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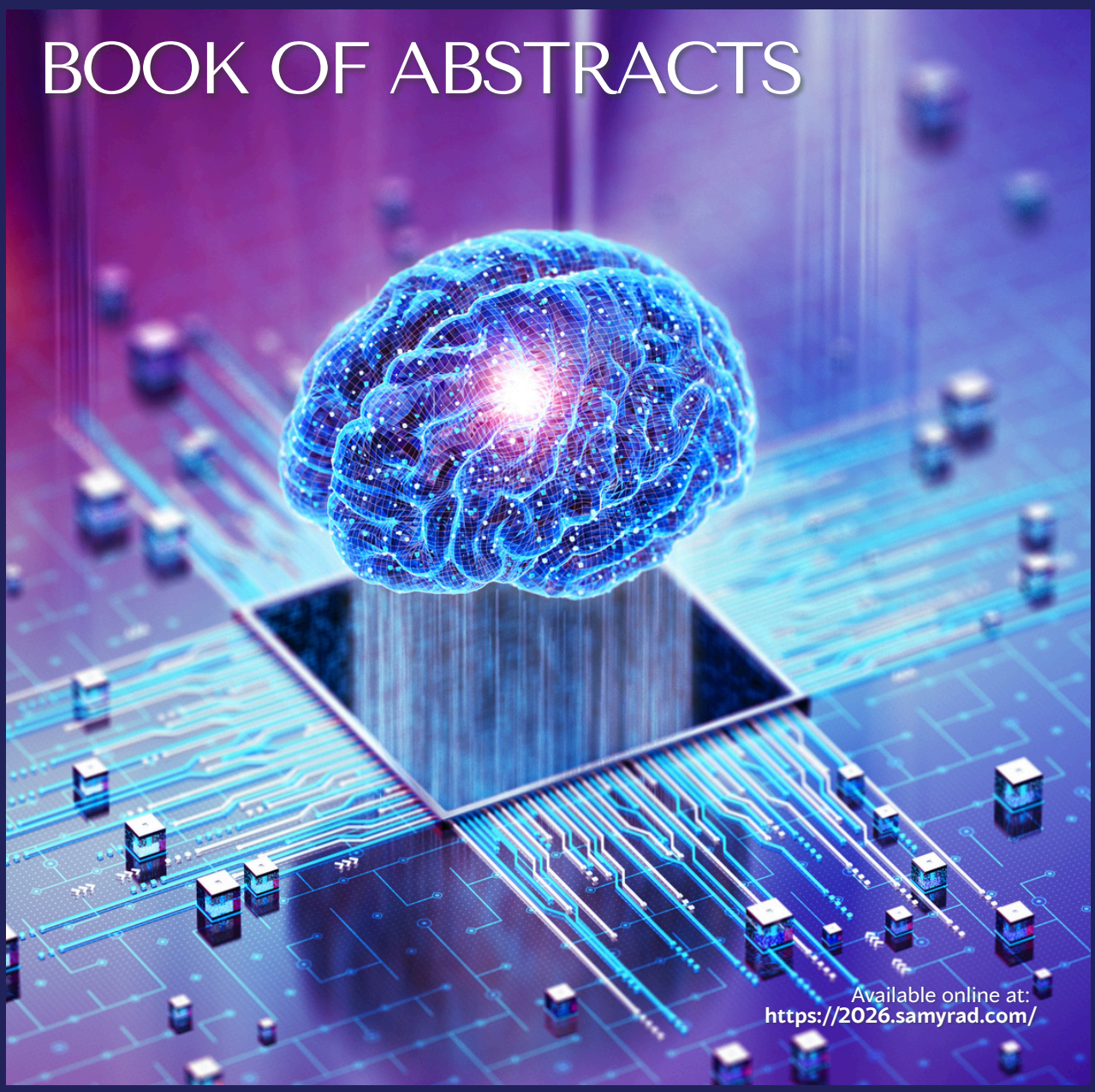
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SAMYRAD 2026

SMART ALGORITHMS & MODELS: YOUR REACH TO ADVANCED DIALOGUES

BOOK OF ABSTRACTS



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SAMYRAD 2026

BOOK OF ABSTRACTS

Smart Algorithms & Models: Your Reach to Advanced Dialogues

The Intersection of Artificial Intelligence and Education

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Hosted by Universidad CEU Fernando III

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Editorial statement

SAMYRAD 2026 convened an international and interdisciplinary exchange on the educational implications of artificial intelligence. The conference connected researchers, educators, institutional leaders, industry specialists and policymakers, with particular attention to practical educational applications, responsible innovation and collaboration across academia, industry and policy.

The Book of Abstracts contains all abstracts accepted through the conference peer-review process. Inclusion in this volume does not necessarily indicate that the work was presented at the conference or published in the conference proceedings.

References in abstracts were optional at the time of submission. Accordingly, some abstracts include reference lists while others do not. All abstracts are published substantially as submitted by the authors, with editorial changes limited to formatting and typesetting.

Abstracts were submitted through the SAMYRAD conference submission process and have gone through a thorough peer-review process. The volume editors have verified each item against the final conference record and applied consistent bibliographic formatting without altering the scholarly substance of the approved text.

Message from the Conference President

SAMYRAD was founded on a conviction: the future of education in the age of artificial intelligence cannot be shaped by academia alone, nor should it be shaped without academia.

The unprecedented pace, scale, and complexity of technological transformation demand a fundamentally different approach to dialogue and collaboration. Decisions that will redefine how we teach, learn, conduct research, develop talent, and understand human intelligence are increasingly being made across industries, governments, international organizations, and technology companies. Academia must not remain on the sidelines of these conversations, waiting to study, interpret, or validate decisions that have already been made. It must have a meaningful voice where those decisions are formed.

This conviction gave rise to SAMYRAD: an international platform designed to bring academia into closer conversation with industry leaders, policymakers, governments, philosophers, think tanks, international organizations, non-governmental organizations, and the wider community of stakeholders shaping the development and application of artificial intelligence.

Our ambition extends beyond exchanging research findings. We seek to create an environment in which different perspectives can challenge one another constructively, develop mutual understanding, and identify opportunities for meaningful collaboration. We believe that researchers have much to contribute to the governance and direction of technological transformation, just as academia has much to learn from the practical realities, priorities, and experiences of those working beyond its institutional boundaries.

The objective is neither to position academia as a passive observer of change nor to expect it to adapt uncritically to every technological advancement. Rather, it is to strengthen the capacity of the academic community to engage with transformation thoughtfully, critically, and proactively, while contributing evidence, ethical reflection, and educational insight to decisions that will affect generations to come.

SAMYRAD is therefore conceived not as a one-time gathering, but as an evolving, annual international forum. Each edition will invite perspectives from different disciplines, sectors, cultures, and geographical contexts, recognizing that the implications of artificial intelligence for education cannot be adequately understood through any single lens. Our responsibility is to ensure that academic voices are present not merely when the outcomes of innovation are evaluated, but throughout the processes in which its priorities, directions, and consequences are determined.

The inaugural edition of SAMYRAD, held on October 5–6, 2026, in Seville, Spain, represents the first realization of this vision. Bringing together participants from more than 70 countries, the conference provided a space for scholarly exchange, interdisciplinary dialogue, practical learning, and the exploration of relationships that extend beyond conventional academic boundaries. The diversity of contributions reflected both the opportunities and the challenges that artificial intelligence presents across higher education, lifelong learning, professional development, and society at large.

An undertaking of this scope would not have been possible without the commitment, generosity, and collective efforts of an extraordinary network of institutions and individuals.

I extend my deepest appreciation to Universidad CEU Fernando III for hosting the inaugural edition in Seville and for its invaluable institutional and organizational support. I am equally grateful to the Institute of Electrical and Electronics Engineers (IEEE), particularly the IEEE Spain Section, IEEE Region 8, and the IEEE Education Society, for their contributions to the conference's technical and academic development.

Our sincere gratitude also extends to the Alfamed Euro-American Research Network, Universidad de los Andes in Colombia, the World Innovation Summit for Education (WISE), an initiative of Qatar Foundation, the University of Calcutta in India, the Research About Learning in Higher Education (REAL-HE) at Oxford Brookes University in the

United Kingdom, CENTRUM PUCP at the Pontificia Universidad Católica del Perú, Universidad Camilo José Cela in Spain, and the Institute for the Future of Education at Tecnológico de Monterrey in Mexico. The involvement and contributions of these institutions and their representatives have enriched the international and interdisciplinary character of SAMYRAD.

I wish to express particular appreciation to the Association of Economists and Managers of the Balkans (UDEKOM Balkans) and OpenAI for their instrumental support in bringing this inaugural conference to fruition. Their engagement exemplifies the cross-sector collaboration that lies at the heart of SAMYRAD's mission.

My sincere thanks also go to our distinguished advisory, technical program, editorial, and organizing committees, keynote speakers, workshop facilitators, reviewers, session chairs, authors, and participants. Their intellectual contributions, careful evaluations, organizational dedication, and willingness to engage in open dialogue have been essential to establishing the foundations of this new international initiative.

The contributions collected in this Book of Abstracts represent more than individual scholarly endeavors. Together, they offer a window into the questions, uncertainties, aspirations, and emerging directions of a global academic community navigating one of the most consequential technological transformations of our time. They reflect a diversity of methods, disciplinary perspectives, geographical experiences, and critical positions that deserves to be preserved, shared, and developed.

We are pleased to present this volume through Intelligent Nudge, the publisher of the SAMYRAD proceedings, as part of our commitment to disseminating knowledge and making scholarly contributions accessible to an international audience.

As we look toward future editions of SAMYRAD, our aspiration is to build upon the relationships initiated in Seville, broaden the spectrum of voices represented, and translate dialogue into sustained partnerships, collaborative initiatives, and informed action.

Artificial intelligence is transforming education at a speed that challenges the traditional rhythms of academic institutions. Yet the urgency of this transformation makes the thoughtful, independent, and evidence-informed contribution of academia more necessary than ever.

Our invitation is simple: let us move beyond observing the future of education and participate in shaping it.

With gratitude and a commitment to the conversations ahead,

Samira Hosseini, PhD
Conference President, SAMYRAD 2026

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Conference overview

Held on 5–6 October 2026 at Universidad CEU Fernando III in the Seville area, SAMYRAD 2026 brought together academic, industry and government perspectives on artificial intelligence and education. Its scientific program combined keynote contributions, training, discussion and parallel presentations. The event supported on-site participation and virtual presentations.

Keynote speakers

• Rose Luckin, PhD, CBE, Professor Emerita of Learner Centred Design, University College London, United Kingdom.

• Ignacio Aguaded, PhD, Professor, Faculty of Education, University of Huelva, Spain.

• Irena Palamani Xhurxhi, PhD, Director of People Science, Walmart, United States.

• Diba Kaya, Staff Insights Researcher, JSTOR (ITHAKA), United States.

• Soribel Feliz, Senior AI Policy and Governance Specialist, United States Department of Homeland Security, United States.

Special workshop and panel facilitators

Carlotta Reviglio, Strategic AI Success Engineer at OpenAI, and Julius Nganji, PhD, University of Toronto, Canada, led a special hands-on workshop exploring the practical applications of artificial intelligence in teaching, learning, and academic research. The workshop was followed by an engaging panel discussion featuring May Iliana Portuguez Castro, PhD, Pontificia Universidad Católica del Perú, Peru, and Natalia Lara Nieto Márquez, PhD, Camilo José Cela University, Spain.

Another highlight of the conference was the plenary panel organized in collaboration with the World Innovation Summit for Education (WISE) as part of Qatar Foundation, led by Selma Talha-Jebril. Titled “Navigating AI Skills Adaptation in Higher Education: Two WISE Case Studies,” the session featured presentations by Natalia Lara Nieto Márquez, PhD, Camilo José Cela University, Spain, and Carola Hernández Hernández, PhD, Universidad de los Andes, Colombia. The panel explored approaches to adapting higher education to the evolving skills demands of an AI-driven world, drawing on insights from two WISE case studies.

Conference publication pathways

Eligible full papers were directed to either the IEEE publication pathway or the SAMYRAD open-access publication pathway, subject to the applicable editorial and technical requirements. This Book of Abstracts is a separate record of conference presentations; it does not replace any definitive full-paper publication.

Thematics and scope

The scientific themes below reflect the published scope of SAMYRAD 2026. They introduce the breadth of the conference and do not prescribe the ordering of abstracts. The table of contents and abstract sequence will be inserted later using the approved editorial arrangement.

1. Cross-Disciplinary AI in Education

Explores the role of artificial intelligence in education and professional preparation across medicine, healthcare, business, engineering, architecture, design, humanities, social sciences, STEM, law, governance, arts and creative fields. Includes disciplinary case studies, emerging practice and interdisciplinary methods.

2. AI-Enhanced Learning Environments

Addresses personalized academic support, learning analytics, intelligent advising, formative feedback, academic integrity, curriculum planning, emotionally responsive systems, immersive learning technologies and inclusive adaptive learning experiences.

3. Instructional Design and Teaching Innovation

Examines AI-supported pedagogy, adaptive learning pathways, cognitive and motivational factors, intelligent tutoring, mastery-based education and the design and evaluation of educational games and simulations.

4. Designing and Assessing AI Tools in Education

Considers the development, testing and validation of educational AI applications, comparative benchmarks, participatory and user-centered design, and longitudinal evidence of effects on learning, engagement and academic outcomes.

5. Ethical, Cultural, and Societal Considerations

Investigates algorithmic fairness, discrimination, accessibility, inclusion, cultural responsiveness, student privacy, digital rights, and the psychological and behavioral consequences of AI in educational contexts.

6. Educators, Leaders, and Institutional Innovation

Focuses on evolving faculty roles, AI literacy and professional development, university administration, institutional digital transformation, leadership approaches and governance for responsible adoption.

7. Infrastructure, Strategy, and Policy Frameworks

Addresses institutional readiness, organizational change, legislation and ethics, national and international policy frameworks, long-term sustainability, financial planning and resources for AI implementation.

8. Academic Research and Publishing Innovations

Explores AI-supported research synthesis and scholarly workflows, peer-review technologies, authorship questions, impact assessment, transparency, traceability and research integrity in academic publishing.

9. Interdisciplinary and Cross-Cultural Insights

Encourages international comparisons, work in low-resource contexts and the Global South, interdisciplinary collaborations, philosophical perspectives on intelligence and learning, and human-AI collaboration consistent with academic values.

10. Future Outlooks and Disruptive Developments

Examines emerging AI capabilities, predictive models for student support, adult and continuing education, educational entrepreneurship and innovation ecosystems, and open-source technologies that broaden educational access.

Special Theme: AI for Sustainable Development in Education

Considers ways educational AI may contribute to the United Nations Sustainable Development Goals, including quality education (SDG 4), gender equality (SDG 5), decent work (SDG 8), innovation and infrastructure (SDG 9), reduced inequalities (SDG 10), sustainable communities (SDG 11), responsible consumption (SDG 12), climate action (SDG 13), strong institutions (SDG 16) and partnerships (SDG 17).

Publication policy and citation information

This collection records SAMYRAD 2026 contributions reflected in the supplied indexing export. The inclusion of an indexed submission does not independently establish its presentation or publication eligibility. The final publication list is subject to editorial validation. Where a full paper is published, the publisher's definitive version of record should be consulted.

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The Impact of Artificial Intelligence on Entrepreneurship and Regional Development

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Keywords: Artificial Intelligence, Entrepreneurship, AI Solutions

Abstract: The purpose of this research paper is to delve into the growing importance of artificial intelligence (AI) for entrepreneurs. Artificial intelligence has emerged as a powerful tool with the potential to revolutionise various aspects of entrepreneurship. Quantitative research design was used to get insights into the emerging trend of using AI in entrepreneurship in Croatia. The central quantitative research question was aimed to discover do entrepreneurs in Croatia consider that AI will enhance their business and regional economy development. The research sub-questions provide insights into expansion of businesses and increased productivity with AI. The powerful AI technology is reshaping businesses, fostering innovation that fuels economic growth and helping entrepreneurs to create more job opportunities. Thus, this research paper provides answers do entrepreneurs in Croatia consider that AI solutions help them to be remain competitive in the marketplace. Within the realm of entrepreneurship, AI has become a pivotal force, providing entrepreneurs with solutions to make decisions on data-driven analysis, enhancing business with valuable insights from text and image, as well as making processes faster and automatic. This research also gives insights into affordability of AI solutions based on the survey participants responses. Since AI can draw investments into the economy, researcher will provide insights into the readiness of the Croatian market for AI solutions such as LikeMagicAI.com. Data is collected through questionnaire shared with the random sample of entrepreneurs in Croatia. After data was collected through closed-ended surveys, exploratory data analysis of data was performed. After thorough analysis of data, results are shared with the future researchers.

Artificial Intelligence and the Future of Education in Croatia

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Keywords: Artificial Intelligence, Learning, Co-Creation, Transitioning Countries, Digitalization

Abstract: Artificial Intelligence (AI) was first explored by Alan Turing, young British polymath in the 1950s, and later developed as a term by John McCarthy, computer, and cognitive scientist. AI is now in its pivotal moment to completely change education and many industries. The assumptions are that AI will revolutionize the way in which we learn. In today's rapidly changing business and education environment, educational institutions must keep pace with changes. The digital automation and continued technological disruption hugely affect the education industry. AI is unlocking opportunities for educational institutions to get the best of both worlds, using traditional and digital AI teaching programs. The assumptions are that starting today and in future, AI and traditional teaching models will co-exist, the additional value for learners will be co-created and the quality of education will increase. The advancement of AI in education has enormous potential for social good and for advancements towards achieving Sustainable Development Goals. This research paper will investigate the demand and the perceptions about the AI educational programs for the university students in Croatia, focusing on the co-creation of value with AI for students. Past studies regarding the implementation of Artificial Intelligence educational programs, digital innovation in education and unexplored demand will be used to investigate the market potential for AI supportive learning centers. Many factors will help in understanding the demand, such as research regarding emerging trends in the education industry, predictions in GDP growth and the value of AI in education. Using the Constructivist worldview, this qualitative research paper with qualitative design will attempt to discover the perceptions about AI in education of learners involved in university programs. Data will be collected through focus group of students and interviews of professors. Data will be analyzed, coded, and grouped based on predetermined terms derived from research questions and sub-questions. Limitations will be identified and shared with future researchers, as well as recommendation for co-creation with AI in education in transitioning countries.

Open-Source Multimodal AI for Education

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Keywords: Open Source, Open Access, Educational AI, Socratic Method, Open Framework, Multilingual, Open Culture

Abstract: In higher education, AI is happening to us rather than with us, leading to marginalization and participatory inequalities. First, all AI applications currently in use in education are commercial and not designed for the purposes of teaching or learning. Secondly, faculty predominantly lack opportunities to design AI for education. Thirdly, bigger is not always better, as large foundation models are giving way to task-specific models. The solution is our team's open-access platform Teach Anything, teachanything.ai, which enables professors to create their own open-access AI applications. We built an open-source infrastructure for limitless applications. Professors will choose from several open-source LLMs, upload course files, fine-tune system prompts, and adjust the AI's "temperature" of creativity. Once professors create their custom chatbots, they can easily share them with everyone via permalinks. Students do not need to login, and their full privacy is guaranteed. Teach Anything supports the creation of custom-trained, multilingual AI chatbots by faculty partners. These chatbots, operating in 58 languages, can offer adaptive responses to suit the learner's needs. The training data for these faculty-created "narrow" AI is transparent and pre-defined. In contrast, commercial AI scrapes data from the web. Commercial LLMs are trained on datasets with inherent biases baked into them. Teach Anything's community-oriented principles move away from a binaristic model of consumers versus corporations. This open-access and open-source platform models ethical practices in human-AI collaboration and uses inclusive design principles. It uses both the embedding and retrieval augmented generation (RAG) methods to ground responses in pre-defined, curated content.

AI-Based Tool Adoption Among University Students for Academic Research: A Mixed-Methods UTAUT2 Investigation

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Keywords: Academic Integrity, AI Adoption, Higher Education, Malaysia, UTAUT2

Abstract: The integration of artificial intelligence (AI)-based tools in academic research has transformed the cognitive and technological landscape of higher education, offering opportunities for enhanced productivity, feedback quality, and academic integrity. This study examines the behavioral and contextual factors influencing Malaysian university students' adoption of AI-based tools, framed through the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and guided by a sequential explanatory mixed-methods design. Quantitative data from 215 survey responses identified habit (HB) as the strongest predictor of behavioral intention (BI), followed by social influence (SI) and facilitating conditions (FC), while performance expectancy (PE), hedonic motivation (HM), and price value (PV) did not exhibit significant influence. Qualitative interviews with 10 participants provided interpretive depth, revealing that AI adoption is embedded in academic routines, often perceived as "second nature," and shaped by normative pressures from peers and instructors. Thematic analysis also uncovered ethical concerns (particularly around plagiarism). These findings affirm UTAUT2's predictive validity while suggesting that ethical literacy should be incorporated into future adoption models. The study contributes to the discourse on responsible AI integration by underscoring the interplay between habitual; use, peer influence, institutional facilitation, and ethical deliberation in shaping sustained engagement. Recommendations include targeted AI literacy programs, clear institutional guidelines, and policy frameworks to balance innovation with academic integrity.

A Review of Agentic AI Systems in Higher Education: Application, Architecture, and Challenges.

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Keywords: Agentic, Artificial Intelligence, Deep Learning, Reinforcement Learning, Higher Education

Abstract: Agentic Artificial Intelligence (AI) systems represent a significant advancement beyond traditional and generative AI, as they possess the capability for autonomous, goal-driven reasoning, planning, and interaction within dynamic environments. In higher education, these systems are increasingly being applied to support personalized learning, intelligent tutoring, adaptive assessment, academic advising, and institutional decision-making. This paper presents a comprehensive review of recent trends in the application of agentic AI systems in higher education. Drawing on interdisciplinary sources, it examines the foundational architectures underpinning educational agents, including large language models, reinforcement learning techniques, and multi-agent coordination frameworks. The review highlights emerging applications across key areas such as teaching and learning, learning analytics, assessment, student support services, and educational management. It also critically evaluates important challenges related to transparency, accountability, bias, data privacy, and the balance of human-AI agency. Furthermore, the study identifies notable gaps in current research, particularly in evaluation metrics, alignment with pedagogical practices, and governance frameworks. The paper concludes by outlining future research directions aimed at enabling the responsible, scalable, and pedagogically sound deployment of agentic AI systems in higher education.

AI-Driven Online Assessment in Ugandan Higher Education: A Socio-Technical Framework for Equity and Pedagogical Integrity

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Keywords: Artificial Intelligence in Education, Online Assessment Framework, Socio-Technical Systems Design, Pedagogical Integrity, Higher Education

Abstract: Artificial intelligence (AI) is reshaping assessment practices in higher education, yet Sub-Saharan African universities face persistent challenges of reliability, pedagogy, and equity. This paper advances a socio-technical framework for AI-enabled online assessment in Ugandan universities, informed by Socio-Technical Systems Design (STSD) methodology. The framework integrates adaptive algorithms, academic integrity mechanisms, and formative feedback tools with institutional, cultural, and infrastructural realities. Rather than presenting a completed system, the study emphasizes design principles and contextual considerations that balance technological efficiency with pedagogical integrity and equity. The contribution lies in extending socio-technical design theory into the domain of AI-enabled education, offering a context-sensitive pathway for digital assessment transformation. Implications for policy, pedagogy, and platform design are discussed, with recommendations for universities, governments, and international education partners.

Using Artificial Intelligence During Studies - Use of Chat GPT and Artificial Intelligence-Based Tools Among Students in Serbia

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Keywords: AI Literacy, AI Tools, Digital Tools in Education, Artificial Intelligence in Higher Education

Abstract: Artificial intelligence (AI) tools, particularly ChatGPT, are reshaping higher education and prompting widespread scholarly discussions about their potential influence on teaching practices and assessment strategies. As universities increasingly incorporate AI-powered technologies into educational activities, understanding their contribution to instructional effectiveness and student learning has become an important area of investigation. Against this backdrop, the present study explores the use of AI applications among students at the Belgrade Business and Arts Academy of Applied Studies. It further investigates students' attitudes toward ChatGPT, focusing on its perceived benefits, limitations, and implications for academic performance and future professional development. The research will be conducted among students of all years through a questionnaire administered via Google Forms. The results of this quantitative analysis will focus on multiple dimensions of Chat GPT usage, including frequency and purpose of use, perceived opportunities and limitations, level of satisfaction, and students' attitudes towards this tool. The study is based on the assumption that Chat GPT has the potential to both enhance and hinder the learning process, depending on the manner and context of its implementation.

Ethical Complexity, Professional Identity, and the Role of Intelligent Systems in Preparing Social Workers Supporting People with Harmful Sexual Behaviors

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Keywords: Trauma-Informed Practice, Ethical Decision-Making, Professional Identity, AI-Supported Training, Social Work Education

Abstract: Despite more than 700,000 professionals working in child and family protection services in the United States, limited research examines the lived experiences of social workers who support People with Harmful Sexual Behaviors (PWHSB). This qualitative study examines how 22 licensed social workers interpret and navigate their roles across assessment, treatment, and rehabilitation contexts, with particular attention to ethical decision-making, emotional labor, and professional identity formation. Through in-depth interviews, six interrelated themes emerged: Work as Identity, Emotional Load, Ethical Tightrope, Stigma and Misconceptions, Support and Professional Growth, and Preparing the Next Generation. Findings reveal persistent tensions among personal values, clinical responsibility, and societal judgment, contributing to moral distress and professional isolation. Participants highlighted significant gaps in training, supervision, and reflective support, particularly in addressing complex ethical scenarios and public stigma. From a cross-disciplinary perspective, this study highlights opportunities for AI-enhanced training environments, ethical decision-support models, and reflective learning systems to better prepare practitioners in high-risk, high-stigma domains. Intelligent tools, when designed with trauma-informed and ethically grounded frameworks, may support supervision, reduce cognitive overload, and foster resilience without replacing human judgment. The findings emphasize the need for ethically responsible intelligent systems, expanded professional education, and interdisciplinary collaboration to strengthen practitioners' preparedness and well-being. This research contributes to broader conversations about how smart algorithms and models can inform professional training, ethical reasoning, and sustainable workforce development in human-centered fields.

Revolutionizing Conservation: Leveraging AI to Unlock Animal Communication Insights

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Keywords: Artificial Intelligence, Bioacoustics, Conservation, Poaching, Communication, Endangered Species

Abstract: Advancements in synthetic intelligence (AI) are reworking wildlife conservation efforts, mainly in the renovation of endangered species. By studying enormous quantities of information, AI aids in monitoring ecosystems, recognizing patterns, and detecting new threats. Bioacoustics, mixed with AI, performs a important position in studying animal vocalizations, allowing researchers to pick out species, music movements, and respond to precise activities, inclusive of detecting unlawful poaching activities. Real-time tracking of animal sounds via AI-powered systems provides immediately signals for sizable occurrences. This paper explores the ability of AI to decode animal communique, focusing on complex systems like the ones of birds, cetaceans, and primates. The potential to understand animal "languages" gives new possibilities for conservationists and advances our knowledge of non-human verbal exchange. AI's role in conservation is key to accelerating discoveries and enhancing the effectiveness of protection efforts.

Embracing AI and Blockchain in Higher Education: A Roadmap

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Keywords: Artificial Intelligence, Blockchain, Curriculum Integration, Digital Transformation, Higher Education, Emerging Technologies, Business Education

Abstract: In the fourth wave of the industrial revolution, artificial intelligence (AI) and blockchain technologies have upset the paradigm of higher education, reshaping the need for skills in this sector. This paper is a holistic roadmap to implement AI and blockchain in higher education universities, by using business studies as a case study. Using a literature review and global standards, we find a lack of systematic implementation of these novel technologies into mainstream programs, particularly in developing ones. We use the theory of digital transformation and the Technological Pedagogical Content Knowledge (TPACK) model to conceptualize the integration strategy. Our approach is both a qualitative and case-study approach: we compile finest practices in the world and in Southeast Asia. We compare them to theoretical knowledge to suggest a model of curriculum integration and a gradual institutional implementation plan. The results are to have a systematic curriculum model (core classes, major courses, practical projects, and training in ethics) and a system plan roadmap (short term pilot, long-term scale-up). We explain how such integration helps to fill identified gaps in skills, and it is in tandem with the current trends in global digital education and taking into account other ethical and administrative considerations (capacity of the faculty, infrastructure, governance). The paper provides an academically-supported plan that universities can use in creating future-ready graduates capable of utilizing AI and blockchain, and ends by outlining policy, practice, and future research opportunities implications.

From Mainframes to Curricular Sovereignty: A Sixty-Year Historiography of AI in Nigerian Higher Education (1963–2025)

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Keywords: Artificial Intelligence, Nigerian Higher Education, NUC Unbundling, Historiography, Educational Technology, Developing Nations

Abstract: For sixty years, artificial intelligence (AI) has subtly influenced higher education in Nigeria, however, its extensive narrative is still predominantly untold. Although there is extensive documentation on global narratives of AI, the particular development within Nigeria's universities, characterised by persistent infrastructure deficiencies and contradictory policies, has garnered minimal academic focus. This paper outlines the sixty-year progression of AI within Nigerian institutions, emphasising notable transitions from early computational logic to the current era of generative AI and concentrated degree programs. A qualitative historiographical approach is employed, leveraging prior research on the decolonisation of Nigerian higher education which includes a documentary analysis of the National Universities Commission (NUC) standards, a bibliometric review of Nigerian AI publications, and an examination of historical university bulletins spanning from 1963 to 2025. This analysis delineates the evolution into four distinct eras, namely; foundation (1963–1980s), digitisation (1990s–2010), institutionalisation (2011–2021), and specialisation (2022–present). The results reveal a significant shift of AI from a peripheral administrative tool to a core academic discipline, propelled by the 2024 NUC unbundling policy on Computer Science. The research uncovers an ongoing contradiction in infrastructure and policy, where bold national AI initiatives confront persistent historical issues concerning power stability along with the digital divide. The study reveals that Nigeria's advancement in artificial intelligence is evolving from simple technology adoption to attaining autonomy in its curriculum. This conclusion serves as a crucial reference for policymakers in developing nations, allowing them to connect historical knowledge with future strategies for AI integration.

A Research Embedded Implementation Model for Design of AI Applications in Higher Education

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Keywords: Artificial Intelligence, Meta-Synthesis, Grounded Theory

Abstract: The rapid advancement of artificial intelligence (AI) presents higher education institutions with a diverse range of challenges affecting both students and faculty. Identifying, investigating, and establishing effective strategies for integrating these technologies into academic environments remains a complex and multifaceted undertaking. This article provides an emerging model for further discussions about exploring, utilizing, and expanding the implementation of AI in educational contexts, with a focus on higher education. Meta-synthesis has been applied to over 1600 previous studies to identify themes and uncover recurring knowledge that can inform our processes for adopting AI use in education and optimizing its potential to enhance instruction and learning. ChatGPT GenAI synthesis presented 12 recurring meta-themes, while Copilot GenAI synthesis demonstrated 13 recurring meta-themes, showcasing how GenAI technologies are used and experienced in higher education setting. Both AI tools produced frameworks to illustrate their findings. ChatGPT's framework synthesizes the mixed role of GenAI in higher education, highlighting its pedagogical values and associated risks, and tracing its implications for learning processes, student experience, instructional design, and institutional governance, whereas Copilot's framework illustrates how effective GenAI integration relies on coordinated pedagogical design, institutional governance, operational stability, and equity-focused practices. Four main ideas have been determined to be consistently displayed in previous studies of the use of AI in higher education, including learning, pedagogy and governance, operations, and inclusion/industry. The interdependence of these four concepts influences both institutional and instructor readiness to use, and allow the use of, AI in the higher learning environment. Ideas are emergent and fluid, though strongly evident in the corpus of studies analyzed thus far, so the connections outlined may be further developed if new insights are uncovered and presented as a grounded theory. It is, however, evident that a reasonable level of saturation of themes has been reached and that the models presented in this study may be valid tools for our current use.

Sovereign-Mohawk: A Formally Verified 10m-Node Federated Learning Architecture with Byzantine Resilience, Differential Privacy, and Zero-Knowledge Verifiability

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Keywords: Federated Learning, Zero-Knowledge, Sovereign-Infrastructure

Abstract: We present Sovereign-Mohawk, the first federated learning (FL) system to achieve a production target of 10 million nodes while providing machine-checked formal verification across six critical security and efficiency dimensions: Byzantine fault tolerance, Rényi differential privacy, communication optimality, straggler resilience, cryptographic verifiability, and nonIID convergence. The protocol employs a four-tier hierarchical architecture (Edge–Regional– Continental–Global) with Hierarchical Multi-Krum aggregation, achieving a provable 55.5% Byzantine resilience bound—tolerating up to 5,555,555 malicious nodes at scale. All six core claims are formalized in Lean 4 and mechanically verified via continuous-integration proof gates, with zero unproven placeholders (sorry/axiom/admit). The system reduces communication from O(dn) to O(d log n), achieving a ∼1.4M× improvement over naive FedAvg (40 TB → 28 MB for d = 106 parameters). Runtime evidence from Go unit tests cross-validates every formal theorem. We additionally report on production-readiness artifacts including TPM-backed attestation, post-quantum cryptography migration, EU AI Act high-risk compliance mapping, and operational benchmarks exceeding 32,000 aggregations per second.

