradigm in teacher education for transformative learning", in Lytras, M.D. (Ed.), *Active and Transformative Learning in STEAM Disciplines (Emerald Studies in Active and Transformative Learning in Higher Education)*, Emerald Publishing Limited, Leeds, pp. 153-175, doi: [10.1108/978-1-83753-618-420231008](https://doi.org/10.1108/978-1-83753-618-420231008).