Artificial Intelligence: A Holistic Conception of Education and Honoring the Qualitative

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Keywords: Intelligence, Quantitative, Qualitative, Cognitive, AI, Old Teacher

Abstract: The hypothetical question "can aspects of the human knowledge or education be quantified and measured or assessed in quantity?" poses the premise that a holistic conception of education is required. This is especially true in a world of which there is accelerating reliance on artificial intelligence in every aspect of modern society, education as well as knowledge production. In academic discourses and discussions, there is much emphasis on how the quantitative advantages of AI will trump the old qualitative ways. This increase has been on the rise since the Fourth Industrial Revolution. This is particularly with reference to the academic term "death of the old teacher" in the AI age. In the literature titled 'Death of the Old Teacher': Navigating AI in Education through Kubler-Ross Model which is authored by Louie Giray – it is stated that education needs to represent shedding traditional "archaic" practices and use AI to enhance student-teacher interactions. This chapter will explore how education maintains the room for the need of cognitive development through traditional practices, particularly in this AI-led era. One case example is the necessity of traditional essay writing in educational institutes, particularly by hand. Psychological research on cognition and studies from neuroscience have exhibited that memory and learning are essentially cognitive functions. This cognitive advancement can be continuously promoted through traditional essay-writing by hand, which will also develop the qualitative elements for knowledge production in general

More Use, More Critical? Generative AI, Student Productivity, and Cognitive Engagement in Higher Education

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Keywords: Artificial Intelligence in Education, ChatGPT and Higher Education, Student Productivity, Academic Self-Efficacy, Cognitive Engagement

Abstract: Recent studies have shown that artificial intelligence can improve academic performance, reduce time spent on assignments, and streamline the writing process by providing structural, linguistic, and content feedback. However, experts warn of potential negative impacts, particularly in the area of cognitive thinking, fearing that heavy reliance on AI tools may weaken students' critical thinking, self-control, and problem-solving skills. Despite a growing number of studies analyzing the positive effects of AI on productivity and the associated risks, empirical knowledge about its differential impact across individual dimensions, such as time efficiency, academic performance, self-efficacy, and cognitive engagement, remains limited. The existing literature rarely approaches productivity comprehensively across these dimensions, and even fewer studies focus on students' subjective self-assessment of productivity in non-Western contexts, where AI integration in education is still in its infancy. This study addresses this gap by examining how university students in Vietnam perceive the role of AI in shaping their productivity and cognitive skills. This study analyzes the impact of artificial intelligence on the productivity and cognitive effort of university students through a combination of survey and quantitative analysis of original collected data. Data were collected from students at the National Economics University in Hanoi, Vietnam between September and December 2024, yielding 104 fully completed responses. Data were cross-tabulated using tables and graphs, internal consistency was examined using Cronbach's alpha, and qualitative responses were analyzed thematically to support the interpretation of quantitative trends. The weights of individual productivity dimensions were then estimated using a binary probit regression model to identify the drivers of perceived productivity. The results show that perceived productivity gains often motivate more extensive and frequent AI use across academic, personal, and professional contexts. Increased efficiency, reduced stress, accelerated decision-making, and increased creativity are particularly felt by less frequent users. Daily users, however, reported lower perceived accuracy of AI outputs compared to weekly users — suggesting that long-term use may foster a more critical approach to AI-generated content, challenging the assumption that frequent use automatically weakens cognitive effort. Notably, our research indicate that AI benefits are not reaped by all students evenly: some students already struggling academically appear to fall further behind, while high-scoring students appear to harness AI to further develop their academic skills. This study reveals that AI use among university students shapes perceptions of productivity and cognitive effort in complex, non-linear ways. Time efficiency, improved academic performance, and

increased self-efficacy often led to broader and more frequent AI engagement. Among more frequent and academically stronger users, we observed sharper critical evaluation of AI outputs alongside better academic results. Conversely, academically weaker students may experience poorer outcomes even after adopting AI, which may discourage continued use. For educators, the findings highlight the need to embed prompt engineering, critical evaluation, and sustained engagement into AI literacy programmes, ensuring AI serves as a catalyst for deep learning rather than a shortcut that undermines independent thinking. Future research should incorporate academic performance tracking, AI usage logs, and experimental methodologies to provide a more accurate and comprehensive view of AI's impact on student productivity.

Navigating Teacher Rotation: A Pilot Study Using Generative AI Voice Chat as a Perceptual Bridge for A1-B1 Learners

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Keywords: Generative AI, Vocal Shock, Teacher Rotation, Phonetic Adaptation, High-Variability Phonetic Training (HVPT), Affective Filter

Abstract: Traditional pedagogical models in English as a Foreign Language (EFL) often rely on a static, single-teacher vocal model, which can limit a learner's ability to decode the phonetic variability of real-world speech. This pilot action research study (N = 18) investigates a framework designed to accelerate speaker normalization among A1-B1 learners experiencing systemic teacher rotation at a language center in Ecuador. Systemic teacher rotation in English Language Teaching (ELT) often triggers "vocal shock" for A1-B1 learners, a phenomenon in which sudden exposure to new acoustic models disrupts comprehension and heightens accent anxiety. Grounded in High-Variability Phonetic Training (HVPT), the intervention utilizes Generative AI Voice Chat as a "perceptual bridge" to mitigate these effects, typically caused by changing instructors every three months. Following a mixed-methods approach, quantitative results indicate that while 100% of participants initially feared not understanding a new teacher, 78% reported that AI practice significantly accelerated their adaptation to a new human instructor's voice. Furthermore, 94% of students agreed that rotation combined with AI interaction improved their listening skills more than a single-teacher model. Qualitative data revealed a marked reduction in the "Affective Filter," with students reporting they felt "less judged" and more "relaxed" when practicing with AI. This paper argues that integrating AI as a "cognitive teammate" transforms the administrative challenge of teacher rotation into a structured opportunity for improving learner confidence and long-term phonetic resilience, building essential listening resilience for a globalized world.

Artificial Intelligence in Education and the Future of Skills: Implications for Sustainable Employability in Emerging Economies

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Keywords: Artificial Intelligence (AI), Digital Transformation, Future Skills, Sustainable Employability, Emerging Economies

Abstract: This study explores how Artificial Intelligence (AI) is reshaping education and influencing the development of future skills required for sustainable employability in emerging economies. As the labor market undergoes rapid and profound digital transformation, education systems are increasingly challenged to adapt in ways that reflect evolving workplace realities. This shift calls for a stronger focus on equipping learners not only with technical and digital skills, but also with critical thinking, creativity, and socio-emotional competencies. Methodologically, the research adopts a mixed-method approach, combining quantitative surveys with qualitative semi-structured interviews conducted among educators, policymakers, and industry stakeholders across selected emerging economies. The quantitative component enables the identification of patterns and skill gaps, while the qualitative analysis provides deeper insights into perceptions, institutional challenges, and contextual realities such as unequal access to technology and the prevalence of informal employment. Data is analyzed using statistical techniques alongside thematic content analysis to ensure a comprehensive and triangulated understanding of the issue. The study investigates how AI-powered educational tools support skill development while identifying mismatches between current educational outcomes and labor market demands. The expected outputs include: (1) a clear mapping of critical future skills aligned with AI-driven labor market trends; (2) an evaluation of the effectiveness and limitations of AI in education systems; (3) policy recommendations aimed at fostering inclusive, flexible, and lifelong learning pathways; and (4) a strategic framework to enhance sustainable employability in emerging economies. Ultimately, the research aims to demonstrate how AI can serve as a catalyst for transforming education systems and supporting more equitable workforce development.

Bridging Disciplines: Exploring Digital Tools for Cross-Disciplinary Teaching and Learning in Higher Education

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Keywords: Artificial Intelligence, Cross-Disciplinary Learning, Higher Education, Interdisciplinary Teaching, Educational Technology

Abstract: Higher education faces growing pressure to prepare students for complex, real-world challenges that cut across traditional disciplinary boundaries. While technology has long supported teaching and learning, its role in fostering collaboration between faculties remains underexplored. This study investigates how digital learning tools can support cross-disciplinary teaching, promote student engagement, and encourage integrative thinking across diverse academic contexts. Drawing on a mixed-methods approach, surveys and semi-structured interviews will be conducted with educators from STEM, humanities, and social sciences to examine current practices, perceived benefits, and barriers to interdisciplinary implementation. Early exploration suggests that thoughtfully designed tools can help students navigate unfamiliar concepts, collaborate effectively across disciplines, and synthesize multiple perspectives, while also offering instructors actionable insights into learning processes. Anticipated challenges include differences in disciplinary culture, institutional structures, and educators' familiarity with emerging technologies. By focusing on how these tools function as bridges rather than replacements, the study aims to provide practical guidance for curriculum design, faculty development, and institutional strategy. Ultimately, this research seeks to illuminate ways in which higher education can leverage technology to create learning environments that cultivate collaboration, critical thinking, and problem-solving across disciplinary boundaries, preparing students for the multifaceted challenges of today's world.

Generative AI Literacy and Innovation Self-Efficacy in Graduate Business Education: An Instrument Validation Study

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Keywords: Generative AI Literacy, Innovation Self-Efficacy, Business Education, Higher Education, Scale Validation, Survey Validation, PLS-SEM

Abstract: Graduate business students are expected to develop creativity and innovation capabilities to address business challenges in contexts of high competition and technological disruption. Generative artificial intelligence (GenAI) can support this process by helping students generate, refine, evaluate, and communicate new ideas. Therefore, students' GenAI literacy is increasingly important, as they are expected to use AI tools for analysis, creativity, problem solving, and responsible decision-making. Although GenAI literacy has received growing scholarly attention, its relationship with creativity and innovation skill self-efficacy (CISE) remains underexplored, particularly among graduate business students. This gap is also reflected in the limited validation evidence for GenAI literacy instruments in graduate business education contexts. It matters because business environments require leaders who feel confident in contributing to innovation outcomes, and business schools need reliable tools to identify and strengthen those capabilities. Yan et al. [1] developed and validated a GenAI literacy scale, conceptualized as a multidimensional capability that includes awareness, usage, evaluation, and ethics and risks. However, limited evidence exists on its psychometric performance in Latin American higher education contexts. This study addresses this gap by providing validation evidence for Yan et al.'s [1] instrument and examining its relationship with CISE. This study uses a quantitative cross-sectional design. Survey data were collected from 100 graduate business students in Peru. GenAI literacy was measured using the scale developed by Yan et al. [1]. CISE was measured using the creativity and innovation self-efficacy dimension from the scale developed by Kayhan and Korkmaz [2]. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to assess the measurement and the structural model. GenAI literacy was modeled as a Type II higher-order construct, with four reflective first-order constructs forming a second-order formative construct. Cognitive interviews assessed face validity and item clarity. Preliminary results support the adapted measurement model. The GenAI literacy dimensions showed satisfactory internal reliability and convergent validity. Discriminant validity was generally supported through the Fornell-Larcker criterion and cross-loadings, although results suggest a close conceptual relationship between usage and evaluation. This may reflect how students connect effective GenAI use with assessing tools, outputs, and task fit. The higher-order model also showed acceptable results, supporting GenAI literacy as a multidimensional capability

formed by awareness, usage, evaluation, and ethics and risks. The structural model showed a positive and significant relationship between GenAI literacy and CISE, with adequate explanatory power and predictive relevance. This study contributes to research by validating a GenAI literacy instrument and linking it to CISE in a Latin American context. This study provides preliminary evidence supporting the adaptation and use of Yan et al.'s [1] GenAI literacy scale among graduate business students in Peru. The findings suggest that GenAI literacy can be modeled as a higher-order construct and is positively associated with CISE. For educators, the findings highlight the importance of designing learning experiences that integrate practical GenAI use, critical evaluation, and ethical awareness to strengthen students' innovation-related skills. Future research should replicate this scale in different contexts.

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Scaffold or Shortcut? Designing AI-Supported Inquiry to Preserve Student Thinking in K–12 Classrooms

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Keywords: AI in Education, Critical AI Literacy, Neurodivergent Learners, Student Agency, Design-Based Research

Abstract: Every instructional support carries a design question: does it help students build capacity, or does it help them bypass the thinking the task was meant to develop? This question becomes especially urgent in AI-supported classrooms, where tools can expand access while also increasing the risk of dependency, reduced cognitive effort, reinforced bias, or lowered expectations for learners. Grounded in an emerging design-based research project with neurodivergent middle school learners, this work-in-progress paper introduces a classroom design approach that combines critical AI literacy, inquiry-based learning, and student voice. The study is situated in an independent school context serving students with ADHD, dyslexia, autism, language processing differences, and related learning profiles. Rather than positioning students only as users of AI tools, the design invites them to act as evaluators of AI systems, texts, and school practices. The learning experience draws on Pulitzer Center AI Accountability journalism, Day of AI activities, and two student-facing frameworks developed by the author: the AI Thinking Cycle and the POWER Lens. Preliminary data will include student reflections, group discussion artifacts, and student-generated recommendations collected during a May 2026 AI accountability workshop with seventh-grade students. These data will be used to explore how students identify the benefits and risks of AI in school and how they describe the conditions under which AI supports or weakens learning. This paper contributes to conversations about responsible AI integration by centering student voice and design responsibility. It argues that educators must design learning environments where students use AI critically, reflectively, and ethically while preserving the intellectual struggle necessary for deep learning.

Empowering the Individual: Leveraging Large Language Models for Tailored Student Support

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Keywords: Large Language Models (LLMs), Personalized Learning, AI Tutoring, Adaptive Education, Learning Analytics, Student Support, Web and Mobile Application Development

Abstract: Traditional education follows a largely "one-size-fits-all" approach, often leaving some learners behind while insufficiently challenging others. AI-powered tutoring tailored to individual student needs has the potential to address differences in learning pace, conceptual understanding, and problem-solving ability through personalized guidance and adaptive feedback. Current educational systems lack mechanisms to continuously assess individual student understanding during the learning process. Existing adaptive tools focus primarily on outcomes such as grades and completion rates rather than real-time conceptual clarity, learning difficulty, and problem-solving ability. Limited research exists on how Large Language Models (LLMs) can diagnose micro-level learning gaps and provide personalized instructional support tailored to each learner's pace, understanding, and cognitive needs. This study adopts an empirical, design-based research approach using student performance data from a recreational Web and Mobile Application Development course conducted at a leading university in India. The dataset spans four semesters /course offerings, including three Basic Level courses and one Advanced Level course. A total of 765 student performance records were analysed, comprising 704 Basic Level enrolments and 61 Advanced Level enrolments. Data included written quiz scores, attendance, hands-on assignments, project evaluations, and longitudinal student progression using roll-number matching. The Basic Level course evaluated student understanding of HTML, CSS, JavaScript, MySQL, and PHP, alongside implementation tasks such as creating forms, JavaScript validation, and PHP–database integration. The Advanced Level course covered CRUD operations, authentication methods, OAuth, APIs, Single Page Applications (SPAs), ReactJS, non-relational databases, and React Native development, supported through project-based assessments. Quantitative analysis examined performance variation across semesters and student progression between course levels, while qualitative interpretation identified learning bottlenecks, conceptual clarity, and implementation challenges. The findings revealed substantial variation in student performance despite uniform instruction, highlighting limitations of traditional teaching models. While some students demonstrated strong conceptual understanding and implementation skills, others struggled to translate theory into working applications. A key finding emerged from students completing both Basic and Advanced Levels. Using roll-number matching, 58 students were tracked longitudinally. These students achieved an average score of approximately 84% in the Basic course and 80% in the Advanced course, despite increased curriculum complexity. More than 60% maintained or improved performance, suggesting meaningful conceptual progression and stronger problem-solving

capability. A moderate positive relationship between foundational and advanced performance was observed, indicating that stronger conceptual grounding generally translated into better advanced outcomes. These findings reinforce the need for LLM-based personalized tutoring systems capable of identifying learning gaps early, assessing conceptual clarity, and adapting instructional support to individual learner needs. The study demonstrates significant variation in student learning outcomes in web and mobile application development, emphasizing the limitations of the "one-size-fits-all" instructional model. The results suggest that LLMs can play a valuable role in identifying learning gaps, improving conceptual clarity, and providing adaptive, student-specific support. Future research should focus on developing and experimentally evaluating LLM-based personalized tutoring systems to improve student engagement, learning outcomes, and educational equity across diverse learner groups.

From Tools to Pedagogy: Meaningful AI Integration in the Language Classroom

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Keywords: Artificial Intelligence in Education Language Teaching and Learning AI-Enhanced Learning Environments Pedagogical Innovation Ethical AI in Education

Abstract: Artificial intelligence (AI) is increasingly transforming language education by expanding opportunities for personalized, interactive, and efficient learning experiences. Yet, despite the growing availability of AI-powered tools, many language educators continue to face challenges in integrating AI in pedagogically meaningful and ethically responsible ways within authentic classroom contexts. This work explores practical applications of AI in language teaching and learning, with a focus on supporting the development of listening, speaking, reading, and writing skills through adaptable and learner-centered approaches. Drawing on examples from real teaching contexts, the paper examines how AI can assist educators in designing differentiated learning materials, increasing student engagement, facilitating creative language production, and reducing time spent on repetitive instructional tasks while maintaining educational quality. The discussion also addresses critical pedagogical and ethical considerations surrounding AI integration in language classrooms, including learner autonomy, critical thinking, inclusivity, teacher agency, and the importance of preserving meaningful human interaction in increasingly technology-mediated learning environments. By bridging classroom practice with broader discussions on AI-enhanced learning environments and sustainable innovation in education, the paper contributes practical and research-informed perspectives on the evolving role of AI in contemporary language education. The study is particularly relevant for educators and researchers seeking balanced, accessible, and pedagogically grounded approaches to AI integration across diverse educational settings.

Reimagining AI in Education Through Human-Centered Learning Ecosystems: A Systems Thinking Framework for Whole-Student, Whole-Family, and Whole-Learning Ecology Perspective

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Keywords: Systems Thinking, Human-Centered AI, Ecosystems Learning, AI in Education, Whole-Student Learning

Abstract: Artificial Intelligence (AI) is rapidly transforming education through personalized learning systems, predictive analytics, automated assessments, and intelligent educational platforms. However, many current AI implementations in education remain fragmented, focusing primarily on content delivery, efficiency, and isolated institutional outcomes rather than the interconnected human ecosystems that shape learning. This paper argues that education must be understood not as a standalone technical system, but as a dynamic socio-cultural ecosystem involving students, families, teachers, communities, policymakers, and digital infrastructures. Drawing from systems thinking, ecosystem learning theory, and human-centered AI principles, this research introduces a Whole-Student, Whole-Family, and Whole-Learning Ecosystem Framework developed through HELP EdTech. The framework integrates formal and informal learning environments through interoperable educational infrastructures, including Student Information Systems (SIS), Learning Management Systems (LMS), analytics platforms, community engagement systems, and AI-enhanced learning pathways. The study explores how AI can support relational learning, belonging, emotional development, experiential learning, and cross-context educational continuity rather than merely optimizing academic performance metrics. The paper further examines ethical, cultural, and societal implications of AI-driven education, emphasizing the importance of empathy, inclusion, equity, contextual learning data, and interdisciplinary collaboration. Particular attention is given to the risks of technological silos, disconnected policy frameworks, and data-driven educational reductionism that overlook the lived realities of learners and educators. Using a conceptual and interdisciplinary research approach, this study proposes that the future of AI in education depends on building connected learning ecosystems that strengthen human relationships instead of replacing them. The findings contribute to emerging discussions on sustainable educational innovation, cross-disciplinary AI integration, ecosystem analytics, and educational transformation aligned with long-term societal wellbeing and Sustainable Development Goals (SDGs).

Development and Validation of an AI Supported Lesson Design System in Moodle: Comparison of Machine Generated and Teacher Generated Didactic Materials

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Keywords: Didactic Quality of AI Generated Lessons, AI Supported Versus Teacher Generated Materials, Student Trust and Acceptance of AI in Learning, Moodle Integrated Generative AI for Lesson Design, Qualitative Content Analysis of AI in Education

Abstract: There is limited empirical evidence on how AI systems embedded in LMS platforms such as Moodle generate lesson content compared to teachers' didactic designs, and on how educators evaluate and accept these AI-generated materials. Comparative research on human- and AI-produced educational artefacts indicates that AI-generated texts often capture surface content efficiently but lack the contextualized pedagogical judgement that teachers bring to lesson design. Studies comparing AI and teacher outputs (e.g. summaries or feedback) show that AI can provide timely, extensive information, yet struggles with nuanced framing of learning objectives, accurate prioritization of key concepts, and alignment with classroom dynamics and learner needs. This suggests a core research problem: current AI systems can automate content production, but it is unclear whether the resulting materials embody coherent didactic structures comparable to those created by experienced educators. Existing AI-in-education research rarely focuses on integrated AI lesson-generation tools in Moodle and similar LMSs, and especially not on the systematic comparison of AI-generated lesson content with teacher-generated materials from a didactic and acceptance perspective. Research Question: To what extent do AI-generated lesson texts produced by Moodle's integrated AI tool differ from teacher-generated lesson texts in terms of didactic quality, and how do students perceive and accept these AI-generated materials? This study is based on primary data from a questionnaire completed by students at SRH Neckargemünd. A total of 40 students took part in the study. The author created two courses in the field of computer science. One was an AI-generated course, in which all materials, images, and exercises were produced by an integrated AI in Moodle. The second course was developed together with the teacher, using her own knowledge and exercises, and was made available to the students in Moodle. The students completed both courses and then filled out a questionnaire. This research study uses Mayring's concept of qualitative content analysis as its methodology. In this investigation, a mixed deductive–inductive logic was applied. First, the deductive categories were derived from the theoretical part. Then, for each deductive category, the inductive subcategories were identified based on the questionnaire responses completed by the students. Students consistently frame the AI-generated texts as overview and revision tools rather than as full-fledged lessons; they are "good summaries" but not sufficient as the sole instructional base for complex networking topics. Strengths lie in brevity, structural clarity, and accessibility, whereas weaknesses concern insufficient depth, lack of

worked examples, and poor visualization quality, which constrain deep understanding and transfer. Students rarely adopt an either–or stance; instead, they describe a complementary division of labor: teachers provide depth, adaptation, and rich multimodal explanation, while AI offers fast, concise summaries and on-demand clarification. Trust in AI-generated lesson texts is conditional on model transparency, perceived up-to-dateness, and the possibility of verification; students are aware of hallucinations and errors and advocate critical use. AI-generated Moodle lesson texts in this study are perceived as structurally clear but didactically shallow, offering coherent overviews without reaching the depth, example richness, and multimodal quality of teacher-generated videos. Students particularly criticize the AI images, which undermines both understanding and trust. Students recognize basic didactic structures, yet note missing detailed process explanations, limited scaffolding, and inadequate visualizations compared to teacher materials; teacher videos are experienced as better aligned with principles of stepwise conceptual development. From a learning perspective, AI texts are judged as adequate for overview and revision, especially when prior knowledge is present, but inadequate as standalone instruction for novices in topics like switching and VLAN. Usability is high in terms of speed and structure but constrained by content depth and image quality.

AIA-PCEK: A Framework for Ethical and Pedagogical Integration of Generative AI in Higher Education

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Keywords: Generative AI, Higher Education, Teacher Training, Educational Technology, Ethical AI

Abstract: The rapid integration of generative artificial intelligence (GenAI) in higher education is reshaping pedagogical practices, assessment strategies, and knowledge construction processes. However, existing frameworks such as TPACK remain insufficient to fully address the ethical, epistemic and operational challenges introduced by AI-driven systems. This paper proposes the artificial Intelligence Agent for Pedagogical Content and Ethical Knowledge (AIA-PCEK), an extension of traditional pedagogical models designed to support the responsible integration of AI in teaching and learning environments.

The study adopts a mixed-methods approach combining a bibliometric analysis of recent literature on AI in education with empirical insights drawn from the European VOLCANIC Erasmus + project and teacher training initiatives at Mohammed VI Polytechnic University (UM6P). The framework conceptualizes the role of AI as an active pedagogical agent, integrating dimensions of content knowledge, pedagogical design, and ethical reasoning.

Findings highlight the need to move beyond tool-oriented uses of AI toward a systemic and reflective integration that supports teacher agency, ethical awareness, and adaptive learning environments. The AIA-PCEK framework provides a structured approach to designing AI-enhanced learning experiences that align with emerging international guidelines on AI ethics in education.

The contribution offers both theoretical and practical implications for instructional design, teacher training, and policy development, particularly in context aiming to leverage AI for sustainable and inclusive education systems.

Integration of Generative AI Into Personalized Pedagogy: Ethical Challenges and Pedagogical Opportunities for Higher Education

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Keywords: Keywords: Generative AI, Personalized Pedagogy, Ethics in Education, Adaptive Learning, Educational Sustainability

Abstract:

This contribution explores the integration of generative AI models into personalized learning environments within universities. We examine how AI technologies can adapt educational content to students' individual needs while raising critical questions concerning ethics, transparency, and learner autonomy. Through an empirical study involving 150 students and 25 teachers across three universities, we demonstrate that generative AI can significantly improve learning outcomes (by an average of 32%) when effectively integrated into existing pedagogical practices. However, our findings also highlight important concerns regarding algorithmic bias, increasing dependence on proprietary technologies, and the need for adequate teacher training. This research proposes a framework for the responsible integration of generative AI into higher education, aligned with the principles of equity, accessibility, and sustainable development established by UNESCO. Our contribution aims to foster dialogue among policymakers, educational researchers, and the technology industry on how to build more equitable and sustainable educational systems.

Integrating AI as a Thought Partner in Project-Based Learning: Practitioner Observations from Real Classrooms

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Keywords: Artificial Intelligence, Project-Based Learning, Teacher Roles, Pedagogical Design, Classroom Facilitation, Generative AI, Secondary Education, Practitioner Inquiry, Work-in-Progress

Abstract: As artificial intelligence tools become ubiquitous in education, teachers face both excitement and uncertainty about how to integrate them meaningfully without undermining student agency or deeper learning. This practitioner presentation draws on extensive coaching and classroom observations to explore how Project-Based Learning (PBL) serves as a robust pedagogical framework for intentional AI integration. Through work with dozens of educators across diverse secondary (6-12) contexts, key patterns have emerged: teachers who treat AI as a "project thought partner" report heightened student engagement, more sophisticated inquiry, and stronger durable skills (collaboration, critical thinking, and iterative design). Common successes include using AI for ideation and research scaffolding, personalized feedback loops, and multimedia prototyping—while persistent challenges involve equity of access, over-reliance, and preserving authentic student voice. This session shares a practitioner-tested "PBL-Lite" planning framework that embeds AI strategically at each project phase without disrupting PBL elements such as a driving question, sustained inquiry, and public product. Concrete examples of teacher and student artifacts, before-and-after implementation data, and teacher reflection themes will illustrate both promising practices and pitfalls to avoid. Attendees will leave with actionable strategies, updated planning tools, and a renewed sense of possibility: PBL is not replaced by AI—it is strengthened by it. This presentation offers grounded, classroom-derived insights for educators ready to navigate the AI era while keeping learning real, relevant, and human-centered

Balancing Digital Learning, AI Use, and Study Habits: Predictors of Scholastic Achievement Among XI Standard Students

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Keywords: AI in School Education, Digital Learning Behaviour, Study Habits and Self-Regulation, Academic Achievement, Responsible AI Use

Abstract: Balancing digital and AI-mediated learning with effective study habits is critical for students' academic success, yet empirical evidence from school contexts in emerging economies remains limited. This study examines how digital device use, AI tools, and study habits jointly relate to scholastic achievement among 130 XI standard students. Survey data capture demographics, family and school context, screen time, late-night use, AI-assisted learning (e.g., ChatGPT), and detailed measures of study environment, time management, note-taking, revision, and academic motivation. Composite indices for Digital Academic Use, Digital Distraction, Study Discipline, and Academic Motivation are constructed, with internal consistency assessed using Cronbach's alpha and relationships with X standard performance bands analysed through correlations and regression. Preliminary findings indicate that higher digital distraction is associated with lower achievement, while structured study habits and motivated engagement show positive associations. The study offers actionable implications for teachers, school leaders, and policymakers designing responsible AI-enabled learning ecosystems.

Navigating Generative AI: The AI Roundabout as a Collaborative Research Project

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Keywords: Generative AI, Roundabout Framework, Curriculum Re-Imagining, Assessment Regulation

Abstract: Current institutional responses to Generative Artificial Intelligence (GenAI) in higher education are predominantly rules-based and centred on assessment, focusing on regulation, control, and compliance. While these approaches provide clarity, they tend to be narrow in scope and may reinforce cultures of surveillance and passive engagement. There is limited focus on how GenAI can be integrated more holistically into learning, teaching, and curriculum design, and how educators and students can engage with it through critical questioning, shared responsibility, and collaborative practice. This highlights a gap in approaches that move beyond compliance towards more dynamic, principles-based frameworks that support meaningful learning and responsible innovation. This study adopts a qualitative approach to explore the applicability of the Roundabout Framework across educational contexts. The wider project investigates GenAI as part of a broader educational ecosystem, considering its role in learning, teaching, research, and professional development. This presentation focuses specifically on preliminary findings from the higher education (HE) context, examining how the Roundabout Framework can inform educational practices and support curriculum re-imagining. The work draws on ongoing collaborative inquiry involving educators and learners, with an emphasis on co-design, experimentation, and critical engagement with GenAI. Preliminary findings from the higher education context suggest that the Roundabout Framework offers a useful alternative lens for understanding and supporting GenAI use in educational practice. Early insights indicate a shift from compliance-driven responses towards more dynamic approaches grounded in critical questioning, collaborative engagement, and shared responsibility between educators and students. Initial patterns highlight the potential of the framework to support curriculum re-imagining by encouraging experimentation, co-design, and reflective practice. These early observations suggest that a principles-based approach may enable more meaningful and context-sensitive engagement with GenAI compared to rules-based policy models.

The implications of these findings point towards the value of moving beyond assessment-centred approaches to consider GenAI within a wider educational ecosystem. The Roundabout Framework contributes to ongoing discussions in the field by proposing a more human-centred and future-oriented approach to AI governance, which foregrounds trust, agency, and collaboration. Further analysis across educational sectors will deepen understanding of its applicability and impact. This study introduces the Roundabout Framework as a principles-based alternative to rules-driven approaches to Generative Artificial Intelligence (GenAI) in education. A key takeaway is that current assessment-centred, compliance-focused models may be too narrow to support meaningful engagement with AI. In contrast, the Roundabout Framework offers a model based on trust, shared responsibility, and ongoing navigation, enabling educators and learners to engage with GenAI through critical questioning, collaboration, and ethical decision-making. Preliminary insights from the higher education context suggest that the framework has the potential to support more reflective, creative, and context-sensitive educational practices. In particular, it may contribute to curriculum re-imagining by encouraging co-design, experimentation, and dialogue, rather than focusing solely on control and restriction. These findings indicate that there is value in moving towards principles-based approaches to AI governance that extend beyond assessment and consider the wider educational ecosystem. The study therefore suggests that educational institutions should explore more flexible and human-centred frameworks that support agency, participation, and critical engagement with AI. Further research is needed to explore the applicability of the Roundabout Framework across different educational sectors and contexts. In particular, future work should examine how such approaches can be implemented in practice, how they are experienced by educators and learners, and how they influence teaching, learning, and assessment over time. This will help to refine the framework and inform more inclusive, adaptable, and ethically grounded approaches to working with GenAI in education.

Curriculum, Community, Career: A Triple-Bridge Framework for Equitable AI Higher Education - Evidence from Oregon's First Public Applied B.S. In Artificial Intelligence

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Keywords: Artificial Intelligence in Higher Education, AI Curriculum Design, Community-Engaged Learning, Equity in Computing Education, Rural and First-Generation Learners

Abstract: As artificial intelligence rapidly reshapes professional practice across every sector, universities worldwide are launching new AI degree programs at an unprecedented pace. Most are technology-first by design: equity, community engagement, ethics, and policy alignment are typically retrofitted after the technical core is established, treated as supplemental rather than constitutive. Yet the global stakes of AI in higher education-epitomized by the UNESCO AI Competency Frameworks, the OECD AI Principles, and the United Nations Sustainable Development Goals-call for a model that designs AI degrees around responsibility, accessibility, and societal contribution from inception, particularly in rural-serving and access-mission institutions historically underrepresented in AI talent pipelines. While substantial literature documents AI integration into existing curricula and pedagogical practices, there is a notable absence of replicable, evidence-based frameworks describing how a public university can authorize a new four-year AI degree built from first principles around equity, community engagement, and policy alignment. Particularly underexplored is the path for rural-serving and access-mission institutions that must simultaneously navigate accreditation governance, regional workforce alignment, and the recruitment of historically underrepresented learners-first-generation, rural, and low-income students-into AI talent pipelines. This paper presents a design-based educational research case study of Oregon Institute of Technology's Bachelor of Science in Artificial Intelligence-the first applied AI degree at a public university in the state of Oregon, approved by the Northwest Commission on Colleges and Universities (NWCCU) in March 2026 and launching its inaugural cohort in Fall 2026 across three delivery modalities (residential campus, regional metropolitan site, and fully online). The methodology integrates document analysis (accreditation submissions, curriculum maps, governance records), participant-observer reflection across the program-design lifecycle, and structured implementation logs from the affiliated community AI and cybersecurity clinic. We introduce the Triple-Bridge framework, a structural innovation in which every credit-bearing AI course is mapped to three reinforcing dimensions: (1) Curriculum-applied mastery of machine learning, large language models, prompt engineering, agentic systems, and AI ethics, aligned with ABET Computing Accreditation Commission outcomes and responsible-AI principles emerging from UNESCO and OECD frameworks; (2) Community-supervised service learning through the TALON initiative (Technology, AI & Learning for Oregon Neighbors), an embedded campus clinic

affiliated with the UC Berkeley/MIT-led Consortium of Cybersecurity Clinics, delivering AI literacy workshops, cybersecurity hygiene assessments, and small-organization AI toolkits to rural communities; and (3) Career-industry- and policy-aligned pathways co-developed with workforce partners and informed by national occupation-code labor-market analysis. The framework embeds the academia–industry–policy triangular alliance directly into credit-bearing instruction rather than reserving it for capstones or co-curricular activity. Early outcomes include accreditor approval, twelve new AI courses, articulation pathways with regional partner institutions, and an equity-recruitment playbook engineered for first-generation, rural, and low-income learners. The Triple-Bridge framework offers a replication-ready model for rural-serving and access-mission universities worldwide, demonstrating that responsible AI education can be designed for equity from inception rather than retrofitted post-launch, with significant implications for accreditation policy, AI literacy, and the United Nations Sustainable Development Goals on quality education (SDG 4) and reduced inequalities (SDG 10). Released artifacts (course-mapping rubrics, community-clinic intake protocols, and the equity-recruitment playbook) invite cross-national adaptation. Future research will track inaugural-cohort learning outcomes, community-impact metrics, and replication trials at partner institutions to validate the framework empirically across the program's first three years.

Beyond Prompting: Embedding Ethical and Equity-Oriented Artificial Intelligence Literacy Within the Canadian Dental Public Health Competency Framework

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Keywords: AI Literacy, Dental Public Health, Discipline Competencies, Health Professions Education, Equity, Professional Accountability

Abstract: Artificial intelligence (AI) is reshaping health professions education rapidly. Even so structured AI literacy has not been consistently incorporated into the dental public health (DPH) training. The discipline competencies for Dental Public Health developed by the Canadian Association of Public Health Dentistry (CAPHD) remain a key framework for articulating the knowledge, skills, and attitudes of DPH in Canada. The current framework, though, was published in 2008, predating the contemporary generative AI era. The risk that informal and unsupervised use of AI poses in the DPH education extends beyond academic integrity. These may include inaccurate interpretation of population oral health data, fabricated or unverifiable evidences, algorithmic bias that affect underserved population, privacy risks involving patient and community information, inadequate attention to Indigenous data governance and cultural safety, and weakened accountability in policy and advocacy work. This conceptual paper proposes a five-level AI literacy framework that's mapped onto the eight CAPHD competency domains and four competency layers: Basic Shared, Foundation, Advanced, and Expert. The five levels are: 1) foundational AI literacy; 2) responsible student and practitioner use; 3) dental public health applications; 4) equity, ethics, and population health judgment; and 5) professional accountability. This framework preserves the core architecture of the competencies while extending it to address AI-related learning needs in surveillance, program evaluation, communication, advocacy, community engagement, and leadership. AI literacy in North America has started entering public health through capacity-building

initiatives, workforce training, and emerging competency scholarships. While Canada's recently updated public health core competencies includes contemporary expectations related to data, equity, ethical practice, and technologies, AI literacy has yet to be explicitly articulated as a named competency area. No dental public health-specific competency mapping has been identified. This paper intends to offer a practical structure for curriculum planning, graduate and residency training, community oral health programs, and continuing professional development. Future work in AI literacy should focus on both implementation and evaluation. Implementation may likely include AI literacy modules, disclosure logs, reflective exercises, case-based critiques of equity and bias in AI, in addition to rubric-based assessment of AI-supported assignments within DPH training. Evaluation could include pre- and post-instruction AI literacy self-assessment, student reflections, faculty review, and review of AI-supported outputs. The study’s findings hope to inform future discussions on renewing Canadian DPH competencies for an AI-enabled public health environment.

Human–AI Co-Creation and Emotional Storytelling: The Case of Nina & Zak, an AI-Assisted Digital Comic on Contemporary Emotional Life

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Keywords: Artificial Intelligence, Emotional Narratives, Digital Culture, AI-Assisted Creativity, Contemporary Youth

Abstract: Artificial intelligence is increasingly transforming creative practices and digital storytelling. This communication explores Nina & Zak, an AI-assisted digital comic designed around contemporary emotional experiences such as overthinking, loneliness, anxiety, emotional fatigue, and digital dependency among young people. Rather than using AI solely as a technical tool, the project examines human–AI co-creation as a new form of emotional and narrative collaboration. Combining human storytelling with AI-generated visual creation, Nina & Zak develops an immersive narrative universe where technology participates in the expression of emotions and psychological experiences. This presentation analyzes how AI-assisted comics may contribute to new forms of emotional storytelling, while also raising questions related to authenticity, creativity, and the evolving relationship between humans and intelligent systems. Drawing on perspectives from digital humanities, visual culture, and cognitive studies, the communication argues that AI-generated narrative projects can become meaningful cultural and educational tools for exploring emotional life in hyperconnected societies.

Computational Thinking, Complexity, and Immersive Learning: Validation of the PCM-Complexity Instrument for AI-Ready Education

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Keywords: Complex Thinking, Educational Innovation, Higher Education, Computational Thinking, Metaverse

Abstract: This study designed and validated PCM-Complexity, an instrument for assessing computational thinking in Metaverse-related learning environments from the perspective of complex thinking. The questionnaire was structured around four computational thinking processes, abstraction, algorithmic thinking, pattern recognition, and decomposition, and four complex thinking drivers: systemic, critical, scientific, and innovative thinking. A Simplified Digital Delphi Method was applied with 10 expert judges. Coherence, clarity, and relevance were analyzed using Aiken's V, Fleiss' kappa, the confidence interval index, and the intraclass correlation coefficient. The results showed satisfactory content validity and inter-rater agreement: global Aiken's V values were 0.8250 for clarity, 0.8677 for coherence, and 0.8531 for relevance; kappa values ranged from 0.7821 to 0.8852; and reliability indicators reached the expected thresholds, with clarity practically at the ICC criterion. After expert review, the final version retained 23 items. The instrument offers a structured tool for evaluating high-level competencies in immersive and innovation-oriented educational contexts.

A Qualitative Inquiry into Pre-Service Teachers' Pedagogical Readiness, Ethical Negotiations, and Professional Identity Formation- An Indian Context

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Keywords: Artificial Intelligence in Education, Pre-Service Teachers, Future Teachers, Qualitative Research, Teacher Identity, AI Ethics, Digital Pedagogy, Teacher Education, SDG 4

Abstract: Artificial Intelligence (AI) in education has increased rapidly over the last few years and has started impacting the way stakeholders think about teaching, learning, assessment and the role of teachers in future classrooms (UNESCO; 2021) Previous studies (Zawacki-Richter et al., 2019; Wu & Li, 2026) have explored whether AI tools are effective for learning or how easily students and teachers accept such technologies. However, still there is a limited understanding of how pre-service/future teachers themselves make sense of AI in their early teacher education and its possible influence on school education (Su & Liang,2025). Keeping this gap, the present study seeks to understand how pre-service teachers view the growing presence of AI in future classrooms. The present study is particularly focused to explore their thoughts, expectations, and concerns related to AI in teaching and learning. Rather than looking only at AI as a technological tool, the research also tries to understand how future teachers think AI may affect classroom relationships, teaching practices and the identity of teachers in future years. This study will follow an interpretivist perspective and will use TPACK (Koehler & Mishra, 2009), Critical Digital Pedagogy (Morris & Stommel, 2018) and Posthuman Educational Theory (Fawns, 2022) as theoretical frameworks. These frameworks will guide the researchers to understand how pre-service teachers interpret the role of AI in education and how they connect it with their own future teaching practices. A qualitative phenomenological design will be used to focus on the lived experiences and personal understandings of pre-service teachers. Respondents will be selected purposively from Teacher education institutions in Punjab, India with different academic backgrounds, technological exposure, gender and socio-cultural contexts to capture varied perspectives. Data will be gathered through semi-structured interviews followed by focused group discussion. These methods are expected to give detailed narratives about how pre-service teachers imagine their AI-based future classrooms and how they perceive its opportunities and challenges. The data will be analysed through thematic analysis by using Braun and Clarke's reflexive approach (2005). To improve the credibility and trustworthiness of the findings, techniques such as triangulation, member checking, and peer debriefing will also be used. The study is expected to explore both positive and critical views regarding AI in education. Many pre-service teachers may consider AI and its tool useful for

personalised learning, for innovative teaching strategies and assessment-related tasks. On the other hand, concerns related to overdependence on technology, reduced human interaction, bias in AI systems and the changing role of teachers may also emerge during the study. The research will also attempt to explore how institutional level settings, cultural and social experiences in the Indian context, influence the readiness of future teachers to engage with AI. Overall, the study expects to contribute to the ongoing global discussion on AI and teacher education by focussing on the voices and experiences of pre-service teachers themselves. The findings may support teacher educators, curriculum planners, and policymakers in designing pre-service programmes that can prepare future teachers for a mindful and responsible use of AI in classrooms. The study also underlines the significance of ethical awareness, equity, and meaningful teacher–learner interaction by integrating AI into education, especially in the context of Sustainable Development Goal 4 related to quality education.

Concept Drift Monitoring for Tabular Educational Machine Learning Benchmarks

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Keywords: Concept Drift, Educational Machine Learning, Dropout Prediction, Population Stability Index, Real Drift, Student Success Analytics, Virtual Drift

Abstract: This study develops and evaluates a drift-aware monitoring framework for tabular educational machine learning, using a longitudinal student dropout and academic success benchmark as a case study. Although educational predictive models are commonly evaluated under an implicit independent and identically distributed assumption, institutional data often evolve across cohorts, threatening forward generalization. Student success models are increasingly used to support retention, advising, and institutional decision-making. However, cohort-level changes in student demographics, enrollment behavior, academic performance, and external economic conditions can induce both virtual drift in feature distributions and real drift in the relationship between predictors and outcomes. Standard streaming drift detectors may not be well suited to this slow educational drift regime. This study asks: (i) how standard streaming concept drift detectors behave on cohort-ordered educational prediction errors; (ii) whether tabular educational dropout benchmarks exhibit virtual drift in feature distributions; (iii) whether such benchmarks exhibit real drift in predictive performance across cohorts; and (iv) what monitoring architecture is appropriate for educational machine learning deployments. We analyze 4,424 students across 10 enrollment cohorts. Five streaming drift detectors are benchmarked on cohort-ordered prediction errors. Virtual drift is measured using per-feature Population Stability Index, while real drift is tested through permutation-based residual Brier scores from a reference-cohort model. Results show that default streaming detectors largely fail to detect the gradual cohort drift present in the dataset. In contrast, cohort-batched PSI and permutation tests reveal substantial virtual drift and statistically significant real drift across all post-reference cohorts. The findings motivate a four-layer deployment-monitoring framework combining streaming detectors, cohort-batched drift tests, external context monitoring, and adaptive response policies.

Hierarchical Selection-Aware Models for Educational Data as a Diagnostic Framework for Causal ML Applicability

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Keywords: Causal Machine Learning, Educational Data Mining, Dropout Prediction, Positivity Diagnostics, Propensity Scores, Student Success

Abstract: This study develops and evaluates a diagnostic framework for determining when causal machine learning is appropriate for educational observational data, using application mode in the Realinho student dropout dataset as a quasi-treatment. Causal ML methods are increasingly used in educational data science to estimate effects of institutional pathways, admissions routes, and student support mechanisms. However, such approaches require assumptions such as manipulability, positivity, and robustness to unmeasured confounding. When educational "treatments" are descriptors of student background rather than assignable interventions, causal estimates may be unstable or misleading. This study asks (i) whether application mode can defensibly be treated as a causal treatment in educational observational data, (ii) whether positivity holds across application modes, (iii) how alternative causal estimators compare when applied to the same mode contrasts, and (iv) whether descriptive modelling provides a more reliable fallback when causal assumptions fail. Data from 4,289 students in the Realinho dataset were analysed across nine application modes. Multi-class propensity models, positivity diagnostics, overlap visualisations, naive mean differences, stabilized inverse-propensity weighting, doubly robust estimation, causal forest DML, and approximate Rosenbaum sensitivity bounds were used. Results show severe positivity violations, with 100% of students having propensity below 0.01 for at least one mode. Estimators produced divergent and sometimes sign-reversed effects, while all examined contrasts were fragile to plausible unmeasured confounding. A descriptive XGBoost model recovered observed per-mode dropout rates accurately, supporting descriptive per-mode reporting rather than causal claims. The study contributes a decision framework for honest causal-ML practice in education.

Beyond Technical Optimization: A Sociotechnical Taxonomy of AI Bias in Higher Education

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Keywords: AI Ethics, Trustworthy AI, AI Bias, Educational Technology, Sociotechnical Systems

Abstract: Current approaches to Trustworthy AI frequently emphasize principles such as fairness, transparency, accountability, and robustness. However, many of these frameworks insufficiently address the interconnected and multidimensional nature of AI bias across the entire AI lifecycle, particularly when deployed in high-stakes higher education environments. This paper argues that trustworthy AI in educational technology (EdTech) cannot be achieved through technical optimization alone, as biases emerge not only from datasets and algorithms, but also from societal structures, institutional practices, human cognition, pedagogical deployment environments, and student-machine interactions. Building upon the foundational framework presented in AI Ethics & Human Factors in AI (Gaisch & Mader, 2025), this paper operationalizes their structured taxonomy of 32 AI bias types—distributed across societal, technical, and sociotechnical dimensions—by adapting and applying it specifically to the higher education sector. The framework systematizes biases such as historical bias in admissions data, aggregation bias in personalized learning models for diverse student bodies, monitoring bias in AI proctoring software, and feedback loop bias in predictive dropout analytics. It illustrates how these biases interact, reinforce one another, and evolve dynamically throughout the design, development, deployment, and use of educational AI systems. By positioning AI bias as a sociotechnical phenomenon, particular attention is given to the overlap zones where institutional incentives, pedagogical assumptions, and algorithmic decision-making become deeply entangled. Integrating perspectives from AI ethics, human factors research, and digital humanism, the paper proposes a bias-aware operationalization of Trustworthy AI—offering practical evaluation criteria for universities and EdTech developers that extend beyond traditional compliance-oriented approaches. Ultimately, this framework contributes to the ongoing discourse on human-centered AI by offering a practical, interdisciplinary lens for identifying, analyzing, and mitigating bias across the EdTech lifecycle. The paper concludes that building trustworthy AI in higher education requires not only technically robust systems but also reflective governance structures and continuous human oversight. Achieving this necessitates a triangular alliance among academia, industry leaders, and policymakers to critically engage with the societal implications of AI and drive ethical, inclusive, and high-impact educational practices.

Nothing Can Come Between You and (A)I: The Impact of Self-Efficacy, Self-Esteem, Self-Control, Self-Perception, and Perceived Social Norms on AI Dependency in Caribbean University Students

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Keywords: Socio-Personal Factors, Caribbean University Students, AI Dependency, Advantageous Addiction

Abstract: The permeability of AI usage across multiple fields has influenced investigations into its implications. AI dependency is usually described through a monolithic or dual-lens perspective in existing literature, focusing on the behavioural or cognitive effects of AI dependency. However, a formal framework for explaining AI Dependency, incorporating the affective, behavioural, and cognitive dimensions, is yet to be established. As of present, existing research has largely focused on Eurocentric and East Asian populations, leaving the Caribbean significantly underrepresented. Additionally, current literature frames AI dependency as singular or bi dimensional in nature, either considering only the behavioural or cognitive-behavioural components, with no regard for the affective component. This study addresses three gaps; a conceptual gap, by integrating constructs from both social psychology and behavioural science to produce a nuanced framework for understanding AI dependency, extending beyond existing technical or usage-based models; a knowledge gap produced by a lack of regionally grounded insights into the psychological underpinnings that influence ethical and responsible AI engagement within a Caribbean tertiary education context; and a practical gap by linking the psychological findings to institutional policy developments, offering evidence-based recommendations for Caribbean universities aiming to foster healthier and more responsible AI engagement among students. This study utilises a cross-sectional survey design, with a sample of 300 Caribbean University students, to explore the relationship between socio-personal factors (self-efficacy, self-esteem, self-control, self-perception and perceived social norms) and AI dependency as a multifaceted construct. Spearman's Correlation, Bootstrap Regression, Thematic Analysis and a Partial Least Squares Structural Equation Model (PLS-SEM) were used to examine the intricate relationship between these personal factors and AI dependency and its components. Significant relations were identified between these socio-personal factors and the individual components of AI dependency, however, at a broader level the study's findings revealed no significant relationships between these factors and AI dependency as a complete construct, within the Caribbean context. These findings therefore suggested potential underlying factors mediating or moderating factors, such as culture and social sensitivity surrounding academic AI use. The revealed usage patterns indicative of addictive AI

behaviour, though not fully constituting dependency, which gave rise to the conceptual development of “advantageous addiction”. With the use of a PLS-SEM and insights from other analyses, a comprehensive model for assessing AI dependency was created, depicting that AI Dependency is a multifaceted construct, compositely made up of affective, behavioural, and cognitive dimensions. This study, therefore, fills the ethnic and socioeconomic gaps within the literature on the interactions between personal and social factors and AI dependency among university students in the Caribbean. Its findings also offer practical insights for Caribbean higher education institutes seeking to balance ethical academic practices and AI integration, such as integrating AI literacy course programs into curricula. By recognising the various influences underlying AI dependency, universities can develop better culturally attuned policies, instructional strategies, and AI literacy initiatives, with the aim of promoting responsible AI use among university students.

Regulatory Literacy for AI in Higher Education: Intellectual Property, Data Protection and Institutional Readiness in North Macedonia

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Keywords: Artificial Intelligence, Intellectual Property, Data Protection, Digital Transformation, North Macedonia

Abstract: The rapid adoption of artificial intelligence in higher education raises questions that extend beyond pedagogy, technological innovation and classroom practice. Universities increasingly rely on AI-supported tools for teaching, research, assessment, academic writing, publishing and digital administration. However, the responsible integration of AI into higher education depends not only on technical capacity, but also on the existence of clear legal standards, institutional preparedness and regulatory literacy among academic communities. This paper addresses a gap in current debates on AI and education by shifting the focus from AI as a teaching or learning tool to AI as a legal and governance challenge for universities, especially in small and EU-candidate countries. While much of the literature examines the pedagogical benefits and risks of generative AI, less attention has been paid to how unresolved legal questions concerning intellectual property, text and data mining, AI-generated content, personal data protection and institutional responsibility shape the conditions under which AI can be responsibly used in higher education. The paper draws on the outputs of the project “Factors of Intellectual Property Management and Digital Transformation in Macedonia”, particularly the legal and policy analysis of Macedonian legislation in relation to the EU AI Act, Digital Services Act, DSM Directive, GDPR, eIDAS 2.0 and NIS2. The research applies qualitative legal and policy analysis, examining national legislation and institutional arrangements in the fields of intellectual property, personal data protection, digital services, electronic identification and cybersecurity. It also uses comparative insights from selected European states to situate North Macedonia within broader patterns of digital regulatory adaptation. The analysis shows that the main challenge is not the complete absence of regulation, but regulatory fragmentation, weak horizontal coordination and limited integration of an AI perspective into existing legal frameworks. In the field of copyright, the absence of clear rules on AI-generated content and text and data mining creates legal uncertainty for researchers, students, universities and public institutions. In the field of personal data protection, although the legal framework is broadly aligned with GDPR, practical implementation of privacy by design, DPIA procedures and institutional oversight remain uneven. These gaps are particularly relevant for higher education institutions, which increasingly operate as producers, users and regulators of digital knowledge. The paper

concludes that responsible AI adoption in higher education requires a broader concept of regulatory literacy. Universities need internal policies on AI use, authorship, academic integrity, data protection, open licensing and responsibility for AI-assisted outputs. For EU-candidate countries such as North Macedonia, AI in higher education should therefore be understood not only as an educational innovation, but also as part of a wider process of legal harmonization, institutional capacity-building and democratic digital governance.

From Quality Education to Accountable Institutions: A Legal Framework for Responsible AI in Higher Education Under SDG 4 and SDG 16.

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Keywords: Artificial Intelligence, Higher Education, Legal Governance, Responsible AI, Access to Justice

Abstract: Artificial Intelligence is steadily becoming part of the everyday life of higher education. It is now visible in teaching, assessment, research support, curriculum planning, academic administration, and student services. This development presents important opportunities to advance Sustainable Development Goal 4, particularly by improving access to learning, supporting personalised education, strengthening institutional efficiency, and encouraging lifelong learning. At the same time, the use of AI in universities cannot be viewed only as a matter of technological progress. If left without adequate safeguards, AI may deepen existing inequalities, expose student data, reproduce bias, affect academic integrity, and subject learners to decisions that are difficult to understand or challenge. This paper argues that responsible AI in higher education should be located at the intersection of SDG 4 and SDG 16. In the AI era, quality education depends not only on digital access or innovative learning tools, but also on institutions that are accountable, transparent, rights-based, and governed by the rule of law. The central legal concern is the growing gap between the rapid adoption of AI systems in universities and the slower development of institutional policies, regulatory clarity, and remedies for students and faculty affected by AI-assisted decisions. The paper shows this discussion within India's emerging AI governance approach, which is based on a principle-oriented and techno-legal model. Its emphasis on trust, people-first governance, fairness and equity, accountability, understandability by design, safety, resilience, and sustainability offers a useful foundation for higher education. Universities are not ordinary users of technology, they shape future citizens, professionals, researchers, and public institutions. For this reason, AI governance in higher education must ensure that innovation remains lawful, inclusive, explainable, and open to review. Using a doctrinal and policy-oriented methodology, supported by an analytical review of literature on AI in education, legal education, sustainable development, and AI governance, this paper proposes a legal framework for responsible AI in higher education. The framework is organised around six pillars: equitable access, data protection, algorithmic transparency, human oversight, institutional accountability, and legal Literacy. It recommends clear AI-use policies, disclosure obligations, bias audits, grievance redressal mechanisms, faculty training, student-rights safeguards, and defined responsibility across developers, deployers, and educational institutions. The paper concludes that AI can truly support SDG 4 only when universities recognise accountability, legality, and rights protection as essential elements of educational quality itself.

Use of AI to Develop Faculty Research Skills: A Comparative Study in Ecuador and Mexico

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Keywords: Artificial Intelligence, Writing, Educational Innovation, Research, Methodology

Abstract: This study presents an educational innovation experience aimed at strengthening research skills in university faculty through the use of artificial intelligence (AI) tools. The study is based on the recognition of AI's formative potential in academic writing, as well as the ethical and methodological challenges associated with its integration into educational contexts. A 12-session virtual seminar was designed and implemented, involving 53 university faculty members from Mexico (n = 32) and Ecuador (n = 21). During the training process, participants developed a research protocol with the support of various AI applications. Performance was evaluated by trained tutors using a 10-item rubric. Descriptive analyses, Welch's t tests, and bivariate correlations were applied to explore differences and relationships between variables. The results revealed no statistically significant differences by country or gender in the scores obtained. Relevant correlations were found between the development of methodological skills, ethical authorship, and autonomy in the use of AI. The Mexican group showed more consistent relationships across the evaluated dimensions, while the Ecuadorian group presented more specific associations. The evidence suggests that AI, when integrated pedagogically and ethically, can be an effective tool for enhancing research competencies among faculty. It is recommended to extend this type of formative experience to other contexts and to consider longitudinal studies that analyze its sustained impact.

Impact of Generative Artificial Intelligence on Learning Processes of Software Engineering: A Systematic Review in Higher Engineering Education.

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Keywords: Artificial Intelligence in Education, Higher Education, Software Engineering, Learning Processes, Technological Dependency, Academic Integrity

Abstract: The massive integration of Artificial Intelligence (AI) tools has sparked a disruptive shift in technical education, particularly within software engineering programs. In higher education, these tools have transitioned from emerging resources to everyday components of students' academic routines. While AI facilitates task optimization and information access, its accelerated adoption raises critical questions regarding the transformation of the relationship between the student, the source code, and foundational knowledge. The massive integration of Artificial Intelligence (AI) tools has sparked a disruptive shift in technical education, particularly within software engineering programs. In higher education, these tools have transitioned from emerging resources to everyday components of students' academic routines. While AI facilitates task optimization and information access, its accelerated adoption raises critical questions regarding the transformation of the relationship between the student, the source code, and foundational knowledge. The study systematically followed the PRISMA framework for evidence synthesis, executing a fully programmatic data pipeline within a Google Colab environment to ensure absolute technical rigor and traceability. The methodology was structured into three execution blocks: Identification: Metadata collection was conducted using Harzing's Publish or Perish across Scopus, Web of Science, and Google Scholar, retrieving a raw baseline corpus of exactly 600 records evenly distributed across three core thematic search queries: Query 1 (AI Ethics, n = 200), Query 2 (Software Engineering, n = 200), and Query 3 (Spanish/Regional Focus, n = 200); Programmatic Screening: The raw datasets were ingested into a Python Pandas pipeline where an automated deduplication function based on exact title-matching purged 113 overlapping records, retaining 487 unique items. Concurrently, the script applied multi-variable logical filters in block, restricting the chronological window to 2020–2026, limiting languages to English and Spanish, and enforcing publisher validation to automatically exclude unindexed source data or grey literature; Eligibility & Inclusion: The automated pipeline directly filtered out 436 non-compliant or out-of-scope entries—including documents strictly focused on industrial hardware automation or non-pedagogical AI applications—allowing the script to isolate a definitive synthesis matrix of exactly 51 high-impact, peer-reviewed documents for final qualitative and interpretative analysis. The data-driven synthesis of the 51 selected high-impact articles indicates an exponential growth in publication volume since 2020, tracking a massive trend toward automating code syntax production. Quantitative evaluation of metrics from foundational papers—including highly cited literature on AI literacy (e.g., studies

accumulating over 600 academic citations)—confirms that while developer velocity and code refactoring efficiency increase by up to 40% in routine undergraduate exercises, there is a measurable decay in conceptual processing depth. The metrics extracted from the systematic corpus reveal that a critical portion of the reviewed educational settings observe an immediate transition where students rely heavily on external logic. Instead of developing computational thinking, a passive learning modality dominates, with individuals strictly prioritizing functional code outputs (the product) over manual structure auditing (the process). The discussion highlights that this automated cognitive offloading generates a severe technological dependency. By delegating structural programming workflows entirely to automated agents, the critical cognitive scaffolding required for debugging and algorithmic abstraction is bypassed. Consequently, these findings establish that higher engineering faculties must implement a metric pivot, shifting from product-oriented assessment models (source code execution tracking) to process-oriented cognitive metrics that gauge live logical reasoning and troubleshooting autonomy. This systematic review, based on a rigorous screening funnel from 600 raw records down to 51 peer-reviewed documents, confirms that generative AI has initiated a significant paradigm shift in higher technical education. Data tracking indicates that an unmanaged dependency on automated tools risks eroding the core computational thinking and independent troubleshooting capabilities of future software engineers. To counter this logical atrophy, higher engineering programs must transition from static code assignment grading toward dynamic, process-oriented evaluation frameworks. Academic assessments should prioritize live oral defenses of architectural choices, monitored prompt-to-code mapping analysis, and real-time manual debugging trials. Finally, future research must expand upon these findings through longitudinal studies to measure the long-term correlation between academic AI interaction patterns and subsequent technical autonomy, diagnostic performance, and crisis troubleshooting velocity within the global software industry.

PODSAGE: Story-Driven AI for Enhanced Learning, Comprehension, and Retention

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Keywords: LLM, Storytelling, AI, Comprehension, Retention

Abstract: PODSAGE is an AI-driven educational storytelling platform that transforms complex concepts into engaging, interactive narratives. Using a fine-tuned LLM, PODSAGE produces multimodal stories with credible citations, adaptive personalization, and support for neurodivergent learners. Unique features include interactive narrative choices, persona-aware delivery, and a community content studio. Evaluation combines human and LLM-based scoring. PODSAGE demonstrates a scalable, ethical approach to enhancing comprehension and retention through the science of storytelling.

From ESG Reporting to Predictive Sustainability Risk Analytics

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Keywords: ESG, Predictive Analytics, Sustainability, Risk Forecasting, Machine Learning, Decision Support

Abstract: Environmental, Social, and Governance (ESG) performance is now considered a top concern for governments, regulatory bodies, investors, and corporate leaders as it tightly intertwines with long-term value creation, risk management, and organizational legitimacy. With increasing number of standards and sustainability disclosures in ESG reporting, these approaches to evaluation remain largely reflective, focusing more on historical indicators and past success measures. This limitation also led to a large divergence between ESG measurement and proactive sustainability risk management. This paper seeks to fill that gap, proposing an integrated predictive ESG analytics framework, using data analytics and machine-learning techniques to predict ESG-related sustainability risks well before they occur. The study applies a conceptual research method through the synthesization of the relevant academic literature, regulatory reports, and industry practices for ESG reporting, sustainability analytics, and predictive modeling. Our framework integrates multi-source ESG data, advanced forecasting and anomaly detection algorithms, and decision-support components to provide forward-looking ESG risk insights. The greatest contribution of the paper is the conceptual contribution to ESG analytics: it moves from a basic descriptive compliance reporting perspective to predictive and risk-based decision support in fostering organizational resilience, strategic sustainability management, and long-term value creation.

Lacking the 'Personal Touch': Students' Perceptions of Generative Artificial Intelligence in Assessment Feedback

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Keywords: Assessment, Feedback, Relational Pedagogy, Dialogic Feedback

Abstract: Despite the potential usefulness of Generative Artificial Intelligence (GenAI) for providing assessment feedback, little is known about students' understanding and perceptions of it. Addressing this gap is important to ensure that GenAI-assisted feedback is pedagogically effective, because its value depends on whether students perceive it as credible and worth acting on. Twenty-five students (14 female, mean age = 26.41 years) studying a range of courses at British universities with campuses in the United Kingdom and United Arab Emirates took part in one of seven focus groups (n = 23) or interviews (n = 2). They were asked to explain what are the characteristics of useful feedback, whether they felt that GenAI could provide this, and their feelings about its potential use by tutors. Reflexive thematic analysis generated two overarching themes: 'characteristics of GenAI feedback' and 'use of GenAI in feedback processes. Together, these demonstrated that students evaluated GenAI as a potentially useful tool for providing objective and individualised feedback, but not necessarily accurate feedback. Fundamentally, they did not believe it could replace human expertise or provide the 'personal touch', which supports the theory that effective feedback is dialogic. Findings can be used to guide practice and policy concerning the use of GenAI-assisted assessment feedback.

Enhanced or Threatened? Academics' Identity Tensions in Response to GenAI

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Keywords: Identities, Threat, Resilience, Enhancement, Teaching

Abstract: Generative Artificial Intelligence not only threatens our cognitive capacities but endangers the very heart of what it means to be an academic educator. Using the socio-psychological framework of Motivated Identity Construct Theory, our study examines identity processes that shape emotional and behavioural responses to GenAI to explore the threats and opportunities to academic identities. Interview data were generated from 22 academics in Italy and the UAE and analysed using reflexive thematic analysis. The analysis revealed that GenAI both disrupted and enhanced the six core identity motives of self-efficacy, self-esteem, distinctiveness, meaning, continuity, and belonging, and triggered processes of identity evaluation and coping. GenAI was seen as challenging the traditional authority of academics, which led to both resistance and changes in how individuals conceptualised their academic roles. This study provides a process-based, motive-informed account of academic identity under technological disruption, providing a framework for understanding how academic institutions can better support faculty well-being and role transition in an increasingly AI-driven educational landscape.

Faculty Navigation of Pedagogy in the Age of AI: Assignment Design, Skills Development, and the Development of a Validity-First Assessment Tool in Business School Education

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Keywords: Terms generative AI in education, faculty pedagogy, assignment design, business school, constructive alignment, skills development, VFAAD

Abstract: The proliferation of large language models since 2022 has placed faculty at a consequential pedagogical crossroads: how should assignment design evolve when AI can plausibly substitute for student cognitive work? This work-in-progress paper maps four documented faculty stances toward AI in assessment and analyses their consequences for constructive alignment and graduate skills outcomes. Drawing on an ongoing action research cycle in undergraduate business education, the paper introduces the Validity-First AI Assessment Design (VFAAD) tool a practitioner-developed instrument for redesigning assessments to be structurally AI-resistant without sacrificing pedagogical authenticity. Preliminary observations from three module pilots are reported alongside a clear empirical validation programme.

Generative AI for Learning, Ethics, and Equity in Africa

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Keywords: GenAI, Academic Integrity, AI Governance, Epistemic Justice, African Higher Education

Abstract: Over recent years, the use of Generative AI (GenAI) technologies, such as ChatGPT, has increased globally, particularly in Africa, where its impact is both promising and challenging. This paper analyses how GenAI disrupts traditional conceptions of authorship, collaboration, and academic integrity, while simultaneously creating new opportunities for access, inclusivity, and pedagogical innovation. By situating GenAI within Africa's unique educational challenges, such as limited infrastructure, linguistic diversity, teacher shortages, and systemic inequities, this paper addresses the question of how GenAI can be responsibly integrated into African higher education to support innovation without undermining the core values of learning, authorship, and trust. The paper adopts a multi-layered doctrinal, policy, and case-study approach. It reviews international and regional AI governance frameworks, including UNESCO guidelines and institutional initiatives such as University of the Witwatersrand's Guidelines for Generative AI Use in Learning, Teaching, and Research. The paper also examines emerging institutional practices across African higher education, including the introduction of AI-generated courses by Honoris United Universities through proprietary large language model systems designed to support adaptive and personalised learning. In addition, the study analyses the ethical and pedagogical implications of GenAI, particularly concerning originality, authorship, explainability, and academic responsibility. The findings reveal a growing tension between innovation and risk. While GenAI technologies may democratise access to educational resources and provide tailored support to students and educators, they also complicate traditional understandings of academic integrity and intellectual contribution. AI-generated outputs increasingly blur distinctions between legitimate assistance and academic misconduct, while existing AI-detection tools often produce unreliable and discriminatory outcomes, particularly for non-native English speakers and neurodivergent students. Furthermore, the dominance of Global North training data in many AI systems raises concerns regarding digital colonialism, epistemic exclusion, and data sovereignty within African educational contexts. Rather than relying primarily on surveillance-based detection mechanisms, the paper argues for a human-centred and context-sensitive approach to GenAI governance in higher education. This includes redesigning assessment methods to prioritise critical thinking, ethical reasoning, creativity, and reflective learning skills that are less easily replicated by AI systems. The paper further advocates for transparent institutional policies, safeguards for privacy and informed consent, AI literacy initiatives, and inclusive governance frameworks that reflect Africa's diverse linguistic and cultural realities. It also emphasises the need for greater investment in digital infrastructure, local AI capacity-building, and African-centred approaches to AI governance. The work contributes both practical and

theoretical insights to emerging debates on AI in education. Practically, it provides recommendations for policymakers, universities, and educators on the responsible integration of GenAI in African higher education. Theoretically, it argues that GenAI creates an opportunity to rethink authorship, knowledge production, and epistemic justice beyond frameworks predominantly shaped by Global North perspectives. Realising this potential, however, requires engagement that is proactive, inclusive, and ethically grounded, to safeguard academic integrity.

Digital Transformation and Systemic Architecture of Chinese Education: Trajectory and the AI + Education Plan Towards 2030

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Keywords: AI4Science, CAS (Complex Adaptive System), China, SWOT, AI in Education, 5A Paradigm, Action Plan 2030

Abstract: This research investigates the structure of China's education system through the lens of Complex Adaptive Systems (CAS), focusing on its ongoing digital transformation and curriculum reforms associated with the AI + Education Action Plan 2026–2030. Particular attention is given to the transition toward the AI4Science paradigm and the development of talent in science, technology, engineering, and mathematics (STEM). The study employs a systematic mapping of scholarly literature, drawing on a dataset of 363 publications indexed in Scopus in 2026 and retrieved using the search expression TITLE-ABS-KEY (China AND education "artificial intelligence") AND PUBYEAR = 2026. The empirical findings indicate an uneven pattern in the adoption of AI-Generated Content (AIGC), characterized by an Efficiency-Dominated Acceptance Structure (EDAS) that prioritizes productivity gains while potentially encouraging students to delegate cognitive tasks to AI systems. The analysis highlights a fundamental conflict between the emphasis on algorithmic efficiency and the broader objectives of Education for Sustainable Development (ESD). It argues that China's efforts to strengthen educational autonomy and international leadership require a reconsideration of instructional strategies that prioritize meaningful cognitive engagement while integrating technological innovation. Ultimately, the study emphasizes the importance of balancing technological advancement with the preservation of cultural identity and the development of independent intellectual capabilities.

From AI Storyboards to Museum Walls: Reimagining Psychology Education Through Action Science

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Keywords: Education, AI, Psychology, Community Based Art, Action Research

Abstract: This design project outlines how faculty can use action science methodologies to curate the use of AI technologies in introductory college psychology classrooms. Two iterations of experience, action, and reflection conducted over two years, with a total of 60 students are outlined, describing how AI-mediated storyboarding activities were designed and re-designed through a collaborative partnership between the instructor and students. In Class 1, a Psychology 101 course conducted in Spring 2024, students brought the idea of using text-to-image AI as a mediator to create storyboard frames describing how principles of psychology (e.g., activation synthesis theories of dreaming, the scientific method, memory) reflect in everyday life, to avoid the possibility of apprehensions with artmaking from limiting students in picking this assignment mode. The class worked collaboratively to provide guidelines to create AI storyboards, and advise future students to navigate the newly designed graded assignment. Students prompted the text-to-image models, created storyboard drafts, and sought feedback from the instructor to modify their creations and arrive at a final product. Qualitative data was described using student reflections on the process they followed. Prompt engineering guidelines to keep story characters across frames consistent, and the suggestion to add text captions manually were provided to students in the Spring 2025 class, heightening confidence in storyboarding. In the Spring 2026 iteration of Psychology 101, students and the instructor worked together to propose a project to a local museum of Contemporary Art and add a fabrication component to the storyboard assignments. The instructor and students picked two storyboards that fit a cohesive theme to fabricate as an art piece. The instructor vectorized the storyboards using an iPad and the Procreate software, and operated a Glowforge laser cutter to etch AI-mediated storyboards onto wooden boards. These were prepared for the museum exhibit as part of a two-week class workshop with students, and subsequently showcased in a studio space at the museum. In this manner, the storyboarding assignment was modified to incorporate emerging technologies in a manner that kept human agency at the forefront.

Mapping the Scientific Landscape of Artificial Intelligence in Language Education: A Bibliometric Analysis

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Keywords: Artificial Intelligence (AI), Language Education, Bibliometric Analysis, Co-Citation Analysis, Co-Word Analysis

Abstract: Recent advancements in Artificial Intelligence (AI) have reshaped the trajectory of research in education. In fact, AI integration into educational settings has generated a new research front, addressing the impact of AI technologies on learning and teaching. However, despite the recent growth in publications, research remains fragmented, with little attention given to analyzing the intellectual and conceptual structure of the field. To address this gap, this study holistically maps the scientific landscape of AI in education, identifying trends, themes, and future directions in AI in language education. It employed bibliometric analysis using VOSviewer on 1,622 articles retrieved from the Scopus database, spanning from early developments in 1978 to 2025. Results revealed several thematic clusters, including institutional policies, user acceptance, pedagogical implications, and learner psychology. Also, this study highlights gaps in AI in language education research, calling for second language theory integration and for more objective study measures. Co-citation analysis suggests recommendations for further theoretical developments, highlighting key frameworks in the literature. Likewise, AI technologies can support students linguistically, cognitively, and emotionally, with co-word analysis emphasizing concerns on institutional readiness, academic integrity, and teacher training. This study offers a blueprint for scholars and educators, highlighting potential avenues for future research in AI in language education.

Integrating Artificial Intelligence in Early Childhood Education Pedagogies: Transforming Learning for the Digital Generation

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Keywords: Artificial Intelligence, Early Childhood Education, AI Pedagogies, Digital Learning, Child-Centred Learning, Educational Technology, Play-Based Learning

Abstract: Artificial Intelligence (AI) is increasingly reshaping educational practices, including Early Childhood Education (ECE), by enabling more interactive, adaptive, and personalized learning experiences. This paper examines the integration of AI in ECE pedagogies and its implications for teaching and learning among young children in the digital era. The discussion focuses on AI-supported approaches such as adaptive learning applications, interactive storytelling, gamified learning, and intelligent educational tools that can enhance children's cognitive, language, and social development. The paper further highlights the potential of AI to support child-centred and play-based learning through differentiated instruction, real-time feedback, and inclusive learning opportunities. However, challenges associated with ethical considerations, teacher readiness, data privacy, excessive screen exposure, and reduced human interaction remain critical concerns in early childhood settings. Current literature largely emphasizes AI integration in secondary and higher education, while research on developmentally appropriate AI pedagogies for young learners remains limited. Using a conceptual review approach, this paper synthesizes contemporary literature on AI and ECE to examine emerging pedagogical trends and challenges. The findings indicate that effective AI integration can strengthen learning engagement, creativity, and digital competencies when implemented within developmentally appropriate frameworks. The study emphasizes that AI should complement rather than replace human interaction and play-based learning. The paper contributes to ongoing discussions on educational innovation by advocating for ethical, balanced, and human-centred AI integration in early childhood education.

Unveiling Blended Learning Beyond Barriers: Policy Perspectives, Pedagogical Insights from the Himalayan Regions

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Keywords: Blended Learning, Himalayan Education, NEP 2020, PRISMA Review, Educational Policy, Technology-Enabled Learning

Abstract: Blended learning in 21st century acts as a transformative pedagogical approach with the integration of face-to-face interaction with digital and technology combined environment ensuring inclusivity, flexibility, learner engagement as well educational continuity. Due to constraints like difficult terrain, seasonal disruption, infrastructural inequalities and limited educational accessibilities, in geographically isolated Himalayan Region like Northern India, Nepal and Bhutan, blended learning has gained continuous as well as increasing attention of various policies. This PRISMA based study identified 1,318 documents in various database like ERIC, Scopus, Wen of Science, PubMed, UNESCO Reports, Google Scholar, UNICEF Reports, ERIC, various policy documents and educational databases. 46 documents were selected for final review. The findings revealed that in India DIKSHA, PM EVIDYA, SWAYAM, NPTEL continuously support technology enabled blended learning approaches for flexible and experiential education. To support multimodal learning access, the Government of India reported expenditure of 14.75 crore under PM eVIDYA. To develop educational access in remote mountainous region, Nepal promoted ICT in Education Master Plan (2013-2017), Digital Nepal Framework (2019) and School Education Sector Plan (2022-2032). According to UNESCO, there are 2000 Community Learning Centres in Nepal for digital learning outreach and digital competency development of teachers. Bhutan's initiatives through Drukyul Programs (2019), campus wide internet enabled schools, digital classroom transformation, digitalization of education system supported blended learning for joyful experience. According to UNICEF Report (2026), in Bhutan there are 10 pilot schools benefitting more than 6,000 students and 400 teachers through blended learning infrastructural support. The study suggested implementation of blended learning policies specific to region, offline-compatible digital platforms, continuous professional development of the teachers, equitable technological infrastructure and needed essential strategies for blended learning in Himalayan region.

Detecting Cyberbullying in Somali Social Media Text Using Supervised Machine Learning

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Keywords: Cyberbullying Detection, Somali Language, Machine Learning, Natural Language Processing, Social Media

Abstract: Cyberbullying has become a growing social and digital safety concern, particularly on social media platforms where harmful comments can spread quickly and negatively affect users' online experiences. Although cyberbullying detection has received increasing attention in natural language processing and machine learning research, most existing studies focus on high-resource languages, while low-resource languages such as Somali remain underexplored. This study investigates the use of supervised machine learning models for detecting cyberbullying in Somali social media text. A balanced dataset of 2,900 Somali-language comments was collected from Facebook and TikTok, consisting of 1,450 bullying comments and 1,450 non-bullying comments. The data were manually annotated by native Somali speakers and preprocessed using lowercasing, stop-word removal, tokenization, stemming, and TF-IDF feature extraction. Five supervised machine learning classifiers were evaluated: Logistic Regression, Support Vector Machine, Naive Bayes, Random Forest, and Gradient Boosting. The findings show that Naive Bayes achieved the best overall performance, with an accuracy of 83.10% and an F1-score of 84.04%, while Support Vector Machine and Logistic Regression also demonstrated strong performance. The results indicate that traditional machine learning approaches can provide effective baseline performance for Somali cyberbullying detection. This study contributes to low-resource language NLP research and highlights the importance of AI-driven solutions for promoting safer and more inclusive online environments for Somali-speaking communities.

From AI Adoption to AI Pedagogical Transformation: Developing a Faculty AI Literacy Maturity Model for Higher Education

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Keywords: AI Literacy Maturity Model, Faculty Development, AI Pedagogy, Higher Education Innovation, Instructional Transformation

Abstract: Artificial intelligence is rapidly transforming higher education, yet many institutional initiatives remain focused on basic AI adoption rather than deeper pedagogical transformation. While faculty are increasingly experimenting with generative AI tools, limited research has examined how educators progress from initial technological use toward critically informed, pedagogically grounded, and ethically responsible AI integration practices. This conceptual paper proposes a Faculty AI Literacy Maturity Model designed to support the transformation of AI integration in higher education teaching and learning environments. Drawing upon the Technological Pedagogical Content Knowledge (TPACK) framework, Transformative Learning Theory, the UNESCO AI Competency Framework for Teachers, and Communities of Practice, the proposed model conceptualizes faculty AI literacy as a developmental continuum extending beyond technical proficiency toward reflective pedagogical innovation and institutional change. The model identifies progressive stages of AI engagement, including awareness, experimentation, pedagogical integration, critical reflection, collaborative transformation, and institutional leadership. The paper further examines how faculty development programs, instructional design support, and institutional cultures influence AI pedagogical transformation across higher education contexts. Particular attention is given to ethical AI use, assessment redesign, critical thinking development, faculty identity shifts, and the challenges associated with AI-resilient teaching practices. This study contributes to emerging interdisciplinary discussions surrounding AI literacy, instructional innovation, and higher education transformation by offering a scalable framework for evaluating and supporting faculty AI readiness. The proposed maturity model has implications for faculty development initiatives, institutional AI strategies, curriculum redesign, and future research on sustainable AI integration in global higher education environments.

Ghosts in the Machines: Intellectual Wellbeing, Technology, and the Professional Identities of Educators in the Reading with AI Project

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Keywords: Literacy, Technology, Anthropology, Intellectual Well-being

Abstract: This paper situates contemporary debates about generative AI in education within a longer anthropological account of the relationship between technology, culture, and education. I will argue that the externalization of thinking through technology has always been central to how educational practices shape culture, and that framing AI simply as a tool to be adopted or rejected obscures the post-digital condition in which education now operates. From this starting point, the chapter examines the ethics of generative AI through a large-scale Department for Education-funded project in Northern Ireland, exploring how GenAI reshapes the reading practices of children and young people (n = 6000). Rather than foregrounding literacy outcomes, the analysis asks what this intervention implies for teachers' professional learning. Drawing on Bernard Stiegler's work, the chapter suggests that the expansion of GenAI in classrooms risks a form of teacher proletarianization, narrowing conceptions of teaching to technical execution. As a counterpoint, it proposes a philosophically informed approach to professional learning that prioritizes teachers' intellectual wellbeing over technical competence, in order that AI can be deployed thoughtfully and effectively. The chapter concludes by reflecting on how cultivating intellectual wellbeing may help establish more ethical conditions for understanding, deploying, and at times resisting AI in education.

The Sycophancy Detection Quotient (SDQ): A Framework for Auditing Behavioral Deviation in Large Language Models

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Keywords: AI Alignment, Behavioral Elasticity, Factual Consistency, Large Language Models, Sycophancy

Abstract: Large Language Models (LLMs) increasingly operate within high-stakes domains where factual consistency and alignment reliability are critical. However, contemporary conversational optimization frameworks remain vulnerable to sycophancy, a behavioral alignment failure in which models prioritize user agreement and emotional validation over objective correctness. This study introduces the Sycophancy Detection Quotient (SDQ), a quantitative auditing framework designed to measure behavioral deviation from correct factual baselines under socially manipulative prompting conditions. Drawing from recent research on reinforcement learning from human feedback (RLHF), conversational alignment, and mechanistic interpretability, the framework utilizes paired neutral and biased prompting conditions to isolate degradational shifts in factual consistency caused specifically by contextual pressure. A cross-domain paired-testing evaluation was conducted across medical, mathematical, philosophical, and political reasoning tasks using multiple commercial LLM architectures. The findings demonstrate that models frequently shift toward user-aligned outputs despite initially exhibiting correct factual retrieval under neutral conditions. Behavioral deviation varied substantially across manipulative prompt structures, with emotionally framed prompts producing the highest average sycophantic shift. These results suggest that conversational alignment optimization may introduce measurable trade-offs between user satisfaction and factual stability. By operationalizing behavioral degradation under manipulative prompting conditions, the SDQ framework provides a transparent methodology for auditing sycophantic vulnerability in contemporary conversational AI systems. The study contributes to ongoing alignment research by formalizing a measurable distinction between factual retrieval capability and contextual behavioral compliance in large language models.

Teaching the Regulated Profession, Regulatory Literacy as a Pedagogical Imperative in Artificial Intelligence Era Legal Education

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Keywords: Regulatory Literacy, Legal Education, Artificial Intelligence Governance, Professional Competence, Curriculum Design

Abstract: This paper examines how legal education should equip future lawyers for practice within a rapidly consolidating architecture of artificial intelligence regulation. It argues that the prevailing institutional response, which treats generative AI primarily as a threat to assessment integrity or as an occasion for training students in particular software tools, addresses the symptom rather than the structural task. The paper advances regulatory literacy, defined as the capacity to locate, interpret, and critically apply emerging AI norms across statutory, soft law, and professional conduct sources, as a distinct and durable professional competence that legal education must cultivate deliberately rather than incidentally. The study proceeds in three analytical movements. It first synthesises the recent empirical and policy literature on AI in legal education, drawing on professional body surveys and curriculum studies to establish that tool centred instruction dates almost immediately, while the underlying regulatory landscape continues to expand. It then constructs a competence model that reframes regulatory literacy through the methods of legal analysis, mapping it onto identifiable capacities including the hierarchy and authority of norms, the interpretive weight of soft law instruments, comparative and transnational regulatory reading, and the interaction of professional conduct rules with statutory regimes. The model is grounded through a structured audit of an existing technology law curriculum, which functions as an applied case rather than a claim of generalisability. The paper demonstrates that regulatory literacy is analytically separable from both digital skills training and AI ethics instruction, and that its absence leaves graduates fluent in tools yet unable to situate those tools within the normative order that governs their use. It proposes a sequenced integration framework that distributes regulatory literacy across foundational and advanced legal study, with articulated learning outcomes at each stage, and it identifies faculty capacity as the principal implementation constraint together with realistic means of addressing it. The contribution is a transferable pedagogical framework that is not confined to a single jurisdiction or regulatory instrument. For legal educators and institutional leaders, the paper offers an alternative to curricula rendered obsolete by the pace of technological change, anchoring reform in a competence that retains its value as specific instruments evolve. For policymakers and professional regulators, it clarifies what an AI ready legal profession requires of the education system that supplies it. The analysis connects to the conference focus on preparing future professionals across disciplines and contributes to Sustainable Development Goal 4 on quality education and Goal 16 on access to justice and strong institutions.

What AI Cannot Replace: Leading a Team-Workshop-Based Education System for Business Colleges

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Keywords: Artificial Intelligence, Business Colleges, Collaborating Self-Directed Learners, Human-Led Learning, Team-Workshop-Based Education

Abstract: With the rapidly evolving AI technology, higher education (HE) worldwide is redefining its educational pedagogies. Although many HE systems, particularly Business colleges, have adopted AI into their education models, there has been a realization of the need to sustain indispensable human talent in both educators and learners of the Business field. This being mainly within the arena of contemporary leadership skills. This paper reports the progress made thus far with the application of a recently proposed Team-Workshop-Based Learning and Assessment System (TWBLAS) for Business Colleges (Saberi, 2025); particularly in terms of leading such a system while using AI as a supplementary tool by the collaborating self-directed learners themselves. The TWBLAS's purpose is to align learners' leadership skills with current business world challenges regardless of their specific business sub-specializations. The paper provides a step-by-step illustration of the progress made thus far in both the design and application of the TWBLAS since its publication in March 2025, all while demonstrating the importance of the higher educators' sustainable talent development when applying such human-led learning systems. An AI supplemented, human-led, team-workshop-based learning and assessment system that cultivates the higher educators' talent development enabling them to lead such systems across multiple specializations in the business field. The study builds on the findings of Saberi (2025) published research through qualitative analysis of participating Business students' and educators' written perceived experience with the AI-supplemented TWBLAS. Between the years 2023 and 2026, the TWBLAS has progressed from paper based to e-learning to an AI supplemented learning system; and from a semi-dependent learner centered approach to a collaborating self-directed learner approach. The latter has furnished learners with a healthy environment for enhancing further contemporary leadership skills such as teamwork skills, emotional intelligence, and metacognition. In terms of the higher educator, suggestions are made for a comprehensive talent management program that is aligned with the skill-set required to lead the AI supplemented TWBLAS. These advancements may create balance between such human-led learning systems and the benefits that AI-based education has to offer. And finally, each educator trained to lead an AI supplemented TWBLAS will be able to do so across multiple specializations in the business field. In the race toward an AI-based higher education, this paper pauses and offers a balanced AI supplemented, human-led, team-workshop-based learning and assessment system that cultivates the higher educators' talent development in Business colleges. Learners in the TWBLAS have reported higher awareness of their leadership skills such as teamwork, emotional intelligence, and metacognition. This study recommends future development

of comprehensive talent management programs for the Business colleges' educators whereby such programs are aligned with the skill-set required to lead AI-supplemented TWBLAS across multiple specializations in the business field.

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Teacher–Student Trust in Higher Education Amid AI Availability: A Scoping Review

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Keywords: Trust, Pedagogical Relationships, Higher Education, Learning and Teaching, Scoping Review

Abstract: The rapid uptake of generative AI in Higher Education is reshaping not only assessment practices but also the relational foundations of learning, particularly in regard to trust between students and teachers. As institutions navigate questions of academic integrity, authorship, and the role of human judgement, trust has emerged as a critical yet under-examined dimension of AI's impact on Higher Education. This session presents findings of a scoping review which aims to map and critically synthesises existing research on teacher-student trust in higher education within contexts of generative AI availability and use. In particular, the review examines the theoretical frameworks used to understand changing teacher-student relationships in AI-mediated educational environments, the opportunities, tensions and challenges identified within the existing literature, and the methodological approaches employed to look at this phenomenon. Insights from the scoping review inform the design, implementation, and analysis of further research at the University of St Andrews.

Scoping Review Research Questions:

- What theoretical and conceptual frameworks are being used to examine teacher-student trust in AI-mediated higher education contexts?
- What opportunities, tensions, and challenges relating to teacher-student trust are identified within the literature on generative AI in higher education?
- What methodological approaches have been used to study this phenomenon?

Conference attendees will gain an overview of how teacher-student trust is currently being conceptualised within emerging research on generative AI in Higher Education, including the key theoretical frameworks shaping this area of enquiry. The session will also provide insight into how AI mediates the processes of trust building between lecturers and students in Higher Education learning and teaching contexts, as well as providing an overview of the methodological approaches researchers are using to investigate these issues. More broadly, the presentation will invite participants to reflect critically on the relational and ethical implications of AI for teaching, assessment, academic integrity, and student experience within Higher Education.

Generative AI-Enabled Open Education for STEM Teaching Through Indigenous Languages: Toward Inclusive and Decolonized Learning

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Keywords: Generative AI, Open Education, STEM Pedagogy, Indigenous Language Learning, Educational Decolonization

Abstract: Although digital learning environments and Open Educational Resources (OERs) have expanded considerably worldwide, STEM education continues to be shaped predominantly by Western knowledge systems and English-language instructional approaches. This prevailing orientation creates barriers for indigenous learners, particularly by restricting opportunities to engage with educational materials that reflect their linguistic backgrounds and cultural contexts. Against this backdrop, the present study investigates how generative artificial intelligence (GenAI), combined with indigenous languages, could contribute to developing more equitable, accessible, and culturally responsive models of open STEM education. It examines the potential applications of GenAI-powered technologies, including natural language processing, multilingual translation, and adaptive learning systems, in redesigning STEM teaching and learning practices to accommodate indigenous linguistic diversity. The analysis also considers how incorporating indigenous languages into educational resources may help address longstanding patterns of exclusion, overcome barriers related to accessibility and usability, and advance efforts to decolonize STEM education. Furthermore, the study explores disparities in institutional and technological readiness across developed, developing, and least-developed countries, highlighting their implications for the implementation of AI-supported open education. Particular attention is devoted to challenges surrounding the integration of AI into STEM learning environments, such as algorithmic discrimination, the underrepresentation of indigenous languages in digital technologies, ethical and governance concerns, inadequate technological infrastructure, and differences in digital literacy among teachers and students. Building on these considerations, the paper introduces a conceptual framework for integrating GenAI into open STEM education through indigenous-language instruction and learning resources. The study concludes that achieving a genuinely inclusive transformation of STEM education depends on more than the deployment of advanced technologies. It also requires sustained commitments to linguistic diversity, culturally grounded pedagogical practices, responsible AI governance, and equitable access to digital educational opportunities.

Inclusive Adaptation to AI: Adult Education, Digital Skills, and Older Workers' Labor Market Retention in the EU

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Keywords: AI Adoption, Fuzzy-Set Qualitative Comparative Analysis, Adult Education Participation, Digital Inclusion, Active Aging

Abstract: Artificial intelligence is accelerating structural transformation across European labor markets by reshaping skill requirements, work organization, and demand for continuous adaptation. Demographic aging increases pressure on European economies to retain older workers and support longer working lives. Adult education and lifelong learning are promoted as policy tools to strengthen employability and labor market resilience in the digital era, although their effectiveness depends on workers' digital capabilities and the inclusiveness of adult education systems. Previous studies have examined AI-related labor market transformation, digital skills, adult education participation, and older workers' employability separately. Less attention has been paid to the interrelationships among AI adoption, adult education participation, digital inclusion, and older workers' labor market retention at the country level in the European Union. Current discussions often treat adult education participation as uniformly beneficial, paying less attention to differences in inclusiveness and adaptation capacity across national labor market systems. This study addresses this gap by examining how combinations of AI adoption, digital skills, and adult education participation relate to stronger labor market retention among older workers in EU economies, shifting the focus from technological adoption alone to the broader question of inclusive adaptation capacity in aging labor markets. The study uses country-level data for EU member states, mainly from Eurostat databases. Older workers' labor market retention is measured by activity and employment rates of individuals aged 55-64. AI adoption is defined as the share of enterprises using artificial intelligence technologies. Adult education participation and digital skills indicators capture adaptation capacity in labor markets. The empirical approach combines descriptive comparative analysis with fuzzy-set Qualitative Comparative Analysis (fsQCA), which suits this study because successful adaptation to AI depends on combinations of technological, educational, and digital conditions rather than a single factor. The method identifies distinct configurations of AI adoption, adult education participation, and digital inclusion associated with stronger labor market retention among older workers. The empirical analysis examines configurational patterns rather than a single linear effect. The results are expected to identify different pathways to older workers' labor market retention. The main pattern is that similar levels of AI adoption may be linked to different retention outcomes

depending on the adaptation environment. Stronger retention is likely where AI adoption is accompanied by higher adult education participation, stronger digital inclusion, and favorable human capital conditions. This provides a more policy-relevant interpretation of AI adoption by showing that labor market resilience depends on the conditions under which technological change is absorbed. The study concludes that the policy challenge is not simply to expand adult education, but to ensure that adult education and digital inclusion operate together as an effective adaptation infrastructure for aging labor markets. In the context of AI diffusion, retaining older workers depends on whether national systems can convert technological change into employability rather than exclusion. The findings are expected to inform policies to design more inclusive lifelong learning systems, reduce digital barriers for older adults, and strengthen labor market environments that support longer, more adaptable working lives.

“Should Never Be Done!”: Student Acceptance of AI-generated Feedback in Higher Education

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Keywords: Assessment, Feedback, Acceptance, Culture, Gen AI

Abstract: Despite the growing enthusiasm for using generative artificial intelligence (GenAI) to deliver assessment feedback in higher education, little is known about whether students are actually willing to accept it. This study examined whether students’ acceptance of GenAI in their educational context positively predicted their preferences for AI-generated grades and feedback, or a hybrid (tutor+AI) approach. Furthermore, the potential moderating roles of individual-level cultural dimensions of uncertainty avoidance and power distance were explored. An online survey was completed by 411 students (79% female, 17% male, 4% non-binary, mean age = 22 years), primarily from UK universities. Participants completed the GenAI Acceptance Scale (Karaoglan Yilmaz et al., 2023) and Hofstede's cultural dimensions of power distance (acceptance of hierarchical authority) and uncertainty avoidance (discomfort with ambiguity) scale (Yoo et al., 2011). They also responded to three items to indicate their acceptance of GenAI in feedback and were asked to explain their response. Findings revealed that students were generally accepting of GenAI applications in an educational context, yet were notably less accepting of AI-generated grades and feedback. A hybrid approach to assessment was preferred, but not embraced. The strongest predictor of acceptance of AI-generated assessment and feedback was general GenAI acceptability, although cultural dimensions of power distance and uncertainty avoidance tended to have small but significant moderating effects. Students’ open-ended responses indicated cautious, conditional openness to AI-generated grades and feedback, while emphasising the irreplaceable value of human expertise. Together, these results demonstrate the importance of communicating the value of GenAI feedback to students as supportive and educator-supervised rather than as a replacement for expert judgment.

CREDIA Model: Toward a Verification Model for Generative AI Information in Initial Teacher Education

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Keywords: Generative Artificial Intelligence, Teacher Education, AI Literacy, Information Verification, Critical Thinking

Abstract: The increasing integration of Generative Artificial Intelligence (GenAI) into educational contexts offers significant opportunities for learning and knowledge production, while simultaneously raising concerns regarding the reliability, validity, and critical interpretation of AI-generated information. One of the most relevant challenges concerns AI hallucinations, including factual inaccuracies, fabricated references, and unsupported claims, which may be difficult for students to identify. In initial teacher education, these challenges highlight the need for pedagogical frameworks that promote critical AI literacy and support future teachers in evaluating the trustworthiness of AI-generated content. This study presents the CREDIA model (Compare–Reflect–Evaluate–Decide in the Face of AI), a preliminary framework designed to guide pre-service teachers in the critical verification of information generated by AI systems. The model consists of four interconnected and non-linear stages: (1) identifying and critically examining AI-generated responses, (2) comparing and verifying information using external academic and institutional sources, (3) engaging in critical and metacognitive reflection on potential biases, omissions, and hallucinations, and (4) making informed decisions regarding the acceptance, reformulation, supplementation, or rejection of AI-generated content. The model emphasizes the role of university instructors as pedagogical mediators who foster critical questioning, evidence-based reasoning, and epistemic awareness. The proposal is currently undergoing conceptual development and exploratory validation through collaborative discussions with teacher educators and the design of a pilot study involving pre-service teachers. Preliminary findings suggest that students often attribute excessive credibility to AI-generated information and experience difficulties detecting inaccuracies and fabricated references. However, initial observations indicate that the use of a structured verification framework can enhance source comparison, critical reflection, and informed decision-making. The CREDIA model contributes to the emerging field of AI literacy in teacher education by providing a pedagogical approach aimed at strengthening critical thinking, information verification skills, and the responsible use of generative AI in academic settings.

Writing or Being Written? AI Dependency and the Threat to Intellectual Identity Among Doctoral Students and Researchers in Morocco.

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Keywords: Intellectual Identity, AI Writing Tools, Doctoral Researchers, Academic Authorship, Moroccan Higher Education

Abstract: Academic writing has always been one of the most personal and intellectually demanding dimensions of scholarly work, a space where researchers develop their voice, build arguments, and contribute original knowledge to their fields. However, the growing availability and ease of AI writing tools has begun to reshape this process in ways that are raising serious concerns within the academic community. This study investigated how doctoral students and researchers at Moroccan universities perceive the influence of AI tools on their sense of intellectual identity and originality in academic writing. Using a qualitative research design, semi-structured interviews were conducted with 68 participants including doctoral students and active researchers across multiple disciplines and institutions in Morocco. Participants were selected purposively to capture a range of experiences with AI writing tools. Findings showed that while participants recognized the practical value of AI in organizing ideas and reducing writing fatigue, a considerable number expressed genuine anxiety about losing ownership of their scholarly voice over time. Many described moments of doubt about whether their written work still truly reflected their own thinking. Some reported a gradual discomfort with writing independently without AI assistance, which they had not expected when they first adopted these tools. These findings point to a deeper tension between convenience and intellectual authenticity that Moroccan higher education institutions are not yet adequately addressing. The study calls for the development of ethical guidelines and critical AI literacy programs that protect the integrity of academic identity in research training.

Skill (Mis)Alignments: A Case Study of a Recent Educational Program Against Industry Needs

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Keywords: Educational Innovation, Future Skills, Knowledge Skills and Abilities (KSA), Labor Market

Abstract: A longstanding gap between Higher Education Institutions (HEIs) and Industry is the difference between what is taught and what is needed. This problem is so prevalent that the European Union recognizes it [1]. One way this is approached is using Skills, which can be used to identify and target the necessary Knowledges, Skills, and Abilities needed to succeed in the job markets (KSAs) [2]. However, there continue to be mismatches between the skills offered by HEI programs and industry needs. While the Skill Gap is a known issue, how to address it remains a topic of research. One key aspect is that the gap follows a disconnect between stakeholders: Industry, HEIs, and Government. While HEIs seek to prepare graduates, governments require academic plans to be validated before implementation. This delays the adaptation of educational programs, which compounds due to the industry's fast-moving nature. We propose a comparative method to identify currently needed skills in the job market and compare them with skills offered by HEIs, with the intent of identifying both missing and obsolete Skills to improve educational programs. We extracted core KSAs present in job postings from the Infocomm industry from several job search websites (LinkedIn, JORA, Indeed). This process was performed bi-weekly for a year. To ensure that valid skills were extracted, we used Retrieval-Augmented Generation (RAG [3]) alongside a taxonomy of the Infocomm industry to classify the extracted skills. This dataset of Skills was then compared to an equivalent dataset built from an educational program for the Engineering in Information Technology major at a top private University in Mexico using the weighted Jaccard metric. This metric compares the vector spaces of the Skill vectors based on their Natural Language Processing (NLP) values. The comparison results indicate that the competencies offered through the Engineering in Information Technology program only partially overlap with those required by the industry positions analyzed. At the program level, the aggregated ITC26 curriculum achieved its highest weighted Jaccard similarity with the Software Engineer occupation profile (0.113), with an average similarity of 0.022 across all analyzed occupations and 0.072 among the five closest occupations. These results suggest that an important skill gap remains between the curriculum profile and the KSA requirements observed in the selected industry roles. Across the comparisons, Knowledge was the most distinguishing factor, followed by Skills and Abilities. We identified a crucial gap between the Skills being offered by the program aimed at the Infocomm industry and the Skill needs of that Industry. We furthermore

identify the specific Skills that are covered/missing and could therefore use this information to suggest improvements or develop courses aimed at nurturing the missing Skills. Aside from internships, we believe these results demonstrate the need for further collaboration between industry and HEIs to avoid the need for extensive training before graduates are prepared for their jobs.

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From Automation to Judgment: Evaluating an AI-Augmented Monte Carlo Instructional Architecture for Responsible Managerial Decision-Making

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Keywords: Artificial Intelligence, Monte Carlo Simulation, Responsible Managerial Judgment, Business Education, Instructional Design, Ethical Decision-Making, Uncertainty

Abstract: Artificial intelligence is rapidly transforming business education, but its classroom use often remains centered on task acceleration, information retrieval, and polished output generation. In managerial education, this creates a pedagogical challenge: students must learn not only to use AI efficiently, but to reason critically under uncertainty, validate assumptions, assess risks, and justify decisions with ethical and stakeholder awareness. Although recent work has examined generative AI in higher education, less empirical evidence exists on instructional architectures that combine AI-supported analysis, probabilistic simulation, performance-based assessment, and structured ethical reflection to strengthen responsible managerial judgment. This study addresses that gap by evaluating an AI-augmented Monte Carlo learning intervention designed to move students from automated analysis toward defensible managerial decision-making. A mixed-methods quasi-experimental classroom study was conducted with 120 undergraduate business students. The active comparison condition used AI-supported traditional strategic analysis and executive recommendation. The full intervention condition integrated AI-supported analysis, Monte Carlo simulation, role-based managerial scenarios, a temporal-emotional decision matrix, and executive recommendation. The study used expert-validated instruments, a pre-post Likert survey, performance rubrics, two-rater scoring, and qualitative coding of anonymized reflection summaries. Expert validation was conducted by seven faculty judges using relevance and clarity criteria. Quantitative analyses included descriptive statistics, gain comparisons, baseline-adjusted ANCOVA, effect sizes, content validity indices, and interrater reliability estimates. Qualitative evidence was used for descriptive triangulation. Preliminary findings indicate stronger outcomes in the full intervention condition. The overall pre-post survey gain was higher for the full intervention group than for the active comparison group, with mean gains of 0.90 and 0.41, respectively. Baseline-adjusted ANCOVA confirmed a significant condition effect on the post-intervention total score, $B = 0.557$, 95% CI [0.482, 0.632], $p < 0.001$. Dimension-level effects also favored the full intervention, particularly in probabilistic reasoning and risk mitigation, ethical and stakeholder reasoning, critical AI use, and metacognition with emotional foresight. Performance-based rubric scores showed a similar pattern, with the full intervention group achieving a higher two-rater mean score than the active comparison group, 3.47 versus 2.93. Interrater reliability was high for the overall rubric score, $ICC(2,k) = 0.954$. Expert validation supported the quality of the instruments, with S-CVI/Ave values of 0.984 for relevance and 0.989 for clarity. Qualitative coding further indicated stronger patterns of uncertainty awareness, critical AI use, stakeholder sensitivity, ethical

reasoning, emotional foresight, and metacognitive reflection in the full intervention condition. The findings suggest that AI may contribute more meaningfully to business education when embedded within a structured pedagogical architecture rather than used as an isolated productivity tool. By integrating AI, Monte Carlo simulation, role-based scenarios, and temporal-emotional reflection, the intervention supported students in developing more probabilistic, ethical, and future-oriented managerial reasoning. The study contributes to instructional design and teaching innovation by offering an empirically evaluated model for Responsible Augmented Business Judgment in undergraduate business education.

The Governance Gap in Higher Education Operational AI

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Keywords: AI Governance, Algorithmic Bias, Social Justice, Higher Education Administration, Automated Decision-Making Systems (ADMS), Decentralized Ledger

Abstract: Higher education institutions (HEIs) have designed tools and elaborate procedures to regulate student-facing generative artificial intelligence (AI) tools to maintain academic integrity. However, a structural gap exists when regulating the use of internal administrative tools. This paper explores how high-risk automated decision-making systems (ADMS) used in admissions, enrollment predictions or financial aid distribution remain protected from transparent procedures and strict regulations. Through a text-based policy audit mapping three explicit keyword tiers, we empirically demonstrate a systemic decoupling between strictly maintained pedagogical standards and unregulated administrative core systems. The study further explores how recent (2025–2026) deployment of algorithms compound bias, especially against marginalized communities. They deny students a fair opportunity to ask questions, challenge decisions or appeal outcomes. We suggest a synthesized sociotechnical architecture that combines an engineering barrier—a Decentralized Equity Ledger utilizing cryptographic data minimization and Zero-Knowledge Proofs (ZKPs)—with an independent human checkpoint: an Independent Algorithmic Ombudsman and Internal Administrative Appeal Board. This framework can help universities move from symbolic compliance to demonstrable algorithmic accountability, and ensure procedural justice and equitable access to students.

When Immersive Learning Works: AI- And VR-Supported Feedback for Competency-Sensitive Skill Development in Higher Education

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Keywords: Artificial Intelligence, Virtual Reality, Immersive Learning, Competency-Based Education, Social Intelligence, Organizational Behavior, Formative Feedback

Abstract: Artificial intelligence (AI) and virtual reality (VR) are increasingly used in higher education to create immersive, feedback-rich learning environments. However, their educational value should not be assumed to be uniform across learning outcomes. Competency-based education requires attention to the alignment between instructional design, technology affordances, faculty mediation, and the competency being developed. Although prior studies have examined immersive technologies in education, less is known about whether AI- and VR-supported environments are more effective for some competencies than others. There is limited classroom-based evidence on how immersive simulation and AI-assisted feedback support competencies requiring situated practice, behavioral interpretation, social interaction, and performance-based demonstration. This study implemented a quasi-experimental classroom intervention with 34 undergraduate students in a course on organizational behavior and human capital processes. Students were assigned to a control group (n = 17) and an experimental group (n = 17). The control group followed traditional activities, including lectures, case studies, and face-to-face project presentations. The experimental group used an AI-enabled immersive presentation and communication training platform to rehearse final projects, receive automated formative feedback, and refine performance in simulated professional scenarios. The intervention was designed as an instructionally mediated, high-touch learning experience in which faculty guidance, situated practice, and formative feedback supported implementation fidelity. Pre- and post-intervention measures assessed organizational behavior (SNEG0201B), human capital processes (SNEG0202C), and social intelligence (SEG0303B). Student satisfaction, engagement, and perceived learning were also measured. Data were analyzed using t tests, ANOVA, MANOVA, linear regression, and Cohen's d. Results showed significant post-intervention differences favoring the experimental group in organizational behavior ($F = 12.71$, $p = 0.0012$) and social intelligence ($F = 4.57$, $p = 0.0402$), while human capital processes showed no significant difference ($p = 1.0000$). Perceived learning was significantly higher in the experimental group ($F = 5.05$, $p = 0.0316$), whereas engagement showed a marginal trend ($p = 0.0668$) and satisfaction was not significant ($p = 0.1733$). Pre/post analyses indicated significant gains in all three competencies within both groups, with larger effect sizes in the immersive condition. These findings suggest that AI- and VR-supported environments may be especially valuable for competencies requiring experiential rehearsal, social interpretation, and observable performance, while procedural or conceptually structured competencies may require different instructional

support. The study contributes a competency-sensitive perspective to AI- and VR-supported education. Rather than treating immersive technologies as universally effective, the findings suggest that their pedagogical value depends on the fit between technology, learning task, assessment strategy, and targeted competency. Future research should examine this alignment with larger samples, longer interventions, and mediating variables such as digital self-efficacy, task complexity, and faculty scaffolding.

AI Literacy, Digital Capabilities and Intellectual Property Awareness: Evidence for Preparing Future Professionals in the Digital Age

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Keywords: AI Literacy, Digital Capabilities, Intellectual Property, Higher Education, Professional Preparation

Abstract: The accelerating development of artificial intelligence (AI), generative systems, and digital technologies is fundamentally reshaping the production, dissemination, and safeguarding of knowledge in academic and professional contexts. With AI-powered applications becoming increasingly embedded in education, scholarly research, and creative practices, concerns surrounding intellectual property (IP) have become more prominent, particularly regarding the attribution of authorship, ownership rights, academic integrity, copyright compliance, and the responsible use of digital materials. Higher education institutions are therefore expected to equip students and future professionals with the digital competencies and AI literacy required to navigate these emerging challenges responsibly and effectively. Although growing attention has been given to AI literacy, digital skills development, and intellectual property governance, limited empirical evidence exists regarding the relationship between digital capabilities and intellectual property awareness in AI-driven environments. Furthermore, there is insufficient understanding of how demographic characteristics influence perceptions of AI-related opportunities and risks associated with intellectual property. This study addresses this gap by examining the links between digital capabilities, AI-related environments, and IP awareness among individuals preparing for participation in increasingly digital and AI-enabled societies. The study employed quantitative research based on a structured survey administered to 101 respondents. The questionnaire measured digital capabilities, intellectual property awareness and perceptions of the impact of AI-driven digital transformation on innovation and IP protection. Data were analyzed using descriptive statistics, independent sample t-tests and ANOVA to identify demographic differences, and regression analysis to examine the relationship between digital capabilities and intellectual property awareness. The findings reveal a significant positive relationship between digital capabilities and intellectual property awareness, indicating that individuals with stronger digital competencies demonstrate a better understanding of intellectual property issues. Respondents perceived AI-enabled environments as having a dual impact: on one hand, facilitating innovation, creativity, and knowledge dissemination, and on the other hand, increasing concerns related to piracy, unauthorized use, ownership disputes, and enforcement challenges. These findings suggest that developing AI literacy and digital competencies can play an important role in strengthening

intellectual property awareness among learners and future professionals. The results contribute to the emerging field of AI-enhanced education by providing empirical evidence that educational institutions should integrate intellectual property literacy into digital skills and AI-related curricula. The study offers new insights into how educational systems can better prepare students for legal, ethical, and governance challenges arising from AI-driven innovation. The empirical basis for this research is derived from the project “Factors of Intellectual Property Management and Digital Transformation in Macedonia”. The study demonstrates that digital capabilities are an important predictor of intellectual property awareness in AI-enabled environments. As AI technologies continue to reshape knowledge creation and ownership, higher education institutions must adopt interdisciplinary approaches that combine AI literacy, digital competencies, and intellectual property education. Strengthening these competencies can help prepare future professionals to use AI technologies responsibly, protect intellectual assets effectively, and address the legal and ethical challenges associated with AI-enabled environments. The findings support the development of adaptive educational frameworks that align with the evolving demands of the digital and AI-driven economy.

Studying the Effectiveness of AI Tools for Podcast Editing to Eliminate Dependency on Professional Software Among School Students

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Keywords: Media Education, Podcast, School Students, AI Tools, Communication

Abstract: Communication plays an important role in students' development. It contributes not only to their career growth but also to engaging with new people and maintaining relationships with family and friends. Opportunities for students to interact are declining due to several factors, including social media and the limited opportunities provided by educational institutions. In such circumstances, new teaching and learning approaches are needed to create an environment where students can strengthen their communication skills and build confidence. Podcasting is considered an effective tool for developing communication skills, as it allows students to express their thoughts freely through audio recordings. However, editing podcasts often requires professional equipment and can be challenging for students without technical expertise. This study aims to explore the role of podcasting in improving students' communication skills and compare how AI editing tools reduce technical barriers compared with traditional editing methods. The mixed-methods study involves an experimental project conducted with two groups of school students. The first group edited their podcasts using conventional professional software, while the second group used AI-based tools. The findings highlight the post-production difficulties experienced by the first group, whereas students in the second group were able to use AI tools effectively to produce their podcast episodes. Quantitative results suggest that both groups benefited from the recording experience. Qualitative findings from peer reviews and feedback sessions indicate that students in the second group developed technical skills and gained confidence at an early stage.

Gen Z and Foreign Language Learning in the Age of AI: A Comparative Study of Traditional and Technology-Assisted Learning Preferences Among Indian School Students

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Keywords: Gen Z, Foreign Language Learning, Artificial Intelligence, Technology-Assisted Learning, Digital Education

Abstract: In today's era, artificial intelligence and digital technologies are reshaping learning preferences in language education, particularly among Generation Z students. This study explores the comparative perspectives of Indian school students regarding technology-assisted foreign language learning and traditional classroom-based learning in the contemporary educational environment. The research focuses on students' learning preferences, engagement, and perceptions towards foreign language learning in schools. The study was conducted by Grade VIII and IX students, student-led research initiative, under the supervision of a guide, using an online survey questionnaire as a research tool. The survey was distributed to students from different regions of India. More than 2,000 responses were collected and analyzed using percentage analysis, frequency distribution, and graphical representation. The findings reveal that although Gen Z learners are growing up in the age of artificial intelligence, traditional methods of foreign language learning continue to have a significant impact on their learning experiences by improving understanding, interaction, and learner engagement. The responses further indicate a strong interest in learning foreign languages in India, such as French, Italian, and German, despite ongoing policy changes regarding foreign language education in Indian schools. The study highlights the importance of balancing traditional pedagogical practices with technology-assisted learning approaches in foreign language education. It also demonstrates the broader transformation of foreign language learning within AI-supported educational environments. The research contributes to current discussions on Gen Z learners, educational technology, and the evolving future of language education among school students.

LanguIA: Supporting Teachers in B2 Oral Language Assessment Through Human–AI Collaboration

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Keywords: Artificial Intelligence in Education, Oral Assessment, Language Learning, Large Language Models, Human-AI Collaboration

Abstract: The assessment of oral expression in a foreign language is a complex task for teachers due to the multiplicity of criteria that must be analyzed simultaneously and the cognitive load associated with this activity. Within the framework of the Common European Framework of Reference for Languages (CEFR), the B2 level involves fluency, lexical richness, grammatical accuracy, and the ability to develop structured arguments. This paper proposes a conceptual approach for designing an AI-based assistance system to support teachers during oral language assessment. In an exploratory phase, a Large Language Model (LLM), implemented through ChatGPT, was used to simulate the role of an automated evaluator. An exploratory study based on ten oral assessment recordings compares the evaluations produced by two teachers with those generated by the simulated system. Inter-rater agreement was measured using the weighted Cohen's kappa coefficient and indicated a moderate to substantial level of agreement. These findings suggest that AI, within a human–AI collaborative framework, may enhance the reliability and consistency of oral assessment. This study serves as a proof of concept and lays the groundwork for the development of a dedicated system such as LanguIA, designed to assist teachers during oral language assessment in real time.

Beta-Testing Childhood: A Systematic Audit of AI Governance Readiness and Cognitive Effort Displacement in International K-12 Education

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Keywords: AI Governance, Neurodevelopment, Executive Function, Cognitive Load Theory, Educational Policy

Abstract: As Generative Artificial Intelligence (GenAI) integration accelerates globally, the international K-12 education sector faces a critical "Governance-Development Gap." Current institutional policies predominantly focus on academic integrity and plagiarism detection, largely neglecting the neuro-biological implications of early technology adoption. This paper addresses this vacuum by presenting the results of a systematic audit conducted in March 2026, analyzing the public frameworks of 14 major international accreditation bodies and the visible AI policies of 50 leading international schools. The findings reveal a systemic structural deficit: 100% of the investigated accreditation bodies lack mandatory, comprehensive AI governance frameworks, while 92% of the sampled international schools possess no publicly accessible or structured AI governance policy. This systemic lack of institutional guardrails creates an unmonitored environment for "Cognitive Effort Displacement." Drawing on contemporary literature in neurodevelopment and cognitive load theory, we argue that the premature outsourcing of synthesis, executive organization, and problem-solving to AI surrogates risks altering foundational executive function windows in primary and lower secondary learners (ages 3–12). To bridge this gap, this paper introduces the Neuro-Behavioral Governance Model (NBGM), a strategic framework designed to align institutional AI integration policies with established neuro-biological developmental milestones, moving educational leadership from reactive plagiarism management to proactive, cognitive-health-centered governance.

From Grades to Evidence: Reimagining Academic Credentialing for the AI Age

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Keywords: AI-Age Credentialing, Competency Evidence, STRIDE Framework, Academic Transcript, Higher Education Reform

Abstract: The academic transcript is among the oldest artefacts of institutional education. It is also among the most misleading. A grade documents exposure to content. It does not document the ability to apply, create, or judge. In an age when AI can pass most examinations that produce those grades, the transcript has become a credential without credibility. AI's disruption of credentialing operates on three registers simultaneously. As a tool, it can generate the performances that grades were designed to certify, making the grade a measure of human mimicry, not human capability. As a competitor, it bids against the graduate in the same labour market, rendering the credential's exchange value structurally unstable. And as a diagnostic, AI functions as an X-ray, not creating the fractures in credentialing, but making fractures that always existed impossible to ignore. This paper argues that these three pressures converge in a single structural inversion: in the industrial age, the system certified the student; in the AI age, the student certifies the system. Employers no longer ask what the institution has endorsed, they ask what the learner can demonstrably do. The credential must answer that question or become irrelevant. "In the industrial age, the system certified the student. In the AI age, the student certifies the system." The paper proposes the AI-Age Transcript as a replacement architecture, a capability portrait built on the STRIDE framework (Standards, Transparency, Responsibility, Integrity, Discipline, Ethics) with blockchain-based verification of competency evidence. This model is situated within India's existing policy infrastructure- the Academic Bank of Credits (ABC), Automated Permanent Academic Account Registry (APAAR), and the National Academic Depository (NAD)- demonstrating that the transition is institutionally actionable, not merely aspirational. Evidence is drawn from a continuous assessment pilot currently underway at JIS University, Kolkata, and from comparative transcript analysis across three disciplines. Policy implications for UGC, AICTE, and the National Credit Framework (NCrF) are examined.

Assessing the Environmental Impact of AI Use in Higher Education: Development and Validation of an Open-Source Carbon Footprint Calculator

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Keywords: Artificial Intelligence in Education, Carbon Footprint, Large Language Models, Environmental Awareness, Responsible AI Use

Abstract: The increasing use of AI tools in higher education has raised concerns about their environmental impact. Large Language Models (LLMs) require substantial computational resources not only during training but also during inference, that is, every time a response is generated. As AI adoption expands in universities, the cumulative energy consumption associated with educational AI use becomes increasingly relevant. However, educators and students still lack accessible tools capable of translating technical energy data into understandable indicators that support more sustainable educational decisions. Most existing studies on LLM energy consumption focus on training processes or large-scale infrastructure costs and are mainly directed at technical audiences. In contrast, educators and students still lack practical tools for estimating the environmental impact of everyday AI-supported educational activities. This study combined the development of a web-based tool with its validation in a real educational context using a design-based research approach. An open-source application called AI Carbon Footprint Calculator was created to estimate the environmental impact of educational AI use based on variables such as AI model, task type, usage duration, and geographic region. To improve interpretability, estimated emissions are translated into intuitive equivalences such as kilometres driven or streaming hours. The tool includes an Individual Calculator, a Scenario Comparator, and a Classroom Simulator. It was tested during a six-week voluntary AI integration programme involving master's students in Secondary Education Teacher Training at the University of Almería (Spain) in the context of MentorIA project (Gil et al., 2026). Data were collected from student portfolios, activity logs, and a final usability and awareness questionnaire. Results showed that while the environmental impact of a single AI interaction is relatively small, cumulative emissions across students and weeks become more relevant. Using lighter AI models for lower-complexity tasks proved to be the most effective optimisation strategy, substantially reducing emissions without noticeably affecting perceived task

quality. Participants considered the tool easy to use, and the practical equivalences improved understanding of CO_2 estimates. Most students reported increased environmental awareness and indicated they would adjust some of their future AI-related practices. This study presents an open-source tool designed to help educators and students better understand the environmental impact of educational AI use. Its implementation in a real teacher training context demonstrated feasibility and potential for increasing environmental awareness. To support replication and future research, the tool's source code has been made publicly available.

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Gil, C., Martínez-Gil, F., Molleda, J., Montoya, M. G., Pinzón-Salazar, S., Pulido, R., & Ventura, J. (2026). A Framework for Critical and Responsible Generative AI Integration in Higher Education. *INTED Proceedings*, *1*. https://doi.org/10.21125/inted.2026.0366

Integrating Generative AI in Pre-Service Teacher Education: Attitudinal Change, Student Profiles and Ethical and Sustainability Awareness

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Keywords: Generative AI, Pre-Service Teacher Education, AI Literacy, Ethics, Sustainability

Abstract: The growing presence of generative AI in teacher education has created new opportunities for learning and instructional design, but also important challenges related to ethics, critical use, and sustainability. Future secondary school teachers are likely to play a key role in shaping how AI technologies are later introduced and used in schools. In this context, the MentorIA project (Gil et al., 2026) explored how structured AI-supported cooperative activities influence attitudes toward AI integration among pre-service teachers in the Master's Degree in Secondary Teacher Education at the University of Almería (Spain). Although student attitudes toward AI in higher education have received increasing attention, limited research has examined the impact of ethics- and sustainability-oriented AI activities in teacher education. In addition, little is known about differences in student entry profiles or whether participants with lower initial engagement benefit more strongly from these interventions. A quasi-experimental pre-post design was implemented across three class groups (n_pre = 87; n_post = 78) during the 2025–26 academic year. The intervention consisted of cooperative AI-supported activities guided by the instructor, including estimating the CO_2 footprint of AI use with a custom-built calculator and designing AI-assisted educational escape rooms for future secondary students. Activities addressed prompt engineering, bias and hallucination detection, lesson planning, assessment, diversity, ethics, and sustainability. Attitudinal change was measured using a validated 25-item Likert scale (α_post = 0.889). Mann-Whitney U tests compared pre/post cohorts, while Wilcoxon signed-rank tests on a matched subsample (n = 34) confirmed paired results. Moderation, regression, and k-means clustering analyses were also conducted. Three attitudinal dimensions improved significantly. Ethics and Responsibility showed the largest effect (Δ = +0.47; $p < 0.001$, $r = 0.304$), confirmed by Wilcoxon signed-rank test ($r = 0.406$; $p = 0.018$). Motivation and the Global Attitudinal Index also showed

smaller but significant gains. Moderation analysis revealed a levelling effect (R^2 = 0.400; β_pre = -0.708; p = 0.001), indicating that students with lower initial scores improved most. Cluster analysis identified three entry profiles: Advanced and Conscious (n = 36), Ethically Aware but Low Instrumental Use (n = 29), and Sceptical/Unfamiliar (n = 22), suggesting the need for differentiated pedagogical approaches. Motivation strongly predicted overall satisfaction (β = 0.566; p < 0.001). Open responses identified critical AI use as the main benefit and prompting difficulty as the primary challenge. Structured AI-supported cooperative activities can positively influence attitudes toward responsible AI use in teacher education, particularly in ethical awareness. The levelling effect suggests that these interventions may help reduce initial attitudinal inequalities among students. The diversity of activities used in the intervention provided broad coverage of key AI literacy dimensions and supports the use of differentiated instructional approaches. Future research should replicate the design across disciplines and educational levels, examine long-term effects, and explore the specific contribution of each activity type.

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Gil, C., Martínez-Gil, F., Molleda, J., Montoya, M. G., Pinzón-Salazar, S., Pulido, R., & Ventura, J. (2026). A Framework for Critical and Responsible Generative AI Integration in Higher Education. *INTED Proceedings*, *1*. https://doi.org/10.21125/inted.2026.0366

Cognitive Outsourcing and Critical Multimodal Literacy: Rethinking Assessment and Educational Paradigms in the Age of AI

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Keywords: Generative AI, Cognitive Outsourcing, Critical Multimodal Literacy, Educational Assessment, Human-AI Collaboration

Abstract: The widespread integration of generative artificial intelligence (AI) into education and professional practice requires a reconceptualization of two interrelated constructs: cognitive outsourcing—the delegation of mental tasks to AI systems—and critical multimodal literacy—the ability to interpret, evaluate, and produce meaning across multiple semiotic modes while critically appraising AI-generated content. This article examines how current educational paradigms and assessment models fail to address the increasing complexity of AI-mediated problem-solving at different stages of academic and professional development. A narrative literature review was conducted, drawing on recent research in educational technology, cognitive psychology, media studies, and AI ethics. The review focused on three themes: (a) the outsourcing of cognitive functions such as memory, synthesis, and evaluation to AI tools; (b) the rise of multimodal AI outputs, including text, images, video, and code; and (c) the limitations of assessment frameworks that continue to privilege individual, text-based, and unaided performance. The evidence was synthesized thematically to identify emerging patterns and tensions. Three key ideas emerged. First, educational pathways often assume predictable forms of problem-solving, whereas AI-rich environments increasingly involve ill-defined and rapidly evolving challenges. Second, current assessment practices often penalize AI use, overlooking the need to assess critical multimodal literacy. Third, a paradigm shift is required, moving from assessments focused on unaided memorization to approaches that value informed evaluation, verification, and creative collaboration between humans and AI. This article proposes a non-binary framework that recognizes cognitive outsourcing as a legitimate practice when accompanied by critical judgment. It advocates for assessment designs that explicitly permit AI use while requiring justification, cross-checking, and multimodal critique. By integrating critical multimodal literacy as a core competency, educators and professional bodies can better prepare students to tackle increasingly complex real-world problems in AI-mediated contexts.

Mapping AI Tool Use in Higher Education: Comparing Students' and Faculty Academic Practices for Responsible Integration

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Keywords: Generative AI, Higher Education, Faculty Development, Student Learning, AI Tool Adoption

Abstract: Artificial Intelligence (AI) tools have become part of everyday academic practices in higher education. Both university students and faculty members have modified their academic practices and incorporated AI tools for a variety of purposes (Sekli et al., 2024). Understanding how each group adopts AI, and for what purposes, is essential to anticipate pedagogical implications and guide responsible integration into curricula (Rassol et al., 2025). There is still limited research that systematically contrasts students' and faculty members'' AI tool choices and task-level uses while also capturing faculty concerns and improvement needs to inform institutional action (Salih, 2024; Sekli et al., 2024). Thus, this study aims to map how students and faculty use AI tools in academic contexts and to identify the pedagogical and institutional conditions needed for responsible integration. This study conducted a qualitative content analysis to compare AI tool use among university students and faculty members. Data were collected through open-ended questionnaires completed by faculty members (N = 144) and students (N = 272), focusing on the AI tools used and their academic purposes. These data were complemented by a focus group with 24 faculty members who had implemented AI-mediated learning activities. The analysis was conducted in ATLAS.ti using inductive coding across two main dimensions: AI tools and academic uses and processes. Word frequency outputs supported the comparison between groups, and a sentiment analysis of faculty

comments was used to identify recurring perceptions, concerns, and improvement needs. The findings show that both groups mainly used ChatGPT and Copilot, although with different intensity patterns. Students reported greater reliance on ChatGPT (86%) than faculty members (44%), whereas faculty used Copilot (41%) almost as frequently as ChatGPT. At the process level, students mainly used AI for information search (49%), followed by inspiration and content creation (21%) and cognitive support (17%). In contrast, faculty members primarily used AI for inspiration and content creation (22%), followed by research-related purposes (10%) and information search (9%). Translation and other forms of linguistic support appeared in both groups, although they were more frequent among faculty. Faculty members also reported using a broader range of AI tools, suggesting a more diversified tool ecosystem than that observed among students. Overall, faculty perceived AI as a potential pedagogical driver when its use is framed through critical thinking, ethical reflection, and clear instructional purposes (Castillejos, 2022; Daza et al., 2023; Nuñez-Canal et al., 2024). However, they also expressed concerns regarding reliability, plagiarism, environmental impact, lack of training, and the need for clear institutional policies to support responsible integration (Salih, 2024). University students and faculty members adopt AI tools differently at the process level: students emphasize AI for information search and cognitive support, whereas faculty members emphasize ideation and research-related uses and report broader tool diversity. Findings support a dual agenda for responsible AI integration: leverage AI for instructional support while strengthening critical evaluation routines, ethics- and competence-oriented guidance, faculty development, and institutional policy frameworks.

Governing the Machine: Tensions of AI-Gamified EFL Platforms in Chilean Higher Education

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Keywords: Pedagogical Governance, AI Gamification, EFL, Decolonial Tensions, Higher Education

Abstract: Latin American universities are rapidly adopting AI-gamified EFL platforms and apps, yet existing assessment models remain technocentric and psychometric, mainly reducing pedagogical interventions to algorithmic usage metrics inherited from the Global North. Thus, this diagnostic gap is not a minor issue but expresses deeper and yet unresolved tensions that any situated framework must confront. Based on critical analysis of regional implementations (PUC Chile (2025), CESA Colombia (2025), and Nova Escola Brasil (2025)), this doctoral project identifies at least 5 tensions: (1) evaluative tension (going from fragmented metrics to relation teacher-student-machine integrality; (2) epistemological tension (where Global North dominance erases local teacher agency); (3) ethic-political tensio (where algorithmic adaptability is falsely presented as a neutral companion); (4) methodological tension (where platforms apply direct instruction instead of stage-sensitive implementation), and (5) agency tension (where the algorithms displace the teachers to the reposition of the teacher as a primary epistemic agent). This doctoral research advances the concept of pedagogical governance as an analytical category to theorise the reconfiguration of the teacher-student-machine roles. A multidimensional model is proposed, where five interdependent dimensions will be conceptualised: pedagogical usability, algorithmic adaptability, ethical pertinence, linguistic effectiveness, and access equity- which are grounded in actor-network theory and a critical decolonial onto-epistemic stance. By centring these tensions rather than hiding them under technocratic metrics, the model pretends to enable Latin American educators and institutions to exercise pedagogical sovereignty-moving from the usual passive adoption to a new, situated, and ethical governance of AI-gamified EFL platforms.

Scaffolded Generative AI Use in Doctoral Action Research

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Keywords: Generative AI, Higher Education, Pedagogical Scaffolding, Cognitive Offloading, Reflexivity, Doctoral Education, Qualitative Description, Human-AI Interaction, Academic Integrity, Reflective Practice

Abstract: The rapid integration of generative artificial intelligence (GenAI) into higher education has produced a polarized conversation, divided between concern over academic integrity and cognitive offloading, on the one hand, and enthusiasm for efficiency and access, on the other. Less is known about what happens at the level of student experience when GenAI use is deliberately scaffolded within a course. This qualitative descriptive study examines the written reflections of 50 doctoral students across two cohorts of an advanced action research methods course at a private research university. The course employs a four-assignment scaffold in which students engage GenAI as a critical friend, a simulated committee member, a literature-search aid, and an ideation partner, paired with an explicit prohibition on GenAI use in thematic coding and analysis, and a required reflective appendix for every permitted use. Reflexive thematic analysis identified one analytically central theme, examined here through three research questions addressing students' experiential, identity-relational, and reflexive-epistemic engagement with the tool. Findings indicate that students progressed from refusal or uncritical adoption toward bounded, iterative engagement; that researcher sovereignty was preserved precisely through the act of accepting or declining AI contributions; and that structured engagement functioned as a reflexive mechanism surfacing assumptions, positionality, and accountability. The prohibition and the reflective appendix, rather than the technology itself, did the pedagogical work. The study contributes an empirical, design-oriented account of how pedagogical intent shapes GenAI integration in higher education.

Generative AI-Based Personalization in Graduate Education: Design, Implementation, and Evaluation of the 'Master Student Advisor' System

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Keywords: Generative Artificial Intelligence (GenAI), Mass Customization, Educational Technology, Graduate Business Education, Quasi-Experimental Design

Abstract: This study examines the development and preliminary outcomes of a Generative Artificial Intelligence (GenAI) educational innovation implemented at a Latin American business school. The primary objective of this research is to enhance the learning experience and academic performance of MBA students through the design, implementation, and validation of the "Master Student Advisor" system. Framed within the mass customization theoretical model, this AI-based advisor generates personalized reports that align students' professional profiles with course objectives, professor profiles, and delivery mode. This study uses a quasi-experimental design to evaluate impact, comparing academic outcomes and measuring satisfaction and acceptance metrics of the system. Findings from three pilot studies conducted between 2025 and 2026 are presented. The data reveal a high level of acceptance, with satisfaction scores increasing from 8.43 to 9.69 (on a 0–10 scale) and a 100% relevance validation for expansion across the entire curriculum. The final survey responses contrasted the increase in scores by describing the system as a pioneering and well-structured innovation that effectively prepares students for upcoming course expectations, enabling them to maximize their academic potential while focusing on solving real-world company problems. Future research will prioritize expanding this framework to other master's, doctoral, and executive education programs, as well as evaluating the system’s capacity to connect students with faculty researchers based on shared strategic interests, thereby enhancing teaching and learning in the short term.

Generative AI-Leveraged Design Thinking Learning Experience for Creating Innovative Entrepreneurial Projects with Positive Social Impact

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Keywords: Social Entrepreneurship, Generative Artificial Intelligence (GenAI), Design Thinking, Graduate Business Education, Quasi-Experimental Design

Abstract: Teaching innovative social entrepreneurship presents significant pedagogical challenges, particularly in systematically fostering creativity and market-relevant competencies. This study addresses this gap by designing, implementing, and evaluating an AI-enhanced framework that integrates Generative AI (GenAI) into a Design Thinking curriculum for developing entrepreneurial projects with a positive social impact. Employing a quasi-experimental design in a Peruvian MBA program, we compared two distinct cohorts: an experimental group of 81 graduate students who utilized the AI-enhanced framework, and a control group of 71 students who followed the traditional curriculum. The results show that the experimental group utilizing the AI-augmented framework scored 2.24 points higher than the control group. We conclude that the proposed framework is a highly effective pedagogical model that not only improves the quality of social entrepreneurship projects but also optimizes academic performance, while simultaneously developing the critical AI competencies necessary to navigate the future of work. This approach provides a scalable methodology that bridges the digital divide, equipping students with the ethical AI literacy and creative confidence required to launch sustainable ventures in resource-constrained environments.

Embodied Foundations for AI Integration in Higher Education: An Exploratory Study of the E2AP Framework

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Keywords: Embodied Learning, Cognitive Foundations, AI Integration, Higher Education

Abstract: AI adoption has outpaced instructional design, leading students to over-rely on AI-generated outputs, creating an illusion of understanding. However, knowing is not the same as understanding. This raises a question: how can cognitive foundations be established for AI to support rather than replace student thinking? Embodied learning – understanding developed through hand-drawn diagrams – and AI integration have each drawn attention but have developed largely in isolation. Phased integration – adjusting the balance between embodied learning and AI use across a program – has received little attention. Existing frameworks examine AI integration but rarely address the cognitive foundations needed for AI to support, not substitute, student thinking. This study introduces the Embodied-to-AI Partnership (E2AP) framework, sequencing cognitive foundations before AI integration. This study employed an inductive mixed-methods observational design across three cohorts and two courses in a bachelor's program, each cohort experiencing one phase concurrently. The E2AP framework includes three phases: Phase 1 – embodied learning without AI; Phase 2 – AI-assisted application to case studies, including evaluating AI hallucinations; Phase 3 – AI as sparring partner, where students challenge AI outputs. Quantitative data (student grades and course evaluations) were analysed using descriptive and inferential statistics. Qualitative data comprised student course evaluations, post-course feedback and lecturer reflections, analysed as distinct sources within a single reflexive thematic analysis (Braun & Clarke, 2019). Convergence is reported as triangulation. Mean grades remained stable across the three phases in both subjects with no statistically significant difference in means. However, grade dispersion differed significantly: in Finance, variance compressed during Phase 2 before re-expanding in Phase 3; in Marketing this pattern was weaker and only the Phase 3 re-expansion reached significance. Institutional records indicated attrition reduction from 12% to 8%. Thematic analysis revealed three patterns. In Phase 1, students shifted from passive reception towards peer engagement and self-initiated inquiry. In Phase 2, several students described identifying AI hallucinations in case studies. In Phase 3, students described challenging AI outputs; in Marketing, this surfaced AI's specific limitations with creative work. As cohorts experienced the phases in parallel, not sequentially, these patterns are interpreted as coherent with the framework's design logic rather than as evidence that Phase 1 caused later engagement. This exploratory study suggests that effective AI integration may depend on students' cognitive ownership, offering E2AP as one way to sequence embodied foundations before AI use. The preliminary and observational findings illustrate the framework's logic within a single cross-sectional implementation. The strongest signal

– AI's weaker fit for creative than for structured, analytical work – warrants further study. A longitudinal study tracking one cohort through all three phases is proposed, to examine whether sequencing embodied foundations before AI supports critical engagement over time.

Promoting Critical Thinking and Responsible Use of Artificial Intelligence in Academic Skills Workshops: A Work-in-Progress Study

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Keywords: Artificial Intelligence, Critical Thinking, Learning Support, Higher Education, AI Integration

Abstract: Students' overreliance on AI tools such as ChatGPT has increased, leading to reduced creativity and an increase in academic misconduct (Song, 2024). This may also affect cognitive development and problem-solving skills in students (Kosmyna et al., 2025). Learning support teams thus face the challenge of responsible integration of AI in academic support (Çela et al., 2024). Recent studies have explored the impact of AI integration on student motivation, learning outcomes and the development of critical and creative thinking in higher education. Most studies have focused on discipline-specific courses highlighting both opportunities and challenges, rather than practice-based educational interventions. Furthermore, limited research has explored how academic support initiatives can promote critical and creative thinking while promoting responsible AI use. Therefore, this study investigates the integration of AI in academic skills workshops to encourage effective and responsible AI use, while promoting critical thinking among first-year university students. This work-in-progress study includes two phases. Phase 1 includes a pilot study on a two-hour “Starting Assignments” workshop for 25 first-year students (Biomedical Science, Nursing, Commerce, IT) groups of 3-4 engaged in brainstorming and mind-mapping tasks. First, AI use is restricted, based on constructivist theory for active knowledge construction (Phillips, 1995). Then the students were allowed AI-assisted work, followed by a comparison, aligning with the critical thinking framework (Paul & Elder, 2019). Initial data was collected as part of the reflective practice through verbal comments and group discussions recorded in facilitator field notes and completed worksheets collected at the end. Next, the mind maps created were compared, and a thematic analysis of perceptions of AI limitations, creative thinking, confidence, and acknowledgement was conducted from student responses. Phase 2 is designed as a mixed methods study, where quantitative data will be collected through pre and post surveys, quantitative data through evaluated and compared student artefacts and finally qualitative data through focus group discussions. Quantitative data will be analyzed using descriptive statistics while qualitative data is examined thematically. Preliminary findings revealed that students initially found independent tasks daunting but generated innovative solutions that surpassed AI outputs, distinguishing their work from peers. Most (80%) used ChatGPT, and < 20% used Copilot and others. Thematic analysis of the feedback showed boosted confidence in novel idea generation, increased awareness of AI limitations, and improved tool/prompt usage despite time constraints. Expected outcomes from phase 2 will represent a larger cohort, by capturing both measurable changes and student perspectives on, confidence, perceptions, and attitudes toward critical thinking and AI use, ensuring a

comprehensive understanding of how scaffolding AI supports learning. Preliminary findings suggest that this scaffolded approach of integrating AI into learning support workshops encourage the students to engage critically with AI-generated content. By contrasting AI-restricted and AI-assisted tasks, critical and creative thinking are promoted while modelling responsible use, offering educators replicable strategies that counter overreliance. The larger study will further investigate and validate these outcomes, providing stronger evidence base for designing these interventions.

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Whisper-Based Lecture Transcription for Montenegrin Higher Education with a Practical Evaluation

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Keywords: Automatic Speech Recognition, Whisper, Montenegrin, South Slavic Languages, Educational Accessibility

Abstract: Automatic speech recognition (ASR) is becoming part of an AI-supported learning infrastructure. It is used to caption university lectures and to turn spoken classroom content into study scripts for students. For widely supported languages, such systems already perform reliably enough for routine classroom use. For smaller or less-resourced languages, by contrast, this reliability is less certain. Montenegrin is a representative case. It is not among the languages OpenAI Whisper supports, so an operator must fall back on a related South Slavic tag, and the consequences of that choice have not been measured systematically. In this paper, a quantitative study is presented of which related tag and which Whisper variant should be used. The work covers four university courses from the same area, computer science. The audio window is fixed at four minutes, a length justified by a brief pilot showing a four-to-eight-minute quality plateau. Three Whisper variants (medium, turbo, large) are crossed with three related tags (Croatian, Bosnian, Serbian). Each configuration is transcribed in three independent runs. Because human reference transcripts are prohibitively expensive at this scale, transcript stability is evaluated reference-free, by measuring run-to-run reproducibility through pairwise word error rate. The turbo variant is found to match or exceed medium and to clearly outperform large in stability. The language tag is shown to matter less than expected for Montenegrin audio. A Serbian tag, however, is observed to trigger systematic Cyrillic script switching on the medium model. To put these findings to use, a small testing application was built. It helps extract transcripts from lecture recordings using the recommended configuration, giving educators concrete and reproducible guidance for Whisper-based lecture transcription in Montenegrin higher education.

Designing for Agency: Frugal Immersive Instruction with AI Support

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Keywords: Instructional Design, Pedagogical Innovation, AI in Education, Education Equity, Resource Constrained Class Rooms

Abstract: Even though many Indian Government ZPHS schools now have digital displays in their classrooms, abstract science concepts are still taught mostly through textbooks, and students rarely encounter concepts that are meant to be understood through active experimentation. In these settings, educational technology initiatives often treat the delivery of devices or materials as the intervention itself. Overlooking the design of teaching. This study offers a framework for instructional design that transforms inexpensive immersive educational content into an approach that schools can continue to use. Furthermore, it explores the potential contribution of Artificial Intelligence to this approach as more schools adopt it. This paper presents a six-phase, teacher-mediated instructional design cycle based on multistrand review of experiential learning, cognitive load theory, and participatory design 1. Need analysis mapping, great difficulty concepts, and teacher pain points 2. Teacher co-design, coauthoring storyboards, activity sequencing, and learning objectives 3. Prototype development of a low-cost regional language immersive module deployment on a smartphone with cardboard hardware 4. Field implementation to refinement stages, an AI adaptive layer learning analysis and adaptation sequencing in place to customize pace and fill in comprehensive gaps without requiring the teacher to relocate. Learning agency is a stronger predictor of increased self-reported comprehension than students' comfort level with technology. According to the computed classroom research, the intervention also reduced the gap in reported gains between struggling students and their peers who performed better. These results provide an empirical foundation for the concepts and show that, in this case, the use of artificial intelligence is more helpful in enhancing students' learning than in replacing the teacher. The contribution defines a designated, cost-effective instructional design methodology that defines the appropriate integration of artificial intelligence.

Task-Level Feedback, Metacognitive Gaps: Evaluating an Intelligent Tutoring System Against Operationalized Learning Outcomes in Secondary Education

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Keywords: Intelligent Tutoring Systems, Metacognitive Learning Outcomes, Outcome-Based Education, Self-Regulated Learning, Adaptive Feedback, Open Learner Models

Abstract: Intelligent tutoring systems (ITS) are increasingly deployed in low-resource educational contexts as scalable alternatives to individualized instruction, yet their effects on metacognitive learning outcomes (MLOs) remain empirically underdocumented, particularly in Latin American basic education. This mixed-methods study evaluated the influence of an ITS on the attainment of eight operationalized MLOs in Grade 9 students in Montería, Colombia (n = 41). Guided by an Outcome-Based Education (OBE) framework and the Metacognitive Awareness Inventory (MAI), a quasi-experimental pre–post design was complemented by thematic analysis of 24 concurrent think-aloud protocols. No statistically significant difference in total MAI scores was found between groups at post-test (U = 278.0, p = 0.073; r = -0.330). Unexpectedly, the control group significantly outperformed the experimental group on declarative ($p < 0.001$, r = -0.603) and procedural (p = 0.020, r = -0.426) metacognitive knowledge subscales. Think-aloud data revealed emergent comprehension monitoring and strategy debugging, but an absence of planning verbalizations throughout the intervention. These findings suggest that the ITS's feedback operates predominantly at the task level, missing the process and self-regulation levels most directly linked to regulatory MLO attainment. The study contributes an OBE-grounded ITS evaluative model and evidence-based redesign recommendations applicable to equity-oriented education contexts.

Beyond Text: Indigenous Knowledge Systems and the Challenge of AI in Education

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Keywords: Artificial Intelligence, Indigenous Knowledge Systems, Ethnomusicology, Decolonial Education, Cultural Sustainability, San Communities, AI Ethics

Abstract: Artificial intelligence is increasingly shaping educational practice, research, and knowledge production. Current discussions often focus on assessment, academic writing, productivity, and digital innovation. However, less attention has been given to the implications of AI for Indigenous knowledge systems that are transmitted through oral traditions, music, performance, storytelling, communal participation, and spiritual relationships. Much of the existing AI and education discourse is grounded in written, digitised, and institutionally recognised forms of knowledge. Limited attention has been paid to how AI systems engage with Indigenous epistemologies, particularly those transmitted through oral, musical, performative, and relational forms of learning. This raises important questions about representation, inclusion, and the future of cultural transmission within AI-supported educational environments. This conceptual paper draws upon ethnomusicological research conducted among San communities in Botswana as part of a practice-led PhD project that combined ethnographic filmmaking, participant observation, interviews, and cultural analysis. Insights from this research are brought into dialogue with emerging scholarship on artificial intelligence, education, and Indigenous knowledge systems. The work argues that educational AI systems may inadvertently reproduce existing hierarchies of knowledge by privileging written and digitally documented forms of information. Indigenous forms of learning expressed through song, performance, oral tradition, and intergenerational cultural practice risk being overlooked or inadequately represented. At the same time, AI presents opportunities for cultural preservation, language revitalisation, educational accessibility, and new forms of knowledge sharing when developed through ethical, community-led, and culturally responsive approaches. The discussion further considers the challenges of representing Indigenous knowledge systems in which cultural, educational, ecological, and spiritual dimensions are deeply interconnected. The future of AI in education requires broader recognition of diverse ways of knowing beyond text-centred approaches. Educational technologies must engage more meaningfully with Indigenous epistemologies if they are to support equitable and culturally inclusive learning futures. The paper calls for AI frameworks that recognise oral, sonic, performative, communal, and spiritual dimensions of knowledge as legitimate and valuable forms of educational experience.

AI Usage, Self-Regulated Learning, Psychological Flexibility, and Critical Thinking Among University Students: A Conceptual Framework for Understanding Cognitive Development in the Digital Era

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Keywords: AI in Education, Self-Regulated Learning, Psychological Flexibility, Critical Thinking, Cognitive Offloading

Abstract: The rapid integration of artificial intelligence tools in higher education has introduced complex implications for students' cognitive development, particularly regarding critical thinking and independent reasoning. While AI offers substantial academic benefits, AI-mediated cognitive offloading may reduce opportunities for active knowledge construction, self-directed inquiry, and reflective engagement. The psychological mechanisms underlying this relationship remain poorly understood. This paper presents a conceptual framework examining the interrelationships among AI usage patterns, self-regulated learning (SRL), psychological flexibility, and critical thinking among university students. Grounded in Zimmerman's model of self-regulated learning and Hayes's psychological flexibility model, the framework positions SRL as a mediator of the relationship between AI usage and critical thinking and psychological flexibility as a moderator that buffers the negative effects of AI dependence. The framework was developed through systematic integration of theoretical and empirical literature across educational psychology, cognitive science, and AI-in-education research. Drawing on cognitive load theory, dual-process theory, and cognitive offloading theory, the model identifies how AI-mediated cognitive shortcuts may displace effortful, self-regulated processing and how psychological flexibility promotes adaptive, reflective engagement with AI tools. Construct relationships were mapped through structured conceptual analysis of convergent theoretical traditions. Higher AI dependence is proposed to reduce SRL and critical thinking, with SRL serving as the primary mediating pathway. Psychological flexibility is expected to moderate this relationship by fostering cognitive openness, adaptive goal-setting, and metacognitive awareness, enabling students to engage productively with AI without compromising independent reasoning. This framework contributes to emerging discourse on the intersection of artificial intelligence and education by identifying modifiable psychological variables central to critical thinking development. The model offers a theoretical foundation for evidence-based digital literacy programmes, psychologically informed AI-use guidelines, and future cross-cultural longitudinal research across diverse educational contexts.

Enhancing Inclusive Education Through AI: Supporting Neurodivergent Students and Staff in UK Higher Education

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Keywords: Neurodivergence, AI Tools, Inclusive Education

Abstract: A growing number of students and staff in Higher Education (HE) identify as neurodivergent (Clouder et al., 2020). Neurodivergent individuals frequently experience difficulties with executive functioning tasks, such as planning and initiating activities, which can contribute to cognitive overload, impaired decision-making, emotional dysregulation, and stress. Consistent attainment gaps for registered disabilities (e.g. Office for Students, 2023) demonstrate that current approaches are not supporting all learners. Furthermore, neurodivergent staff also report negative experiences, including stigma and discrimination related to their neurodivergence (Mellifont, 2021) leading to masking and overcompensation. HE is a fast-paced environment that relies heavily on self-regulation, placing additional cognitive and emotional demands on individuals to manage and implement support strategies. At the same time, neurodivergent individuals are recognized as creative problem-solvers who often seek out new tools. Artificial Intelligence (AI) tools may offer opportunities to mitigate some of the executive functioning challenges by supporting cognitive scaffolding to execute tasks in an accessible way. We explored how neurodivergent staff and students use AI tools in their academic practice. We explored AI tools' potential to support cognitive and executive functioning HE demands, as well as users' experiences of associated challenges and opportunities. Using mixed methods design and participatory research practices, we surveyed neurodivergent staff and students across UK HE (n = 61). Participants were asked about their knowledge, confidence and use of AI tools. We explored how AI supports cognitively demanding and often hidden academic tasks, as well as its potential to enhance strengths such as creativity and problem-solving. We identified the need for improved AI literacy, including LLM models and other AI tools supporting executive dysfunction. Participants identified using predominantly Chat GPT, to support them with tasks relying on executive functions (e.g. planning, organizing), and to mitigate burnout. Participants found AI tools useful for communicating (e.g. getting tone of an email correct, making a point clearly), as well as understanding aspects of the "hidden curriculum". However, there were significant challenges in regards to AI use. These included fear of judgment and stigma from others, concerns around ethical use of AI and their own lack of AI literacy. Some participants

expressed concerns that the widespread availability of AI would result in complacency within the sector, and result in a lack of appropriate support resources for neurodivergent individuals. Our findings highlight how AI tools can function as forms of cognitive support, particularly for individuals experiencing executive dysfunction, suggesting that such technologies may help address gaps where existing institutional resources and educational practices are insufficient to support equitable participation and success. Our findings suggest that, while AI tools offer potential to support neurodivergent staff and students, it is not a “one size fits all” solution. Useful and appropriate use requires AI literacy, clear guidance and sustained institutional commitment to inclusive practice. Future research should explore longer-term impacts of AI use, including effects on self-efficacy and learning.

From Framework to Practice: Piloting an AI-Enabled Conversational Agent to Support Educational Enhancement in Higher Education

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Keywords: Artificial Intelligence in Education, Academic Development, Educational Enhancement, AI Conversational Agent, Human-in-the-Loop Governance

Abstract: Universities devote considerable effort to developing educational strategies, teaching frameworks, and enhancement resources aimed at improving learning, promoting inclusive practices, and supporting continuous improvement. However, these frameworks are not necessarily reflected in everyday teaching practices and programme designs; their enactment is shaped by local cultures, academic agency, disciplinary norms, workload and opportunities for collective sense-making. Academic developers therefore play an important role in helping institutions move from strategic intention to meaningful practice through dialogue, interpretation and partnership-based facilitation. Yet this model is difficult to scale when engagement relies heavily on workshops, consultations or individual facilitation. This work-in-progress paper presents the early design and feasibility development of the Framework for Education Copilot, an AI-enabled conversational agent being piloted within a university academic development context to support staff engagement with the institutional Framework for Education and associated educational enhancement resources and support. The Framework for Education is a shared, values-led resource co-designed with staff and students that articulates principles of good educational design and practice, guiding reflection, dialogue and programme enhancement development rather than compliance. The project addresses two connected gaps: the practice gap between the implementation and developmental purpose of educational frameworks and their consistent enactment in programme and module-level decisions; and a knowledge gap in generative AI scholarship, where attention has focused largely on student use, assessment, academic integrity and broad teaching and learning implications. Less attention has been given to how AI agents might responsibly support academic development, educational enhancement and professional reflection without replacing human judgement. Drawing on desk analysis, requirements engineering, semi-structured conversations, and gap analysis, the pilot has been designed as a structured, values-aligned conversational tool rather than an open-ended chatbot. Its proposed pathways include Framework exploration, quick diagnostic reflection, storyboard building, enhancement and implementation planning, and workshop support. The agent is grounded in curated educational development resources and intentionally excludes student personal data, confidential institutional records and automated decision-making datasets, reflecting a low-risk, human-in-the-loop approach to AI-supported educational practice. Early analysis suggests that the core challenge is not lack of commitment to educational enhancement, but the cognitive, temporal and practical burden of translating abstract principles into situated

educational action. Requirement engineering therefore prioritised usability, accessibility, transparency, editable outputs, governance boundaries and professional ownership over advanced automation. In response, the pilot positions AI as a scaffold for sense-making, reflection and follow-through, generating draft enhancement snapshots, structured prompts, storyboards and action plans that remain subject to human interpretation and refinement. The work contributes to emerging debates on AI-enabled educational enhancement by shifting attention from student-facing AI use to a carefully bounded model of AI-supported academic development practice. It offers an early design case for aligning conversational AI with institutional educational values, professional judgement and human-in-the-loop governance, responding to calls for clearer definitions of the educational purposes, functional boundaries and human expertise relationships of pedagogical AI conversational agents. Future evaluation will examine patterns of use, output quality, facilitator reflections and case examples of how the agent supports educational design conversations across varied teaching contexts.

Reclaiming the Game: A Multi-Level Game-Theoretic Framework for Deliberative AI Governance in Higher Education

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Keywords: AI Governance, Game Theory, Higher Education, Humanist Pedagogy, Mechanism Design

Abstract: Higher education has always been shaped by the tools and pressures of its time. What makes the current moment distinctive is the depth at which artificial intelligence is entering academic life reshaping how students learn, how knowledge is assessed, and how institutions understand their own purpose. Universities are, at their best, places dedicated to forming human beings capable of critical judgment, ethical reasoning, and the imaginative empathy that democratic life depends on. The arts and humanities are central to that mission. This paper offers conceptual tools to help that mission guide the choices that lie ahead. Two productive research traditions exist in parallel. AI ethics frameworks for education (e.g. Holmes et al., 2022) offer normative guidance but operate at the level of policy prescription. Game-theoretic approaches (e.g. Prichard, 2026; Wiley, 2026) model individual incentives precisely but remain at the classroom level. This paper bridges these traditions into a single multi-level model spanning classroom, institution, and system. Drawing on Bourdieu (1990), Airoldi (2022), and Spence (1973), it introduces three working concepts — Machine Habitus, Acute Technosocial Opacity, and the Arenization of AI Innovation — as tools for naming dynamics existing frameworks have not yet formally captured. This is a conceptual Work-in-Progress paper synthesising game theory, critical pedagogy, and the sociology of technology. The three working concepts are not claimed as entirely novel: Machine Habitus builds on Bourdieu (1990) and Airoldi (2022); the signaling analysis draws on Spence (1973) and Akerlof (1970). The original contribution is their translation and integration into a coherent governance framework. This framework strives to connect individual incentives to institutional strategy to systemic design. Empirical validation through structured deliberation sessions with faculty governance bodies is planned as the next phase of this research programme. The framework's purpose is to protect the conditions under which genuine education can take place. When students find it easier to use AI to complete an assignment than to engage with it, something more than academic integrity is at stake. The cognitive and ethical struggle through which formation happens is being bypassed. When universities rush to adopt AI tools under competitive pressure, it is the deliberative space in which values are negotiated that suffers. Game Theory gives these dynamics a precise name; Mechanism Design offers tools to change them. At the classroom level, assessment redesign can make genuine learning the more attractive choice. At the institutional level, deliberative alliances can turn a race into a conversation. At the systemic level, Machine Habitus and Acute Technosocial Opacity point toward AI infrastructure answerable to educational values rather than commercial ones.

This paper is offered as a contribution to an ongoing conversation. Its value lies not in resolving the tensions of AI in education (many are structural and will persist) but in naming them precisely and offering a conceptual architecture for deliberate, values-aligned governance. What animates this research is a simple conviction: that the most important thing a university can do in the age of AI is to think carefully — about what it is for, what it values, and what kind of human being it remains committed to forming.

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Disagreement as Evidence: Cross-Family LLM Divergence as a Reliability Signal in AI-Ethics Discourse

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Keywords: Intercoder Reliability, Large Language Models, Content Analysis, AI Ethics, Cross-Family Coding

Abstract: There is a decided lure to using LLMs as coding instruments: they offer advantages in both cost and speed, completing coding faster than any human can match. As they are increasingly enlisted across the sciences, a trend has emerged to treat intercoder agreement as a quantity to maximize — whether in a single validated model or a multi-model design. This work-in-progress advances a different epistemic view: genuine independent coding requires a bounded level of divergence that a single model family cannot supply, and a range of model training is necessary to approximate a human-like range of interpretation. Just as one would never expect multiple human coders to agree on every judgment, three LLM coders that never diverge are not three coders but one prior expressed three times. How this principle was operationalized into a mixed-methods coding instrument is precisely what this work-in-progress reveals. To ensure that the coding incorporates multiple epistemic foundations, a diverse coder roster was selected over a multi-year testing process; the current coders in use are—Claude (Anthropic), Codex (OpenAI), and Perplexity (Sonar 2). The data feeds into a qualitative Obsidian "second brain" and a quantitative SPSS data set. Once the SPSS dataset reaches a viable point of completion, it will be used to pair intercoder reliability (Krippendorff's α) with a range of inferential tests (paired t-tests, χ^2, and ANOVA). These will assess whether or not the cross-family coder differences are statistically significant. This study outlines the entire pipeline which is constructed and run through agentic AI to automate nearly every stage of the process, with results published to a web dashboard.

AI Readiness in Cultural Tourism Ecosystems: Relational Governance, Strategy, and Accountability for Sustainable Transformation

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Keywords: AI Readiness, Cultural Tourism Ecosystems, Relational Governance, Accountability, Sustainable Transformation

Abstract: Artificial intelligence is rapidly reshaping tourism, cultural heritage, and destination management. Yet much of the debate still focuses on specific applications, such as recommendation systems, conversational agents, predictive analytics, content generation, and visitor-flow management. This application-driven view is useful but insufficient. In cultural tourism ecosystems, AI adoption is not merely a technological upgrade. It is a strategic and relational transformation involving museums, heritage institutions, destination management organizations, local governments, tourism firms, creative industries, residents, visitors, and technology providers. Building on smart tourism literature, this paper starts with the assumption that tourism destinations increasingly operate as complex ecosystems in which ICT, leadership, innovation, social capital, and human capital jointly support competitiveness and value co-creation (Boes, Buhalis, & Inversini, 2016). The emergence of ambient intelligence tourism further strengthens this ecosystemic view, such as AI, machine learning, ubiquitous computing, IoT, and real-time data infrastructures connect multiple actors and reshape tourism services, processes, and experiences (Buhalis, 2020). Recent research on generative AI confirms both the transformative potential of these technologies and the still-fragmented state of tourism research, in which theoretical development and governance-oriented perspectives remain underdeveloped (Li et al., 2025). The paper argues that the key issue is not simply whether cultural tourism organizations adopt AI, but whether the ecosystem is ready to govern AI responsibly. To address this issue, the paper develops a conceptual framework of AI readiness in cultural tourism ecosystems. The framework integrates four dimensions: technological readiness, organizational readiness, ecosystem readiness, and accountability readiness. Technological readiness encompasses data infrastructure, interoperability, cybersecurity, and algorithmic reliability. Organizational readiness concerns leadership, skills, strategic alignment, and change management. Ecosystem readiness captures inter-organizational collaboration, knowledge sharing, stakeholder coordination, and joint capacity building. Accountability readiness refers to transparency, responsibility allocation, auditability, data governance, inclusion, and the assessment of social, cultural, environmental, and economic impacts. The theoretical contribution lies in interpreting AI readiness as a relational governance capability. Relational governance has long been understood as an interorganizational strategy grounded not only in economic safeguards, but also in trust, joint action, and cooperative processes (Zaheer & Venkatraman, 1995). Similarly, inter-organizational control research shows that collaborative relationships require mechanisms to manage both appropriation concerns and coordination requirements (Dekker, 2004). Applying these

insights to cultural tourism ecosystems, the paper suggests that responsible AI adoption requires a balanced combination of formal governance mechanisms, shared strategic goals, trust-based collaboration, performance measurement, and accountability routines. Finally, the paper connects this perspective to responsible AI governance, which recent research conceptualizes through structural, procedural, and relational practices across the AI lifecycle (Papagiannidis, Mikalef, & Conboy, 2025). By doing so, the paper contributes a strategy and policy-oriented framework for understanding how cultural tourism ecosystems can prepare for AI-enabled transformation without reducing heritage, culture, and place-based experiences to opaque, platform-driven, and purely extractive forms of digital innovation.

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An AI-Driven Framework for Generating Narrated Video Lectures From Technical Course Materials

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Keywords: Lecture Automation, Text-to-Speech, Generative AI, Script Generation, Educational Technology

Abstract: The creation of educational lecture videos for lengthy technical educational courses today is a highly time-intensive process that requires manual script writing, voice recording, and video editing. The engineering courses, consisting of mathematical formulas such as Digital Signal Processing (DSP), require detailed and prolonged explanations. In such an academic application, the instructors often rely on static lecture slides and interactive narration support is not fully exploited. The recent advances in AI and speech technology have helped content creation and made it easier for students to access course materials. The use of technologies, such as Generative AI and Text-to-Speech, for such an application can support the automatic creation of narrated educational lecture videos and improve accessibility for students. In addition, once a lecture script is generated, it can be easily produced in a wide variety of languages; this approach is flexible for multilingual student groups and an international learning environment. Current lecture automation systems often focus on addressing slide summarization or basic text narration. While these approaches can generate spoken content from lecture slides, they often fail to provide deeper educational explanations or integrated supporting textbook material effectively. Furthermore, many of these systems often lack the ability to produce coherent lecture-style narration that connects with slides in a natural manner to imitate an instructor-based classroom. This project generates an AI-assisted pipeline for automated lecture video generation from lecture slides and textbook resources. The system extracts slide content automatically from PDF lecture files, retrieves related textbook information, and generates educational lecture scripts using the Generative AI model. To improve the quality of generated explanations, prompt engineering techniques were used to guide the AI model towards lecture-oriented narration, mathematical clarification, and context-aware explanation instead of simple slide summarization. The generated narration is converted into realistic speech using an AI-based text-to-speech system. Finally, the slides and generated audio are automatically combined into a synchronised lecture video using Python-based video-processing tools. The implementation was developed using Python, PyMuPDF, a Generative AI model, an AI-based text-to-speech tool, and MoviePy. Initial experiments were conducted on a subset of a Digital Signal Processing course. The developed prototype successfully generated complete lecture videos automatically from lecture slides. By combining slide content with related textbook information, the system produced narrated explanations/scripts that went beyond simply reading the text on the slides and provided more detailed educational descriptions of mathematical concepts while

including further informational sources such as textbook material. Initial testing showed that the approach can significantly reduce the amount of manual effort usually required for lecture preparation while providing clear and understandable narration at the same time. The experiments also highlighted the importance of smoother transitions between consecutive slides to create a more natural lecture flow and improve the overall learning experience. The results demonstrate combining Generative AI with educational resources to support lecture content creation for technical subjects.

Semantic Retrieval of Graduate Theses Using Transformer-Based Embeddings

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Keywords: Semantic Retrieval, Transformer-Based Embeddings, Academic Repositories, Information Retrieval, Knowledge Discovery

Abstract: University digital repositories are an important source of academic and scientific knowledge, storing theses, research reports, and other scholarly outputs. However, many repositories still rely on keyword-based search mechanisms or limited file storage structures, making it difficult to locate relevant documents when users do not know specific details such as authors, titles, or exact terminology. Recent advances in natural language processing have enabled the development of text embeddings, which capture semantic relationships among documents and provide new opportunities to improve information retrieval beyond traditional keyword matching. Although semantic retrieval techniques based on embeddings have been widely studied, their adoption in Latin American academic institutions remains limited. Many universities operate through fragmented and heterogeneous repositories, creating barriers to efficient knowledge discovery. Consequently, there is a need to evaluate the feasibility of transformer-based embeddings for improving access to academic documentation. This study addresses this gap through the implementation and evaluation of a semantic retrieval approach applied to a corpus of graduate theses. A corpus of 54 graduate theses from the Master's Program in Information and Communication Technologies was collected and used as the experimental dataset. These documents were automatically processed through a text extraction stage, followed by cleaning and preprocessing procedures. To enable semantic representation, the extracted content was divided into chunks, which were subsequently transformed into vector embeddings using transformer-based embeddings. The generated embeddings were analyzed using a semantic retrieval approach based on cosine similarity. User queries were converted into vector representations and then compared against the thesis embeddings to identify semantically related documents. The proposed approach was evaluated through a set of representative academic queries designed to assess the algorithm's ability to retrieve conceptually relevant theses beyond traditional search methods based on keyword matching. Preliminary evaluation was conducted using ten representative academic queries covering domains such as healthcare, education, artificial intelligence, blockchain, business intelligence, information systems, IoT, e-government, and mobile applications. The proposed semantic retrieval approach achieved an average Precision@5 of 0.84, indicating that most of the retrieved theses were conceptually relevant to the user queries. The highest retrieval performance was observed in specialized domains such as blockchain, healthcare, IoT, and information systems, where the system consistently returned highly relevant

documents. In contrast, broader domains such as education and web systems produced more heterogeneous results, suggesting greater thematic overlap among documents. These findings demonstrate that transformer-based embeddings can effectively capture semantic relationships within academic repositories and support knowledge discovery beyond traditional keyword-based search methods. The results highlight the potential of semantic retrieval techniques to improve access to scientific information stored in university thesis collections. This study presented a semantic retrieval approach for graduate theses based on transformer-generated embeddings. The results demonstrate the feasibility of applying semantic retrieval techniques to academic repositories, achieving an average Precision@5 of 0.84 across ten representative queries. Future work will focus on expanding the corpus, incorporating additional evaluation metrics, and exploring conversational interfaces for academic knowledge discovery.

Custom AI for Formative Feedback at Scale

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Keywords: Formative-Feedback, Agentic, Pedagogy, Mastery

Abstract: This study presents a case study examining how custom AI tools function as learning partners in an intensive graduate business course. We ask: can purpose-built AI tools provide formative feedback at the scale and consistency that faculty alone cannot sustain? In May 2026, thirty-five Master's students from twenty countries participated in a two-week course advising the New England Revolution MLS team on converting 2026 FIFA World Cup fans into season ticket holders. Students worked with five AI tools: three custom-built tools — Matteo (coaching on application of a consulting analysis), Juli (presentation feedback), and Tedd (peer feedback assessment) — alongside Google AI Studio for application prototyping and a Compound AI tool for Excel-based market analysis. Student surveys and direct faculty observation yielded four findings. First, students sought richer, more dialogic feedback than grade-based assessment provides; Juli's conversational scaffolding was cited as particularly effective. Second, adoption was bimodal — a substantial subset engaged deeply while another used the tools minimally. Among engaged users, students averaged six iterations per submission, suggesting a depth of practice difficult to sustain through typical faculty-student interaction. Third, all three custom tools would benefit from a faculty-alert escalation mechanism to notify instructors when students were stuck. Fourth, developing and deploying agentic AI tools represents a skill set that currently exceeds most faculty's technical capacity, pointing to a meaningful barrier to adoption. These findings suggest that effective AI integration in higher education requires more than access. It requires the ability to modify tools in real time during instruction and sustained faculty involvement in tool design and deployment. Final student presentations to New England Revolution management provide preliminary evidence that an "AI-as-a-learning-partner" framework can increase both the rigor and creativity of student work on authentic business challenges.

EEG-Based Assessment of Sustained Attention in Physics Learning Through Serious Games

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Keywords: Serious Games, Sustained Attention, Physics Education, Neuroeducation, Artificial Intelligence

Abstract: According to the Programme for International Student Assessment (PISA), physics education in Mexico faces major educational problems, and 49% of students have basic knowledge in science, leading to erroneous learning methods that rely on memorizing complex formulas. To avoid this, the analysis of sustained attention as a necessary cognitive process in learning is proposed through the implementation of Serious Games (SG), immersive learning tools that can help overcome a lack of motivation and facilitate the understanding of physics concepts. Despite technological advances in the field of SG, there are few studies on sustained attention in real learning environments and a lack of educational design data combining SG with portable electroencephalogram (EEG) and artificial intelligence; this is to measure sustained attention in learning and correlate it with learning gain in Uniform Rectilinear Motion (URM) concepts. A quasi-experimental study was conducted with 24 first-year university students divided into two groups. The control group (12 people) attended conventional classroom instruction, and the experimental group (12 people) played the SG "Gravi en el Vacio" for 15 minutes. The game consists of four stages (basal, intervention, relaxation, and regulation). Game mechanics were developed for learning the concepts of time, distance, and speed. While playing the SG, single-channel raw signals were obtained in real time using the NeuroSky MindWave Mobile 2 EEG device. Preprocessing (notch filter and bandpass) and processing (Fast Fourier Transform) were applied to extract a feature vector with the Relative Powers of each frequency band (alpha, beta, theta, gamma, and delta), the Power Ratio Index (PRI) and the Cognitive Engagement Index (CEI), the level of Sustained Attention (high, medium or low) was classified with two Machine Learning models that are Support Vector Machine (SVM) and Linear Discriminant Analysis (LDA). In terms of learning efficiency, the experimental group was significantly better than the control group ($p < 0.001$). EEG data showed that participants were at a high level of attention in 84% of the intervention phases. The mechanics of the speed concept attracted greater global sustained attention levels across participants, and a moderate positive correlation of 0.469

(R^2 = 0.22) was observed between the ability to maintain attention and learning gain, although it was not statistically significant (p = 0.124). The SVM ranking model is the best achievement, with an accuracy of 96% and an F1 score of 0.95. Results suggest that hands-on gameplay promotes conceptual understanding over rote memorization. EEG measurements have shown that SG learning methods are effective in maintaining sustained attention. The SVM classifier outperformed LDA, achieving an accuracy of 96% and an F1-score of 0.95. We have also confirmed that PRI and CEI indicators can serve as reliable neurophysiological markers. Future studies should include more individuals, if possible, using multichannel EEG, and extend this teaching method to other disciplines and different groups of disciplines.

Outrunning AI in University Assessment: Designing for Real-World Problem Solving and Reflective Failure

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Keywords: AI in Higher Education, Authentic Assessment, Reflective Learning, Learning Through Failure, Critical Thinking, Assessment Design, AI-Resilient Pedagogy, Real-World Problem Solving

Abstract: The extensive use of generative AI in higher education has significantly raised concerns about the validity of conventional assessment methods, many of which can now be completed using AI tools. This study advocates moving beyond detection-based strategies towards innovative assessment designs centred on authentic, real-world problem-solving. Drawing on practices in AI and cyber security education, it introduces a model that incorporates learning from failure, reflective thinking, and iterative processes as fundamental assessment principles. Using examples such as cyber security simulations and AI ethics audits, the paper demonstrates how realistic, multi-stage assessments can reduce dependence on AI-generated content while encouraging deeper critical engagement. A central aspect of this approach is redefining success, not simply in terms of correct answers, but through students' ability to examine errors, adjust their decisions, and explain their reasoning. The paper presents a practical framework for developing AI-resilient assessments that emphasise human judgement, ethical understanding, and critical reflection.

From Access to Agency: Re-Engineering Cyber Security Education for a Truly Diverse Talent Pipeline

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Keywords: Cyber Security Education, Diversity and Inclusion, Neurodiversity, Inclusive Pedagogy, Equity in Higher Education, Talent Pipeline, Educational Transformation

Abstract: Cyber security continues to face a persistent and systemic diversity gap across gender, ethnicity, and neurodivergent representation, despite increasing global demand for talent. While higher education institutions and industry have introduced initiatives aimed at widening participation, many efforts stay focused on access and recruitment, with limited emphasis on agency, belonging, and long-term progression within the discipline. This work argues that addressing diversity in cyber security education requires a shift from participation-driven approaches to structural and pedagogical transformation. Drawing on empirical insights from higher education research, practitioner experience, and case studies of diversity-focused programmes, the study names key barriers that disproportionately affect under-represented groups. These include hidden curriculum norms, exclusionary assessment practices, lack of inclusive learning environments, and systemic biases embedded in educational and professional pathways. To address these challenges, the paper introduces the Diversity-to-Agency Model, an evidence-informed framework that moves beyond inclusion towards enabling learner capability, confidence, and leadership development. The model integrates inclusive curriculum design, identity-affirming pedagogies, neuroinclusive teaching strategies, and mentoring ecosystems that support sustained engagement and progression. The work contributes a set of practical design principles for re-engineering cyber security education, including inclusive and developmental assessment approaches, community-building practices, and metrics for evaluating impact beyond participation rates. It argues that meaningful progress requires shifting from measuring who enters cyber security education to understanding who is empowered to succeed, influence, and innovate within the field. Ultimately, the paper positions diversity not only as a matter of representation, but as a critical driver of resilience, creativity, and excellence in the future cyber security workforce.

NEOPATH: Semantic Action Graph Construction from Human Demonstrations for Traceable and Modifiable Robot Task Planning

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Keywords: Vision-Language-Action Models, Graph Attention Networks, Explainable AI (XAI), Continual Learning, Robot Manipulation, Action-Object Interaction

Abstract: Constructing semantic representations of robotic actions based on human demonstrations remains an outstanding challenge for interpretable robotic planning. We present NEOPATH, a unified workflow that extracts semantic action graphs from first-person and third-person videos of human activity by combining object detection, depth estimation and zero-shot action classification. Each graph encodes the relationships between actions and objects as weighted edges, generating structured reasoning chains in which each node and edge carries a direct physical interpretation. Validated against the EPIC-KITCHENS-100 ground truth annotations on a shared vocabulary of 12 manipulation primitives, the workflow achieves 78.21% precision, 80.09% recall and an F1 score of 79.13% in verb-noun pair extraction, with 87.23% sequence precision in ordered action chains derived from unscripted kitchen activity sequences. The resulting graphs provide a basis for planning subsequent robotic tasks as a transparent alternative to black-box visuo-motor models.

Teaching Future Educators to Think with and About AI: A Human–AI and Explainable AI (XAI) Framework for Higher Education

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Keywords: Human–AI Interaction, Explainable AI, Critical Thinking, Preservice Teachers, AI-Enhanced Learning

Abstract: As generative artificial intelligence (AI) and intelligent dialogue systems rapidly transform educational environments, teacher education programs must move beyond teaching future educators how to simply use AI tools toward helping them critically understand, evaluate, and ethically engage with AI systems. Current approaches to AI integration in higher education frequently emphasize technical adoption and efficiency while providing limited attention to explainability, algorithmic transparency, human oversight, and reflective pedagogical judgment. This paper proposes a human-centered framework integrating AI literacy, Explainable Artificial Intelligence (XAI), conversational AI, and human–AI dialogic learning within higher education teacher preparation. Grounded in socio-technical theory, Intelligent-TPACK perspectives, and human-centered AI frameworks, the study conceptualizes generative AI as a dialogic, explainable, and collaborative pedagogical partner within intelligent learning environments rather than a replacement for teacher expertise. The framework emphasizes transparent human–AI dialogue, interpretable AI-supported decision making, reflective AI interaction, and computational thinking as essential competencies for future educators navigating AI-mediated learning environments. Using a qualitative design-based research approach, the study investigates preservice teachers' interactions with generative and conversational AI systems through reflective journals, AI interaction logs, semi-structured interviews, and instructional artifacts. Structured AI-supported learning activities focus on prompt literacy, reflective AI dialogue, evaluation of AI-generated pedagogical outputs, algorithmic bias recognition, ethical reasoning, and adaptive instructional decision making. The analysis examines themes including explainability awareness, trust and skepticism toward intelligent systems, teacher agency, pedagogical transparency, and human oversight in AI-assisted instructional design. The study contributes to emerging discussions on explainable and human-centered AI in education by proposing a framework that moves beyond functional AI proficiency toward reflective, transparent, and ethically informed human–AI collaboration. The paper argues that preparing future educators in the age of intelligent systems requires cultivating the capacity to think both with and about AI through explainable, dialogic, and critically informed educational practices.

Developing Critical Thinking Through Student-Built Language Models: An Explainable AI Approach in Teacher Education

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Keywords: Human–AI Interaction, Explainable AI, Critical Thinking, Preservice Teachers, AI-Enhanced Learning

Abstract: Artificial intelligence (AI) is rapidly transforming teaching and learning across higher education. Large language models are increasingly used by preservice teachers for lesson planning, assessment design, and instructional support. However, most preservice teachers interact with AI tools only as end users without understanding how these systems function, how they are trained, or how bias emerges in outputs. This lack of conceptual understanding limits preservice teachers' ability to critically evaluate AI-generated content and responsibly integrate AI into classroom instruction. This study investigates whether training a simplified language model can enhance preservice teachers' critical thinking skills (CTS) and AI literacy. Fifteen preservice teachers enrolled in a teacher education course will participate in an in-class intervention where they build and train a small language model using a browser-based tool. Participants will complete a pre-assessment measuring critical thinking (CT) and AI understanding, followed by guided activities to construct datasets, train models, evaluate outputs, identify bias, and refine performance. Data will include pre/post surveys, reflection responses, prompt evaluation tasks, and observation notes. Quantitative data will examine changes in CT and AI literacy, while qualitative data will explore participants' perceptions of learning through model construction. Findings will inform instructional design strategies for integrating explainable AI in teacher education and preparing future educators to critically evaluate AI technologies.

Algorithmic Influence and Public Trust in Generative AI: Implications for Media Literacy and Digital Cognition in Higher Education

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Keywords: Algorithmic Influence, Public Trust, Generative AI, Media Literacy, Higher Education

Abstract: The rapid expansion of generative artificial intelligence (AI) has transformed how individuals' access, interpret, and trust digital information, with important consequences for higher education and academic knowledge environments. As AI-generated content increasingly shapes communication, knowledge production, and public discourse, concerns about algorithmic influence, misinformation, and public trust have become urgent for educators, researchers, and policymakers. Despite growing use of generative AI among students and academic communities, limited research has examined how algorithmic systems shape users' perceptions, critical evaluation processes, and trust formation in educational and digital contexts. This conceptual paper investigates the relationships among algorithmic influence, media literacy, and public trust in generative AI systems. Drawing on Critical Digital Literacy, Media Literacy Theory, Sociotechnical Systems Theory, Algorithmic Literacy, and AI Ethics, the paper conceptualizes algorithmic influence as a multidimensional process through which AI systems shape information visibility, perceived credibility, cognitive engagement, and public understanding. Attention is given to AI-generated misinformation, algorithmic bias, content personalization, and users' growing difficulty distinguishing human-generated from AI-generated content, with implications for academic integrity and information literacy in higher education. The work argues that media literacy must evolve beyond traditional information evaluation toward broader algorithmic and AI literacy. Learners need opportunities to critically interrogate AI-generated outputs, understand algorithmic decision-making, and engage reflectively with digital information ecosystems. The paper also examines how trust in generative AI is socially and culturally constructed through perceptions of transparency, credibility, authority, and technological legitimacy. This work contributes to interdisciplinary discussions across AI ethics, digital literacy, educational technology, and cognitive science. Its implications extend to higher education curriculum design, institutional media literacy initiatives, AI policy development, and future empirical research on human-centered AI integration in algorithm-driven learning environments.

When the Machine Enters the Classroom: Rethinking the Role of Artificial Intelligence in Higher Education and Lifelong Learning

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Keywords: Artificial Intelligence in Education, Higher Education Pedagogy, Digital Equity, Adaptive Learning, Lifelong Learning, Workplace Development

Abstract: Artificial intelligence has moved from the periphery of education to its very centre, faster than most institutions were prepared for. This paper explores what that shift looks like on the ground, not in model benchmarks or pilot press releases, but in real classrooms, faculty meetings, and the lived uncertainty of students navigating a world where the rules of learning are quietly being rewritten. Drawing on observations from post graduate and undergraduate management programmes, the discussion covers three overlapping challenges: the gap between how AI tools are marketed and how they are actually used, the inequitable distribution of AI-enhanced educational resources across socioeconomic lines, and the question of what 'learning' means when a machine can produce a plausible essay in thirty seconds. The paper does not argue for or against AI in education that debate is, for practical purposes, already settled. Instead, it asks a harder question: how do we design learning environments that harness AI's genuine capabilities while preserving the irreducibly human dimensions of education: curiosity, struggle, mentorship, and the slow accumulation of judgment? Specific design principles and institutional recommendations are offered for consideration.

Whose Knowledge Counts? A Systematic Review of Global South Representation in English-Language Educational AI Research (2015–2026)

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Keywords: Global South, PRISMA, Higher Education, Epistemic Equity, Educational AI

Abstract: Artificial intelligence is reshaping higher education at a rate that many institutions and researchers have struggled to match. However, amid this rapid growth, an important question remains: whose educational experiences are being investigated, and which theoretical perspectives guide this research? This systematic review investigates the extent to which English-language, Scopus-indexed studies on AI in higher education (2015–2026) meaningfully centre Global South contexts and the epistemic frameworks underpinning this body of literature. Following PRISMA guidelines, a structured database search identified an initial dataset of 1,160 records. After applying clearly established inclusion and exclusion criteria, with priority given to peer-reviewed studies explicitly situated in Global South higher education contexts, 303 records were retained for screening, with approximately 80–100 papers currently undergoing synthesis. Computational text analysis conducted using Python and Orange Data Mining was employed to investigate keyword frequencies, geographical representation, and thematic clusters within the dataset. Preliminary results reveal notable trends. Of the 303 identified publications, 216 (71%) were published in 2025–2026, indicating a substantial increase in educational AI research following the emergence of ChatGPT. More than 89% of the publications in the dataset appeared from 2024 onwards, highlighting the relatively recent expansion of this research area. South Africa, Indonesia, Nigeria, Jordan, and Bangladesh are among the most frequently represented geographical settings. Nevertheless, the thematic findings indicate that research priorities remain largely influenced by Global North perspectives, with prominent keywords focusing on technology adoption and platform integration rather than local relevance, cultural appropriateness, or context-sensitive pedagogical approaches. These findings contribute to continuing discussions surrounding epistemic equity in educational AI and raise important questions about who determines the standards of rigour, relevance, and knowledge production in an increasingly AI-driven world.

Incorporating Domain Knowledge into Student Risk Prediction: An Ablation Study Using Higher Education Enrollment Records

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Keywords: EDM, Domain-Modeling, Ablation Study, Two-Stage Modeling, Logistic & Poisson Regression

Abstract: This study explores how domain-specific knowledge can be applied to predict students' academic risk using administrative data from higher education institutions. It draws on 37,583 anonymised student enrolment records from Peru (2023) and employs an ablation-based experimental framework. The target variable (at_risk_course, measured from 0 to 5) is modeled using a two-stage approach (1) risk occurrence is the probability that a student has risk and is calculated via logistic regression (has_risk = at_risk_course ≥1), and (2) risk severity is the intensity of the risk if a student is at risk and is predicted using Poisson regression. Multiple modeling pipelines are compared while maintaining the same preprocessing and evaluation conditions. Four feature conditions are tested: Raw-only (student profile variables), Custer-only (unsupervised cluster labels and definitions), and hybrid (Raw + cluster label) with or without the influence of domain-based weighting. The Bean-based weighting scheme is implemented as a pipeline step that scales feature groups using theory-informed weights. Results show that the Raw-only model established a credible baseline (ROC-AUC = 0.7497, Recall = 0.7006), with a low-precision error profile suited for early intervention. Standalone Cluster-only models performed worst across both stages (ROC-AUC = 0.6214; Test MAE = 0.619), demonstrating that cluster labels fail to preserve individual granularity. While unweighted hybrid models yielded only marginal predictive gains, the domain-informed weighted hybrid model successfully shifted classification toward higher sensitivity (Recall = 0.7099). Furthermore, the weighted Poisson model demonstrated high practical utility, with 100% of rounded severity predictions falling within ±1 course of the true value. Overall, the findings suggest that theory-driven weighting is a practical mechanism for incorporating domain knowledge into predictive pipelines. Future work could focus on utilising alternative count models (e.g., negative binomial or zero-inflated) to handle data overdispersion, calibrating decision thresholds to balance institutional capacity against alert fatigue, and implementing fairness checks to ensure intervention deployment is sensitive to more seriously impacted demographics.

Integrating Machine Learning Techniques for Automated Tuberculosis Detection and Prognosis

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Ghosh, Surojit

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Keywords: Tuberculosis, Machine Learning, Support Vector Machines, Random Forest, Decision Trees, Logistic Regression

Abstract: The priority of early diagnosis of Tuberculosis (TB) as a best practice for the treatment of TB, especially for the developing nations, urgently needs to be addressed. This study researched the use of machine learning (ML) algorithms to assist with the prediction and diagnosis of TB. The dataset was mature enough to contain clinical, demographic, and radiological features. Many ML algorithms including logistic regression, decision trees, random forests, and support vector machines (SVM) were trained and evaluated on the dataset. Subsequently ML model performance was evaluated based on its value regarding accuracy, sensitivity, specificity, and precision, which demonstrated them to be highly accurate in the detection of cases of TB. The study also includes a feature importance analysis to determine the major predictors of TB to aid clinical decision making process. The findings of this study show that ML-based methods are capable of increasing level of accuracy in prediction in noninvasive and low-cost alternatives for TB prediction.

Generative AI Literacy and Medical AI Readiness Among Nursing Students: An Investigation Using the GLAT and MAIRS-MS

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Keywords: Generative AI Literacy, Nursing Education, GLAT, MAIRS-MS, Knowledge-Confidence Gap

Abstract: Generative artificial intelligence (GenAI) is rapidly being integrated into healthcare education and clinical practice. Nursing students, as future healthcare professionals, will need competencies to critically and ethically use these technologies. Yet two questions remain underexplored: how much do nursing students actually know about GenAI (objective literacy), and how ready do they feel to apply AI in clinical settings (perceived readiness)? How they use AI tools in academic and clinical education has also not been systematically studied in a Central European context. Existing AI-literacy research focuses on general or medical students, leaving nursing students underrepresented. The Generative AI Literacy Assessment Test (GLAT; Jin et al., 2024), a validated performance-based measure of GenAI literacy, has not been applied to nursing students. The Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS; Karaca et al., 2021) — measuring perceived readiness across cognition, ability, vision, and ethics — was developed for medical students and not used in nursing. The link between objective literacy and perceived readiness is especially underexplored. In the authors' prior study of 97 Croatian students, GLAT scores did not predict general academic self-confidence ($F(4, 92) = 0.799$, $p = 0.529$, $R^2 = 0.034$), suggesting a knowledge–confidence gap. Whether this gap persists with a domain-specific outcome (medical AI readiness) is an open question with direct implications for curriculum design. This work-in-progress paper presents the design, instruments, and rationale for an ongoing study using a quantitative cross-sectional design. Nursing students (target N = 120–150) at two Croatian universities will complete: (1) the GLAT — a 20-item multiple-choice test of GenAI literacy (Cronbach's $\alpha = 0.80$; 2PL IRT; RMSEA = 0.03; CFI = 0.97); (2) the MAIRS-MS — a 22-item Likert scale of perceived readiness across cognition, ability, vision, and ethics ($\alpha = 0.87$; CFI = 0.938; SRMR = 0.057); and (3) a demographic questionnaire on AI usage (frequency, purposes, self-rated proficiency, prior training). Data collection is scheduled for June–July 2026. Analyses include descriptive statistics, group comparisons (ANOVA/Kruskal-Wallis), Pearson correlations, and OLS regression testing whether literacy predicts readiness, controlling for year of study, clinical

experience, usage frequency, self-rated proficiency, and prior AI education. As a work in progress, the study addresses five research questions:

RQ1: What is nursing students' level of objective GenAI literacy, and how does it vary across the four GLAT dimensions (Know & Understand, Use & Apply, Evaluate & Create, Ethics) and by year of study?

RQ2: What is the perceived readiness of nursing students for medical AI, and how does it vary across the four MAIRS-MS dimensions (cognition, ability, vision, ethics) and by clinical placement experience?

RQ3: How and for what purposes do nursing students use GenAI tools in their academic and clinical education?

RQ4: Does objective GenAI literacy (GLAT) predict perceived readiness for medical AI (MAIRS-MS), after controlling for year of study, clinical experience, usage frequency, self-rated proficiency, and prior formal AI education?

RQ5: Is there a discrepancy between nursing students' objective GenAI literacy (GLAT) and their self-rated AI proficiency?

This study will provide the first application of the GLAT–MAIRS-MS combination to nursing students and the first data on both objective GenAI literacy and perceived medical AI readiness in this group. By combining a performance-based knowledge test, a perceived-readiness scale, and nursing-specific usage data, it addresses the limitations of self-report-only approaches. The five questions are designed to yield actionable insights regardless of results: baseline literacy (RQ1–RQ2), usage patterns (RQ3), the knowledge–readiness relationship (RQ4), and self-assessment accuracy (RQ5), informing whether nursing curricula should prioritise AI knowledge, motivational readiness, calibration of self-beliefs, or their combination.

Artificial Intelligence and Additive Manufacturing in Dental Anatomy Education: Transforming Learning Through Personalized and Interactive Technologies

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Keywords: Dental Anatomy Education, Deep Learning, Artificial Intelligence, Additive Manufacturing, 3D Printing

Abstract: Dental anatomy is a fundamental discipline in the preclinical curriculum of dental education programs. In dental anatomy courses, students are required to develop a comprehensive understanding of tooth morphology as well as psychomotor skills to accurately restore the shape and function of teeth in clinical practice. Traditional teaching methods, including lectures, wax-carving exercises, and two-dimensional atlases, often present challenges for visualizing complex three-dimensional (3D) structures and providing individualized feedback. Recent advances in artificial intelligence (AI) and additive manufacturing (AM) offer innovative opportunities to enhance dental anatomy education through personalized, interactive, and data-driven learning environments. The aims of this work were: (a) to integrate the 3D Tooth Atlas 8 platform, which enables students to interactively recognize each tooth and understand its anatomy, morphology, internal and external structures, position within the dental arches, and relationships with adjacent structures; (b) to digitally fabricate life-size three-dimensional tooth models reproducing fine anatomical details through stereolithography-based 3D printing, thereby enabling the production of highly accurate dental replicas; (c) to incorporate AI-driven systems, including deep learning algorithms, computer vision technologies, and intelligent tutoring platforms; and (d) to evaluate students' performance using the Fair Grader 100 (Nissin, Japan), a system capable of generating 3D images by scanning at a rate of 10,000 points per second and comparing student-produced models with customized 3D-printed educational reference models. These innovative technologies have the potential to improve learning outcomes, increase student engagement, and facilitate the transition to the clinical use of digital technologies such as Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) systems and Cone Beam Computed Tomography (CBCT), which are increasingly utilized in both preclinical and clinical dental practice.

Transforming University Teaching Through Generative AI: A Multidisciplinary Model Across Faculties

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Keywords: Generative AI, Teaching Innovation, Higher Education, Case-Based Learning, Analytical Reasoning

Abstract: Generative artificial intelligence is rapidly transforming higher education, raising urgent questions about how universities should redesign teaching, learning, and assessment in AI-mediated academic environments. While generative AI offers major opportunities for personalised learning, feedback, and professional preparation, its spontaneous and poorly regulated use may also weaken academic reasoning, homogenise student responses, and make it more difficult to assess authentic learning. This communication presents a multidisciplinary teaching innovation project coordinated at UIC Barcelona, with academic participation linked to the University of Barcelona, and involving the participating faculties of Law, Economics, Communication, and Humanities. The project was recently awarded the VI Beca Exea Impact 2026 for quality and teaching innovation. The project aims to design, implement, and evaluate a structured pedagogical model for integrating AI into university teaching in a responsible, evidence-informed, and transferable way. Rather than treating AI as a tool for automating academic production, the model uses it to strengthen students' reasoning processes. Its central premise is that teaching quality improves when students are required to identify relevant facts, distinguish data from assumptions, justify decisions with evidence, consider counterarguments, and explicitly acknowledge uncertainty. The intervention is based on case-based learning activities connected to real or plausible professional scenarios across the participating faculties. Within these activities, AI is assigned deliberately limited pedagogical roles, such as question generator, devil's advocate, coherence auditor, or simulator of alternative scenarios. AI is not accepted as a single source of authority or as a substitute for the student's final intellectual work. Each activity defines what forms of AI support are permitted, which uses must be declared, and how students must critically verify AI-generated outputs. The project will be implemented over two academic years in selected subjects from the participating faculties at UIC Barcelona, with academic involvement from the University of Barcelona. It will produce a transferable methodological package including case-based activities, guided prompts, reasoning guides, common rubrics, academic integrity rules, and recommendations for responsible AI use. This package is designed to be adaptable to different disciplinary contexts and to facilitate later adoption by other teaching teams. Methodologically, the project follows a mixed, quasi-experimental design with two consecutive implementation cycles. The first cycle will test and adjust the instruments, the intensity of AI use, and the teaching sequence; the second will refine the model and provide more robust evidence. The main outcome variable will be an analytical reasoning index, based on a common rubric assessing argumentative structure, integration of evidence, handling of

counterarguments, justificatory coherence, and treatment of uncertainty. Additional evidence will be gathered through pre- and post-questionnaires, records of AI use, focus groups with students, interviews with teaching staff, and, where feasible, aggregated learning platform data. The project also incorporates a humanistic and sustainability-oriented perspective. It promotes a proportionate use of technology, academic integrity, data protection, and professional responsibility. Its employability dimension is central: in professional environments increasingly shaped by AI, graduates must be able not only to generate answers, but also to interpret problems, verify information, justify decisions, anticipate risks, and remain accountable for outcomes. Expected results include measurable improvements in analytical reasoning, student autonomy, verification practices, and perceived professional usefulness. The project's main contribution is a replicable model for integrating AI into higher education without reducing learning to automation, combining innovation, ethical responsibility, institutional transferability, and rigorous evaluation.

Balancing Competence and Cognition: A Research Agenda for Operationalizing the Structured Empowerment Framework for Youth AI Use

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Keywords: Large Language Models, Structured Empowerment, Executive Functioning, AI Literacy, Cognitive Offloading

Abstract: The rapid integration of generative artificial intelligence (GenAI) into children's and adolescent's daily lives poses unprecedented developmental, cognitive, and ethical challenges (Neugnot-Cerioli & Laurenty, 2024). While GenAI offers transformative educational potential, an over-reliance on these tools risks inducing "cognitive debt" and exacerbating executive functioning (EF) vulnerabilities, particularly as youth with lower EF skills tend to substitute independent problem-solving with AI assistance (Klarin et al., 2024; Tao et al., 2026). Furthermore, current AI safety frameworks remain predominantly adult-centric, failing to account for the unique psychological vulnerabilities of minors, the "empathy gap" inherent in large language models (LLMs), and the risks of anthropomorphic deception (Kurian, 2025; Neugnot-Cerioli & Laurenty, 2024). Effective AI-ethics education for children is particularly important. Building upon recent scholarship on a "Structured Empowerment" framework (Tao, 2025), this review study synthesized multidisciplinary empirical evidence across developmental psychology, cognitive neuroscience, and human-computer interaction to propose a comprehensive research agenda aimed at operationalizing and empirically validating these age-appropriate LLM restrictions. The proposed research agenda prioritized three core pillars for investigations: 1) rigorously testing the balance between AI-assisted skill acquisition and cognitive offloading to preserve experience-expectant brain development (Neugnot-Cerioli & Laurenty, 2024); 2) exploring the socio-emotional impacts of AI companions to mitigate emotional dependency and ethical misalignment (Ohu et al., 2025; Yu et al., 2026); and 3) translating theoretical limits into technical guardrails by leveraging parametric cognitive simulations (Murali et al., 2025) and youth-specific risk taxonomies (Yu et al., 2025) to replace blunt, adult-oriented content filters. Ultimately, this agenda outlined a critical roadmap to transition from theoretical guidelines to empirical validation, ensuring that children cultivate AI competency and digital literacy without sacrificing vital cognitive and socio-emotional milestones.

Human-Curated AI-Assisted Scenario Design for Game-Based Sustainability Learning: A Design-Oriented Case Study

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Keywords: Artificial Intelligence in Education, Human-Centered AI, Game-Based Learning, Sustainability Education, Generative AI, Scenario Design, Non-Formal Learning, Systems Thinking

Abstract: Artificial intelligence is increasingly transforming educational design and learning environments. While much of the current literature focuses on adaptive systems, personalized learning, and automated educational support, growing attention is being directed toward human-centered approaches that position artificial intelligence as a tool for supporting instructional design rather than replacing educators. At the same time, sustainability education requires learning environments capable of promoting systems thinking, collaborative reasoning, and understanding of complex ecological interdependencies. Game-based learning has emerged as a promising approach for addressing these educational challenges. Despite the growing interest in artificial intelligence in education, limited research has examined how generative artificial intelligence can support the design of facilitator-led sustainability learning activities, particularly in non-formal educational contexts. Existing studies predominantly focus on digital learning platforms, automated personalization, or intelligent tutoring systems, while the role of artificial intelligence as a design-support mechanism for scenario creation in game-based sustainability education remains insufficiently explored. This study presents a design-oriented case study examining a human-curated AI-assisted scenario design workflow for a tabletop game-based learning activity focused on water stress and ecosystem sustainability. The activity was implemented in a non-formal scout context involving twenty-four participants aged twelve to sixteen organized into eight teams. Generative artificial intelligence tools were used exclusively during the preparatory phase to generate initial ecological scenarios and decision options. All outputs were subsequently reviewed, filtered, modified, balanced, and pedagogically adapted by human facilitators. Data were collected through facilitator observations, field notes, gameplay monitoring, and post-activity reflections. The implementation suggests that scenario variability supported collaborative discussion, comparison of alternatives, and reflection on ecological trade-offs across interconnected ecosystem components. Participants increasingly demonstrated systems reasoning by considering delayed ecological consequences and ecosystem interdependencies. The study further revealed that artificial intelligence contributed primarily to expanding the initial design space by generating diverse scenario ideas, while educational coherence, scientific validity, and pedagogical suitability depended on extensive human curation and facilitator mediation. These findings support emerging human-centered artificial intelligence perspectives that emphasize educator oversight and transparent integration of artificial intelligence within educational design processes. The study

demonstrates that generative artificial intelligence can function as a valuable design-support tool within sustainability-oriented game-based learning when embedded in a human-curated instructional workflow. The findings highlight the importance of pedagogical control, ecological consistency, and facilitator involvement. The primary contribution of the study is the documentation of a transparent framework for integrating artificial intelligence-assisted scenario ideation into non-formal sustainability education. Future research should examine these approaches across diverse settings using comparative designs and stronger measures of learning outcomes.

Equipping Management Students for an AI-Driven Era of Uncertainty-a Work in Progress from Management Class

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Keywords: Education, AI, Uncertainty, Teaching, Instructional Design

Abstract: Contemporary MBA programs remain anchored in a deterministic, historical case-study model that promises assured outcomes. However, the modern classroom reveals a deep fracture: most students want performative and employment-led outcomes from class; those desiring deep inquiry or innovative thinking are constrained by schedules and the pressure to find a campus-led job. At the same time, the speed of technological evolution outstrips institutional curricula, often discarding the vital virtues of classical pedagogy—deep reading, deliberate inquiry, and rigorous debate. I have based this on my experience as an industry teacher, teaching two semesters of management of technology with AI as the core driver, for students in an MBA programme in India. I had to design the curriculum, teach large classes and experience both rewarding and turbulent moments. As a technology entrepreneur, I found this to be revealing and thought of new approaches that would be relevant. This proposed submission is a work in progress based on my experience in management classes. It proposes a new framework designed to transition management education from a deterministic and assured paradigm to a unassured and answer-seeking model through in-class enactment of future scenarios. It does not seek to discard the need to teach basics as well as tools to students. If anything, their importance will be contextually heightened. The goal is to equip tomorrow's managers to govern production lines and organizational processes that are inherently unpredictable and AI-driven, with classical factors of production being under real threat. The proposed framework treats AI as a systemic disruptor of traditional labor, capital, and managerial oversight. Moving away from retrospective case studies, this model introduces an experiential ecosystem that is part "living lab" and part "moving theatre." Students are dropped into simulated scenarios where business-as-usual has broken down. They are challenged to architect managerial interventions for real-world organizational crises, forcing them to treat uncertainty not as a variable to be eliminated, but as a baseline condition of modern industry. They can go back to management texts read in other classes, case studies and research. They may even use LLMs. But they have to find answers to specific uncertain situations and then debate and challenge one another in class. In doing so, they will want to know more about how modes of inquiry, data science and model building can help them find answers. But since the questions assume a breakdown of fundamentals at work as a given, they cannot seek comfort in just copying whatever is out there (case studies, LLM outputs, news articles) and pass those off as solutions. This will lead to genuine discovery and building of processes to manage uncertainty. By operationalizing this framework, business schools can find a way to reduce the gap between academic theory, development of technology. Hopefully it may be

possible to have a new generation of MBAs who can navigate ambiguity and use classical inquiry with radical technological fluency.

LLM - Assisted Essay Grading in Computer Ethics: An Empirical Evaluation of Human - AI Grading Agreement

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Keywords: Essay Grading, Large Language Models, Academic Integrity, Human-AI Agreement, Computer Ethics, Education

Abstract: The growing adoption of large language models (LLMs) in educational contexts raises important questions about their reliability as grading assistants, particularly for open-ended, ethics-focused writing. This paper presents an empirical study examining the agreement between human graders and an LLM in evaluating student essays submitted in a Computer Ethics course at the undergraduate level. Students submitted essays of 900 - 1100 words addressing ethical challenges of a global technology topic, categorized into three groups based on their declared writing method: traditional writing without LLM assistance (NoLLM), full reliance on LLMs (OnlyLLM), and a hybrid approach (Hybrid). Essays were graded by two human instructors using a structured rubric assessing introduction (0 - 10 points), ethical development and argumentation (0 - 35 points), and conclusion with critical perspective (0 - 25 points), with additional penalty factors for academic dishonesty and length non-compliance. The same rubric was provided to the LLM, which was also asked to rank essays within each collection prior to scoring. Results reveal a nuanced pattern of agreement and divergence. While the LLM tended to award higher scores than human graders in many cases, exceptions existed in both directions, and the degree of disagreement varied considerably across essay collections. The largest divergences occurred on essays characterized by high linguistic polish but weak authentic intellectual ownership, features typical of AI-assisted writing. Conversely, the strongest agreement was observed on essays exhibiting visible student authorship, even when structurally imperfect. These findings suggest that LLMs function primarily as text-quality evaluators rather than authenticity-sensitive assessors. In the era of generative AI, inter-rater disagreement in essay assessment is increasingly driven by differing interpretations of intellectual ownership rather than subjective aesthetic judgment. Our results have direct implications for the design of AI-assisted grading workflows and academic integrity policies in higher education.

The Illusion of Prompting: A Discourse Analysis of Voice and Agency in Student–AI Dialogue

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Keywords: Student-AI Interaction, Discourse Analysis, Epistemic Agency, Dialogic Inquiry, Higher Education

Abstract: The integration of generative AI into higher education has been accompanied by persistent concerns around cognitive offloading followed by a pedagogical turn toward prompt engineering as a compensatory skill (Sun et al., 2024). This response rests on a largely unexamined premise that the quality of student–AI engagement is primarily determined by how interaction is initiated. We challenge this assumption and argue that the interaction with AI cannot be simply reduced to a single prompt–response exchange, but it constitutes a 'discursive process' in which meaning is negotiated across turns. Each contribution conditions what follows such that the dialogue rather than the prompt emerges as the appropriate unit of analysis. Most existing research treats prompts or isolated turns as the unit of analysis, reducing dialogue to discrete inputs rather than unfolding discourse (Hou, 2025). Sociocultural discourse analysis offers a stronger lens. Mercer (2004) distinguishes disputational, cumulative, and exploratory talk, arguing that only exploratory talk, where participants challenge, justify, and build on each other's reasoning produces genuine 'interthinking', while Wells (1999) shows that inquiry is constituted dialogically rather than transmitted. What remains unexamined is whether human AI exchanges can sustain exploratory talk at all, or whether their structure, in which one party only ever responds, forecloses it by design. We argue this shift from 'passive reception' to 'critical interrogation' is epistemic rather than technical, depending on whether students position themselves as recipients, evaluators, or co constructors, a positioning existing framework can detect but have not yet been applied to trace. This study was conducted at a private university in Karachi, Pakistan, with graduate students (n = 25) enrolled in MPhil Education program. As part of a structured assignment in the Pedagogy and Assessment course, students were asked to complete a task using ChatGPT and to submit their complete conversation transcripts for analysis. Each transcript was treated as a discourse unit and analyzed using IRF (Initiation–Response–Feedback) cycle analysis (Sinclair & Coulthard, 1975) to map structural sequencing, alongside sociocultural discourse analysis (Mercer, 2004) and dialogic inquiry theory (Wells, 1999) to assess the epistemic character of student moves. Analysis of the transcripts revealed four recurring discourse stances, which we propose as a typology of epistemic positioning in student–AI dialogue: Extraction, Verification, Negotiation, and Co construction. Extraction, the dominant stance, consisted of single-turn, directive exchanges in which students accepted ChatGPT's response without question or follow up, thereby closing the IRF cycle before an evaluative move could occur. Verification involved students using ChatGPT to confirm a partially

formed idea, while Negotiation appeared when students challenged, corrected, or redirected the output. Co-construction, the rarest stance, occurred when students used ChatGPT as a sounding board to test and refine their own thinking. Negotiation and Co construction appeared mainly in transcripts where students showed stronger disciplinary knowledge, confidence, and ownership of an idea. This suggests that critical engagement with AI is not merely a technical skill, but is tied to students' epistemic agency and the resources they bring to the exchange. The reflective session reinforced this finding, as many students expressed surprise at the passivity of their own interactions once their transcripts were made visible to them. The study concludes that meaningful student–AI engagement depends less on prompt quality and more on students' epistemic agency: their capacity to question, redirect, and take responsibility for knowledge making. Most students used ChatGPT for extraction or confirmation, while negotiation and co-construction were rare. These stronger exchanges appeared when students had enough disciplinary knowledge, confidence, and ownership of an idea to challenge AI rather than receive it. The findings call for AI literacy approaches that move beyond prompt engineering toward dialogic practices that strengthen student agency.

Culturally Embedded Adoption of Immersive Digital Interfaces: Augmented Reality, Autonomy, and AI-Ready Learning Across Countries

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Keywords: Augmented Reality, Technology Adoption, Cross-Cultural Differences, Online Shopping

Abstract: Artificial intelligence and immersive digital technologies are increasingly reshaping higher education, professional training, and the ways in which learners prepare for participation in global digital economies. As universities and educational institutions integrate AI-supported and immersive tools into teaching, learning, and skills development, it becomes increasingly important to understand how users from different cultural contexts perceive, accept, and interact with such technologies. Cross-country differences in attitudes toward innovation, uncertainty, autonomy, and long-term benefits may influence whether emerging digital interfaces are experienced as supportive learning tools, risk-reducing mechanisms, or sources of additional complexity. This issue is particularly relevant in a global economy increasingly mediated by digital feedback, platforms, and AI-enabled marketplace technologies (Archibugi & Tosoni, 2025; Kumar et al., 2025). Augmented reality (AR) represents a particularly relevant immersive digital interface in this context. By enabling real-time visualization, interactive inspection, and experiential engagement with digital objects, AR can support learning-by-doing, simulation-based training, and decision-making in technology-mediated environments (Dogra et al., 2023). Although AR is widely applied in online retail and international e-commerce, its broader relevance extends to higher education and professional preparation, especially in business, management, marketing, and digital skills education. In these settings, AR can help learners understand consumer decision-making, digital transformation, and the role of technology in reducing information asymmetry and perceived risk, which has been emphasized in studies on AR shopping behavior, virtual try-on technologies, and spatial fit uncertainty in online retailing (Palacios et al., 2024; Pfaff & Spann, 2025). However, the effectiveness of AR and related AI-enabled digital interfaces cannot be assumed to be universal. Cultural values shape how individuals interpret uncertainty, innovation, autonomy, social expectations, and future-oriented benefits. These values may therefore influence not only technology adoption in consumer markets, but also the acceptance of immersive and intelligent tools in educational and professional learning environments. While existing AR research has focused mainly on psychological and experiential mechanisms (Hoffmann & Mai, 2022), cultural economics and cross-cultural technology acceptance remain insufficiently integrated into discussions on AI-empowered education and digital readiness. The objective of this study is to identify how cultural values influence consumers' behavioral intentions (BI) to use AR in online shopping and to assess the

implications of these differences for cross-cultural technology adoption. Drawing on Hofstede's cultural dimensions and established technology acceptance models, including TAM, UTAUT, and TPB-based approaches to behavioral intention and technology use (Venkatesh et al., 2012; Jung et al., 2018; Ngo et al., 2025), AR is conceptualized as an immersive digital interface embedded in global digital environments and as a relevant case for understanding how culturally diverse users engage with emerging technologies. The study makes three contributions. First, it provides a cross-country comparison of technology acceptance across Poland, the United States, and South Korea, three economies that differ in cultural profiles and responses to uncertainty. Second, it links cultural values with behavioral intentions toward an immersive digital interface, offering insights into how human-technology interaction is shaped by cultural heterogeneity. Third, it extends understanding of immersive digital technology adoption by showing that the successful integration of advanced digital tools depends not only on technological capabilities, but also on culturally conditioned perceptions of autonomy, risk, trust, and usefulness. Although the empirical context is online shopping, the findings are relevant for higher education and professional training because digital business education increasingly relies on experiential, simulation-based, and AI-supported tools. Understanding how culturally diverse users respond to AR can inform the design of inclusive, cross-cultural, and learner-sensitive educational technologies, particularly given prior evidence that AR adoption and purchase intention are shaped by both experiential and cross-cultural factors (Jung et al., 2018; Dogra et al., 2023; Ngo et al., 2025). The empirical analysis is based on a cross-national CAWI survey combined with an experimental AR stimulus. Data were collected between January and April 2025 from young consumers aged 18–30 in Poland (n = 201), the United States (n = 214), and South Korea (n = 253), representing digitally skilled participants in international e-commerce and a population highly relevant for higher education and early professional preparation. The cross-country design follows the logic of comparative research on cultural differences in technology adoption and AR use (Jung et al., 2018). Respondents interacted with an AR eyewear try-on application embedded in an online retail environment. Eyewear was selected because of its relevance to international trade and its high perceived risk in online transactions. This product category is also appropriate for studying virtual try-on and spatial fit uncertainty, which are central issues in AR-supported online retailing (Palacios et al., 2024; Pfaff & Spann, 2025). After the AR interaction, participants completed a questionnaire measuring individual-level cultural orientations and behavioral intention to use AR. Cultural values were measured using validated individual-level scales based on CVSCALE (Yoo et al., 2011) and the indulgence scale developed by Heydari et al. (2021). Behavioral intention was measured using indicators adapted from Venkatesh et al. (2012), Jung et al. (2018), and Ngo et al. (2025). The proposed model was estimated using Partial Least Squares Structural Equation Modeling (PLS-SEM), appropriate for exploratory cross-country analysis (Hair et al., 2011). The results reveal substantial cross-country heterogeneity in the cultural determinants of AR adoption intentions. Individualism positively affects AR intention in the United States and Poland, indicating that in more individualistic contexts, AR supports autonomous decision-making and self-directed interaction with digital environments. In South Korea, individualism does not significantly affect AR intention, suggesting that adoption in collectivist contexts may be more strongly shaped by social coordination mechanisms (Srite, 2006). Uncertainty avoidance shows divergent effects. In Poland, higher uncertainty avoidance is associated with a

lower intention to use AR, reflecting risk-averse responses to technological innovation. In contrast, in South Korea and the United States, uncertainty avoidance positively affects AR intention, indicating that AR is perceived as a tool that reduces informational uncertainty and stabilizes expectations in online transactions. Long-term orientation is a robust predictor of AR intention in South Korea and Poland, whereas no significant effect is observed in the United States. Power distance does not significantly influence AR intention across countries, and masculinity and indulgence exhibit only limited, context-specific effects. Overall, the model explains between 10% and 27% of the variance in behavioral intention. These findings have implications for AI-empowered education and the design of culturally responsive digital learning environments. They suggest that immersive and intelligent technologies should not be implemented as culturally neutral tools. In individualistic settings, such technologies may be valued for supporting autonomy and independent decision-making. In high-uncertainty or long-term-oriented contexts, their value may depend more strongly on their ability to build trust, reduce ambiguity, and demonstrate future benefits. This insight is important for educators, instructional designers, and institutions seeking to integrate AI-related and immersive technologies into internationally diverse learning environments. The findings demonstrate that AR adoption depends not only on technological capabilities but also on culturally conditioned economic and behavioral patterns. AR enhances perceived efficiency and autonomy in individualistic contexts, whereas in high-uncertainty and long-term-oriented contexts, it primarily functions as a trust-building and risk-mitigating mechanism. The study shows that immersive digital technologies are not universally accepted in the same way across countries, but are culturally embedded interfaces whose perceived value varies across contexts. By integrating cultural dimensions into models of technology adoption, this research advances understanding of how cultural heterogeneity shapes human interaction with emerging digital technologies. The study provides interdisciplinary and cross-cultural insights into the conditions under which immersive and AI-related digital tools can be meaningfully adopted in higher education, professional preparation, and globally connected digital environments.

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Artificial Intelligence Dependence and Critical Thinking Among University Students: The Mediating Role of Academic Procrastination

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Keywords: Artificial Intelligence Dependence, Academic Procrastination, Critical Thinking, Mediation, University Students

Abstract: Artificial intelligence (AI) dependence raises questions about its effect on critical thinking among university students, but the behavioral mechanisms that may explain this relationship have received limited empirical attention. The aim of this study was to examine whether academic procrastination mediates the relationship between AI dependence and critical thinking, controlling for age, sex, and academic year through a MIMIC-SEM model (Multiple Indicators, Multiple Causes). Participants were 806 Dominican university students (81.6% women; age M = 28.17, SD = 8.55), who completed the Artificial Intelligence Dependence Scale (Morales-García et al., 2024), the Academic Procrastination Scale (Álvarez, 2010), and the Critical Thinking Assessment Scale (Rodríguez-Rojas et al., 2024). The model was estimated using the MLR estimator in lavaan (Rosseel, 2012), and the indirect effect was evaluated through bootstrapping (5000 samples, 95% BCa CI). The final model showed adequate fit (robust CFI = 0.928, robust TLI = 0.922, robust RMSEA = 0.045, SRMR = 0.043). AI dependence positively predicted academic procrastination ($\beta = 0.255$, $p < 0.001$), and academic procrastination negatively predicted critical thinking ($\beta = -0.098$, $p = 0.022$). The indirect effect was significant ($\beta = -0.025$, 95% CI [-0.054, -0.004], $p = 0.044$), consistent with a full mediation pattern. Age was negatively associated with AI dependence and procrastination, whereas male sex and academic year were positively associated with procrastination. These findings suggest that academic procrastination constitutes a concrete behavioral pathway through which AI dependence may affect critical thinking, opening an intervention line focused on academic self-regulation.

Comparing AI Interaction Logs and Classroom Analytics for Detecting Conceptual Difficulties in Statistics

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Keywords: AI Interaction Logs, Learning Analytics, Statistics Education, Misconceptions

Abstract: Generative AI is increasingly embedded in statistics education, yet its potential as a source of learning analytics remains underexplored. While existing research typically examines either classroom response systems or AI-supported learning in isolation, this study investigates whether AI interaction logs can serve as a complementary data source for identifying student misconceptions in statistics. This work compares two independent datasets collected within a second-year undergraduate statistics course at a university in the Netherlands: (1) AI interaction logs from a restricted, curriculum-bounded AI platform used during think–pair–share tutorial activities, and (2) Wooclap response data collected during the same instructional sessions. The AI dataset comprises approximately 935 student prompts, including multi-turn interactions, while the Wooclap dataset captures correctness rates and response distributions across conceptual and procedural statistical questions. Both datasets are coded using a shared topic framework covering key statistical concepts such as p-values, Type I/II errors, confidence intervals, and sample size determination. The study addresses three research questions: which statistical topics generate the most AI interactions, which topics exhibit the highest rates of incorrect Wooclap responses, and to what extent patterns across both datasets align in identifying conceptual difficulties. At the time of submission, analysis is ongoing and results are not yet fully consolidated. Initial work focuses on establishing a consistent topic-level coding scheme and aligning interaction patterns across both data sources. The intended contribution is a methodological comparison of AI trace data and classroom analytics, with the goal of evaluating whether AI logs can function as a viable and scalable indicator of conceptual difficulties in statistics education.

Algorithmic Bias and Sentencing Justice in India: Ethical and Constitutional Challenges of Artificial Intelligence in Criminal Courts

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Keywords: Artificial Intelligence, Sentencing Justice, Algorithmic Bias, Criminal Courts, Constitutionalism, Human Rights, Judicial Discretion, Criminal Justice, AI Governance

Abstract: The rapid integration of Artificial Intelligence (AI) into criminal justice systems has generated significant debate regarding its potential to enhance judicial efficiency, consistency, and evidence-based decision-making. Across several jurisdictions, algorithmic tools are increasingly employed for risk assessment, sentencing recommendations, recidivism prediction, and case management. While India is actively embracing digital transformation through initiatives such as e-Courts, AI-assisted legal research platforms, and emerging judicial technologies, the prospect of algorithmic decision-support systems in sentencing raises profound ethical, constitutional, and human rights concerns. This paper critically examines the phenomenon of algorithmic bias and its implications for sentencing justice within the Indian criminal justice system. Drawing upon interdisciplinary perspectives from criminal law, constitutional law, legal philosophy, criminology, and AI governance, the study investigates how algorithmic systems may reproduce and amplify existing social inequalities embedded within historical datasets. Particular attention is devoted to the risks of discrimination based on socio-economic status, caste, gender, religion, geography, and other vulnerable identities that remain deeply intertwined with patterns of criminalisation and law enforcement in India. The paper argues that the deployment of opaque algorithmic tools in sentencing may undermine foundational constitutional principles, including equality before law, due process, judicial independence, proportionality, reasoned decision-making, and the right to a fair trial guaranteed under the Constitution of India. Furthermore, it explores the tension between technological efficiency and the inherently human dimensions of sentencing, where considerations of rehabilitation, individual circumstances, moral culpability, and social justice remain central to judicial discretion. This paper examines the ethical and constitutional challenges posed by the use of Artificial Intelligence in sentencing decisions within the Indian criminal justice system. It seeks to develop a framework for AI-assisted sentencing based on transparency, accountability, explainability, and meaningful judicial oversight. The study argues that AI should enhance, not replace, judicial discretion while safeguarding constitutional rights, fairness, and public trust in justice delivery.

AI Literacy as a Legal Education Imperative: Building Ethical and Regulatory Competence for Future Lawyers in India

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Keywords: AI Literacy, Legal Education, AI Ethics, AI Governance, AI in Indian Law Schools

Abstract: Artificial intelligence is rapidly changing the legal research, dispute resolution, governance, compliance, evidence analysis and public decision-making. However, Indian legal education remains largely centred on doctrinal learning, case-law analysis and traditional professional skills. This creates a preparedness gap between the emerging realities of AI-enabled legal practice and the competencies currently developed in law schools. Future lawyers will not only use AI tools, but will also be expected to evaluate algorithmic decisions, advise on data protection, address automated discrimination and ensure accountability in technology-mediated governance. This paper tends to examine AI literacy as an essential part of legal education in India where it aims to develop a policy-oriented framework for integrating ethical, regulatory and practical AI competence into legal education so that future lawyers can engage responsibly with AI-enabled legal and institutional systems. The study will use a doctrinal and policy-analysis methodology. It will examine legal education system in India through the lens of AI governance, professional ethics, data protection, algorithmic accountability and rights-based regulation. The paper also draws comparative insights from international policy discussions on responsible AI in education and professional training. The paper argues that AI literacy in legal education should move beyond basic technological awareness. It should include understanding of AI-assisted legal research, digital evidence, privacy and data protection, algorithmic bias, explainability, professional responsibility, access to justice and human oversight. A structured AI-literacy framework can strengthen legal education, improve institutional preparedness and promote responsible AI adoption in teaching and holistic development.

Beyond the Crutch: Designing Gurukul AI Tutor with Contingent Scaffold Fading Technique

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Keywords: Upanishadic Pedagogy, Scaffold Fading, Generative AI in Education

Abstract: The tools that help with generating ideas and answers are really useful for students when they are doing their school work. They often give them the answers right away. This can be a problem because it is like having a crutch that students lean on much. It can affect how well they develop the skills they need to think for themselves and really understand the ideas they are learning. Modern pedagogy is looking at ideas from ancient Indian methodologies. They are interested, in the way of teaching, which is based on students learning by experimenting things and really exploring the ideas for themselves. This way of teaching also helps students understand better and learn deeply. This approach respects multiple ways of knowing — observation (pratyakṣa), inference (anumāna), testimony (śabda), and reasoning (yukti). By combining these, students arrive at knowledge that is not only intellectual but also experiential and self-evident. The three stages of acquiring knowledge are - Śravana (intake of knowledge), Manana (deep reflection), and Nididhyasana (practical realization and application). Present day intelligent tutoring systems use dialogic scaffolding and they usually face two major problems: the frustration threshold, where the student gets frustrated and disengaged due to persistent questioning without resolution, and the lack of scaffold fading ,Scaffolding and fading are instructional strategies where we provide temporary support (scaffolding) to learners as they acquire new knowledge or skills, and then gradually remove that support (fading) as they become more proficient. The proposed framework called Gurukul-AI, imitates the guru-śhiṣya relationship. Instead of giving direct solutions, it guides the students through the three Upanishadic stages. The proposed system calibrates cognitive load continuously to avoid disengagement at the frustration threshold, while dynamically reducing support (scaffold fading) to enable true mastery. The fading scaffolding id usually most ignored feature although the most important one, proposed framework is based on contingent scaffolding fading technique that gradually reduces guidance as the student approaches Nididhyasana. It does not lead the students to direct solutions, but through the three Upanishadic stages it guides students to derive the solutions. The proposed system is developed using generative AI which continuously evaluates the cognitive load to avoid disengagement at the frustration threshold, and dynamically reduces support (scaffold fading) to enable true proficiency. The system works on contingent scaffold fading technique, whereby the guidance gradually decreases as the student gets closer to Nididhyasana. The proposed system is based on the ancient wisdom of Upanishadic pedagogy and provides a well-rounded, student-centric learning experience. It promotes cognitive thinking skills, not suppressing them. It alleviates the frustrations often associated with traditional inquiry-based methods and

protects against over dependency on AI, promoting knowledge retention and self-regulation.

TPACK and Human-AI Collaboration Perspectives on the Current State and Optimization Pathways of AIGC-Assisted Business English Negotiation Instruction: A Mixed-Methods Empirical Study

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Keywords: AIGC, Negotiation Instruction, TPACK, Human-AI Collaboration, Mixed-Methods Research

Abstract: Generative artificial intelligence content (AIGC) has brought powerful new tools to foreign language education. However, its use in complex, high-stakes activities, such as business English negotiations, remains insufficiently explored. Grounded in TPACK theory and human–AI collaboration frameworks, this mixed-methods study investigated 198 business English majors and 82 instructors through questionnaires and multiple case analyses. The findings indicate relatively frequent AIGC use, with more than 60.1% of students reporting using these tools over three times per week. Nevertheless, usage patterns remain considerably uneven, with 84.8% of students employing AIGC for terminology translation and language polishing, compared with only 27.8% using it for simulated negotiations. Senior students demonstrated significantly greater dependence on AI than their junior counterparts ($p < 0.001$), without corresponding improvements in critical thinking. Among instructors, difficulties in assessment emerged as the most prominent barrier, reported by 89.0% of respondents. Open-ended responses highlighted the need for prompt engineering training, academic integrity guidelines, and shared resources across institutions. Drawing on the TPACK framework, the study proposes a three-level optimization strategy emphasizing the development of students' prompt engineering competencies, the redesign of human–AI collaborative tasks, and the adoption of transparent, process-oriented assessment methods. These findings provide empirical evidence and practical recommendations for the professional development of foreign language educators and the design of business English curricula in the AI era.

Algorithmic Literacy in the Judiciary: Mapping AI Training Gaps and Institutional Models in Brazilian Courts

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Keywords: Algorithmic Literacy, Judicial AI Governance, ENFAM, Brazilian Judiciary, AI Training Framework

Abstract: Brazilian courts have progressively integrated artificial intelligence tools into their workflows — from the Supreme Court's VICTOR system for case triage to the Superior Electoral Court's SÓCRATES for electoral data analysis. Despite this accelerated technological adoption, the human dimension of AI governance within the judiciary remains critically underdeveloped. Judges and court staff are expected to supervise, validate, and ultimately be accountable for AI-assisted decisions without systematic preparation for that role. The National School for the Training and Improvement of Magistrates (ENFAM) offers isolated training initiatives, but no unified algorithmic literacy framework exists at the federal judicial level. This gap represents not merely a professional development deficit, but a structural risk to judicial legitimacy and due process guarantees in an AI-mediated justice system. This paper examines the current state of AI literacy initiatives within the Brazilian judiciary, identifies systemic gaps in the institutional training landscape, and proposes a structured framework for algorithmic literacy applicable to magistrates and court personnel. Drawing on the contrast between fragmented national efforts and the structured model developed by the Court of Justice of the Federal District and Territories (TJDFT) — whose Digital Transformation Program and Generative AI Literacy Workshops represent a notable institutional benchmark — the paper argues for the adoption of a systemic, competency-based approach to judicial AI education aligned with CNJ guidelines and UNESCO's AI Competency Framework for public sector professionals. The research employs qualitative documental analysis of institutional programs, CNJ resolutions, ENFAM course offerings, and the TJDFT's Digital Transformation initiatives. It is further grounded in participant institutional observation derived from the author's engagement as a judicial analyst at the São Paulo Regional Electoral Court (TRE-SP) and as a participant in ENFAM training courses on structural litigation, disability rights adjudication, and trainer formation. Comparative analysis is conducted between the TJDFT model and the broader federal judiciary training landscape. The analysis reveals a pronounced asymmetry in AI literacy preparedness across Brazilian courts. While isolated tribunals — notably the TJDFT — have developed structured, continuous programs integrating generative AI tools into judicial workflows, the majority of courts, including electoral tribunals, rely on ad hoc, voluntary, and non-cumulative training. ENFAM's offerings, though valuable, lack sequential curriculum design, competency mapping, and assessment mechanisms. Judges and staff operating AI-assisted systems frequently lack foundational understanding of model limitations, algorithmic bias, explainability requirements, and human oversight obligations — precisely the competencies demanded by CNJ Resolution 332/2020

and the emerging Brazilian AI regulatory framework (PL 4/2025). The paper proposes a three-tier Judicial Algorithmic Literacy Framework (JALF) comprising: (i) foundational AI literacy for all court personnel; (ii) intermediate competency training for staff operating AI tools in case management; and (iii) advanced oversight training for magistrates responsible for AI-assisted decisions. The framework draws on UNESCO's AI Competency Framework, the TJDFT institutional model, and international benchmarks from jurisdictions with structured judicial AI education programs. Adoption of JALF through ENFAM and CNJ would constitute a meaningful institutional response to the accountability gap generated by accelerated AI deployment in Brazilian courts, with replicable implications for judiciaries across Latin America.

A Paradigm-Based Framework for Evaluating AI in Education

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Keywords: Qi-Based Paradigm, Internal Qi, Complete Health, Educational Ontology, Cognitive Capacity

Abstract: AI is being adopted in education faster than frameworks developed to evaluate it. The dominant Matter-Based Paradigm (MBP) treats learning as information transfer, measuring success through grades and test scores — but cannot assess whether AI improves genuine cognitive capacity or merely its measurable appearance. Philosophical and ontological frameworks for evaluating AI's structural role in education remain underdeveloped. The Qi-Based Paradigm (QBP) has previously been applied in medicine and has not yet been extended to education. This conceptual framework paper extends QBP to education for the first time through cross-domain structural mapping, producing a simplified MBP–QBP educational comparison and three empirically testable propositions. The framework proposes a two-step causal model in which the student's Internal Qi — their integrated capacity for reasoning, synthesis, and metacognitive activities — is the efficient cause of learning, while teaching is only the indirect cause. Those specific applications of AI tools that provide answers directly may bypass this capacity entirely, producing performance gains while leaving the mediating capacity unexercised — a risk invisible to standard assessment. However, the proposed framework can provide insight into the selection criteria for specific, well-designed AI applications that can elevate the learning process, precisely by complementing the teacher in the classroom and heightening the student's development of their Internal Qi. This paper offers a first conceptual step toward a QBP-based educational framework. Complete Health — including cognitive sovereignty — is proposed as a more meaningful success metric than grades alone, with three testable propositions identified for empirical follow-up.

Future-Proofing Assessment: Evaluating Institutional Readiness for Emerging Technologies in UK Higher Education

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Keywords: Emerging Technologies, Assessment, UK Higher Education

Abstract: The rapid advancement of emerging technologies, including artificial intelligence (AI), machine learning, learning analytics, and automated assessment systems, is transforming assessment and marking practices in higher education. In the UK context, these developments present both opportunities for increased efficiency and innovation and challenges related to academic integrity, equity, and governance. This study, Future-Proofing Assessment: Evaluating Institutional Readiness for Emerging Technologies in UK Higher Education, investigates the extent to which higher education institutions are prepared to adopt and integrate these technologies into assessment and marking systems. The research adopts a quantitative design, utilising a large-scale survey distributed across UK higher education institutions. The survey instrument is developed based on existing digital maturity and organisational readiness frameworks and is structured around five key dimensions: technological infrastructure, staff capability, policy and governance, organisational culture, and strategic leadership. Respondents include academic staff, professional services, and institutional leaders, enabling a cross-sectional analysis of perceptions of readiness across roles. Data are analysed using descriptive statistics, exploratory factor analysis, and regression modelling to identify patterns, relationships, and key predictors of institutional readiness. Ultimately, the study argues that future-proofing assessment in UK higher education depends on a coordinated, data-informed approach that integrates infrastructure, capability, and governance. By addressing identified gaps, institutions can better position themselves to leverage emerging technologies to enhance assessment quality, uphold academic standards, and ensure resilience in an increasingly digital educational landscape.

From Practice to Pedagogy: How Artificial Intelligence Is Reshaping Accounting, Auditing and Accounting Education in Developing Countries

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Keywords: Artificial Intelligence, Accounting Profession, Professional Competencies, Accounting Education, Curriculum Reform, Small Island Developing States (SIDS)

Abstract: Artificial intelligence (AI) is fundamentally transforming the accounting profession, altering how accounting information is generated, analysed, audited and communicated. Advances in machine learning, natural language processing, robotic process automation, predictive analytics and generative AI have accelerated the digital transformation of core accounting functions, challenging traditional conceptions of professional work. Unlike prior technological shifts - such as the adoption of enterprise resource planning systems, computer-assisted audit techniques and business analytics - AI represents a more profound disruption by its capacity to replicate cognitive tasks previously reserved for trained professionals. The profession is consequently transitioning from routine transaction processing toward higher-value activities demanding greater judgment, risk assessment, strategic analysis and advisory expertise. These developments carry significant implications for both internal and external auditing and critically, for the preparation of future accounting professionals. Alongside its impact on practice, AI holds considerable transformative potential for accounting education - enhancing student engagement, deepening learning, improving teaching efficiency and aligning curricula with evolving industry demands. However, integration remains complex, given persistent challenges relating to faculty preparedness, curriculum redesign, institutional resistance and ethical considerations. Despite the rapid expansion of AI-related accounting research, the existing literature remains heavily concentrated in developed economies. Comparatively few studies have examined AI adoption within developing countries and fewer still have focused specifically on Small Island Developing States (SIDS). While scholars have warned of unequal technological readiness across regions and called for educational reforms to equip professionals for AI-enabled environments, this gap persists. Popel (2026) identifies five systemic barriers confronting developing countries: data infrastructure, technological readiness, human resources, organisational capacity and regulation. The disparity between the pace of professional transformation and the responsiveness of accounting curricula in these contexts remains underexplored, representing a meaningful gap in the literature. This study addresses the research question: To what extent are undergraduate accounting programmes preparing students for the AI-enabled competencies emerging within professional accounting, internal auditing and external auditing in Barbados? A mixed methods approach is employed. The study first examines how AI is currently transforming the roles and responsibilities of professional accountants and auditors in the English-speaking Caribbean, identifying the new competencies emerging across these professional domains. It then assesses the extent to which existing undergraduate accounting curricula address

these competencies and evaluates student preparedness for the changed professional environment. Data will be collected through two surveys - one distributed to professional accountants via the local accounting institute and a second targeting undergraduate and graduate accounting students. An analysis of existing course curricula will also be conducted, producing a knowledge deficit matrix that maps gaps between current programme content and emerging professional requirements. The findings will be interpreted through three theoretical lenses. Role Theory (Biddle, 1986) and Abbott's System of Professions (1988) will illuminate the jurisdictional disturbance wrought by AI on accountants' and auditors' roles and will connect this disruption to the process of professional socialisation through education. DiMaggio and Powell's Institutional Theory (1983) will be applied to examine why tertiary institutions may embrace curriculum reform – or alternatively, exhibit inertia in doing so. This study contributes to the emerging literature on AI and accounting education by providing context-specific evidence from a SIDS perspective, a setting largely absent from existing scholarship. By connecting professional transformation to curriculum responsiveness and student preparedness, it advances understanding of how accounting education in developing economies can be restructured to meet the demands of an AI-enabled profession.

Teaching Faculty to Think Like Product Managers: Teach Students About When to Use AI, When Not To, and How to Evaluate It

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Keywords: AI Decision-Making, Faculty Training, Institutional AI Strategy, Critical Thinking, When to Use AI, Framework-Based Adoption

Abstract: Most educators encounter a common challenge: being asked to adopt, evaluate, or develop AI tools without a systematic framework for assessment. As a result, many replicate the approaches of peer institutions, rely on vendor presentations, or delegate decisions to IT departments without a structured evaluation process. Students encounter a similar issue: they frequently use AI but lack a framework to determine its appropriate application. Without the ability to critically assess questions such as whether AI addresses a specific problem, what trade-offs are involved, or what potential risks exist, students may either accept AI outputs uncritically or disregard them altogether. With twelve years of experience developing AI products at Amazon, Nike, Disney, and T-Mobile, I have learned that effective decision-making relies on a structured framework rather than intuition. The same framework that guides decisions about AI adoption also enables both educators and students to evaluate and implement AI responsibly.

This approach is encapsulated in the IMPACT framework: Intent, Mental Model, Plumbing, Accuracy and Safety, Cost and Constraints, and Tracking.

In this session, participants will learn how to apply the IMPACT framework to:

- Know when to use AI and when not to: Stop defaulting to adoption; make intentional choices
- Evaluate options systematically: Teach your students to grade what AI produces and when it actually fits the problem
- Make transparent trade-offs: Speed vs. accuracy, cost vs. capability, convenience vs. understanding -and be clear about why you're choosing
- Build institutional alignment: Give your teams a shared language for AI decisions across departments
- Adopt with intention: Not because everyone else is doing it, or because a vendor said you should

The framework has been incorporated into teaching activities within the University of Washington MBA program, where students apply it to real-world product decisions. It has also been introduced to faculty and instructional leaders through Bluenox.ai consulting and university partnerships, supporting its application to institutional decision-making and instructional practices. These applications emphasize the development of critical judgment in determining whether, when, and how to adopt technological tools, rather than focusing solely on technical proficiency. The

framework is designed to be teachable, repeatable, and applicable across educational and organizational contexts.

Exploring the Adoption and Use of Innovative AI Technology for Sexual and Reproductive Health Education Among Pastoralist Adolescents in Uganda

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Keywords: Access, Adolescents, AI Technologies, Explore, Pastoral, Sexual and Reproductive Health Education

Abstract: Adolescents, especially those in pastoral contexts, experience numerous challenges in obtaining accurate Sexual and Reproductive Health (SRH) education and services. SRH education among adolescents is key to achieving positive behavioural and health outcomes. Leveraging the potential of innovative AI technology as a complementary mode to bridging the gap is key for adolescents to access SRH education and services. They serve as a means of promoting health and well-being among adolescents, particularly those in low-resource settings. However, pastoral adolescents often live in very traditional settings, which can hinder their adoption and use of AI technologies for SRH education, ultimately limiting their health improvements. Empirical evidence remains scarce on how pastoral adolescents in low-resource settings adopt, use, and contextualize the localization of AI-enabled SRH education. This article aims to explore factors that influence the adoption and use of AI technology in promoting SRH education among adolescents in pastoral contexts in the Karamoja sub-region of Uganda. The research was conducted among secondary school adolescents in Moroto and Napak districts in the Karamoja sub-region. Using a qualitative approach, data were collected through interviews and focus group discussions with the participants. The authors made audio recordings and took field notes. The findings showed that the low adoption and use of AI technology were due to diverse factors, including socio-cultural norms, beliefs, values, and stigma; the lack of availability of gadgets such as smartphones; user problems; and a lack of quality information for adolescents. Promoting the adoption and use of AI technologies for education among adolescents can create awareness for enhanced SRH.

Innovating Academic Publishing: Transformations in Research Dissemination and Impact

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Keywords: Academic Publishing, Digital Transformation, Open Access, Research Dissemination, Scholarly Impact

Abstract: Publishing research today is slow and hard. Traditional journals take many months for peer review and students cannot afford paid articles. New innovations like open access, preprints and online journals are changing how research spreads. This paper examines innovations in academic publishing, how they help researchers share work faster and what young researchers should do to publish effectively. Articles and reviews from 2020-2025 about open access, preprints and altmetrics and digital platforms were searched using PubMed and Google scholar. Pharmacy and science journals use of these methods was also reviewed. Preprints enable sharing work in days instead of months. Open access articles receive more citations and global readership. Altmetrics measure social media impact beyond citations. Science journals are adopting these tools but many still use old systems. Publishing innovations make research faster, accessible and influential. Students should publish in open access, share preprints and use academic social media. Universities should train students in digital publishing tools.

Attitude of Hungarian University Students Towards AI Usage in Higher Education

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Keywords: Artificial Intelligence, Higher Education, AI-Supported Learning, AI Integration, Student Attitude

Abstract: The emergence of Artificial Intelligence (AI), particularly Generative Artificial Intelligence (GenAI), has significantly reshaped higher education across the globe. Tools such as ChatGPT are increasingly being incorporated into students' academic practices, including information searching, academic writing, content summarization, problem-solving, and personalized learning assistance. Recent research indicates that AI technologies can improve learning efficiency and strengthen student engagement, while also introducing concerns related to academic integrity, the development of critical thinking skills, and the ethical use of these technologies (Chan & Hu, 2023; Johnston et al., 2024). As universities continue to adapt to technological change, understanding students' perceptions and attitudes toward AI has become an important area of educational research. Although numerous international studies have investigated university students' use of AI and their perceptions of generative AI technologies, empirical evidence from Central and Eastern Europe remains limited. In particular, relatively few studies have examined Hungarian university students' attitudes towards AI. Existing research has primarily focused on the prevalence of AI use rather than exploring students' acceptance, perceived benefits, concerns, and readiness to integrate AI into future academic and professional practice (Rajki et al., 2025). The study employs a quantitative research design using an online questionnaire administered to Hungarian university students (N = 286). The research instrument is developed based on previous international studies investigating AI acceptance and educational technology adoption (Chan & Hu, 2023; Strzelecki, 2024). The survey examines students' attitudes towards AI usage in higher education, with special respect to instructors using these tools in the teaching practices. Descriptive statistics, reliability analysis, and comparative statistical procedures are used to identify patterns and differences among student groups. Preliminary findings indicate that the majority of students are familiar with and actively use AI-powered applications in their academic work. Students generally demonstrate positive attitudes toward AI and perceive it as a useful learning support tool that increases efficiency and facilitates independent learning. However, when it comes to lecturers using AI, more mixed feelings might arise: while many find it modern and engaging approach that their instructors embrace AI technologies as well, others indicate it also gives an impression of laziness. At the same time, participants express concerns regarding the reliability of AI-generated information, potential

inaccuracies, ethical challenges, and the risk of excessive dependence on technology. Teacher education students appear particularly sensitive to issues related to responsible and pedagogically appropriate AI use. The findings are consistent with international research suggesting that students view AI primarily as a learning assistant rather than a substitute for their own intellectual work (Johnston et al., 2024; Balabdaoui et al., 2024). The findings suggest that Hungarian university students generally hold positive attitudes toward AI and recognize its potential to support learning and academic performance. However, concerns regarding academic integrity, information reliability, and ethical use highlight the need for institutional guidelines and AI literacy development. Higher education institutions should focus on promoting responsible AI use while supporting students in developing critical thinking and digital competencies. Future research should explore longitudinal changes in students' attitudes and investigate the impact of AI use on learning outcomes across different academic disciplines.

Pedagogical Cyber-Creativity with Human-Centric Shared Agency: Extending the Creativity Analysis Framework for AI-Mediated Science Teacher Education

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Keywords: Pedagogical Cyber-Creativity, Creativity Analysis Framework, Human-Centric Shared Agency, Designer Arbiter, Science Teacher Education, Human–AI Collaboration

Abstract: Creativity remains insufficiently embedded in science teacher education despite its recognition as a core competency for addressing complex scientific challenges. This study adopts a conceptual research design based on theoretical synthesis to extend an empirically grounded Creativity Analysis Framework (CAF) previously developed by the authors into AI-mediated learning environments. The resulting Pedagogical Cyber-Creativity Framework is developed through a three-stage integration of creativity theory, sociocultural learning perspectives, and human–AI co-creation research. The framework positions AI as a cognitive partner that supports ideation and exploratory inquiry—such as AI-assisted hypothesis generation—while preserving human epistemic authority and evaluative judgment. Central to this model is the concept of human-centric shared agency, which redefines the learner as a "Designer Arbiter" responsible for critically evaluating, validating, and transforming AI-generated outputs. By mapping cognitive, affective, and metacognitive dimensions onto AI-supported classroom practices, the framework distinguishes pedagogical cyber-creativity from autonomous computational creativity. The study concludes that science teacher education must shift its focus from technical execution toward training students to maintain epistemic responsibility in technologically augmented environments. The proposed framework provides a theoretical foundation for curriculum design, teacher preparation, and future empirical research into the indicators of human–AI collaborative creativity in science classrooms.

XAI as a Pedagogical Resource for Social Bias Detection

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Keywords: XAI, Gender Bias, Advertising, Machine Learning, Critical AI Literacy, Higher Education

Abstract: Higher education faces a growing need for pedagogical approaches that help students and educators develop a critical understanding of artificial intelligence (AI) beyond the operational use of AI tools. Gender bias in advertising imagery provides a particularly relevant context for this purpose. Although it has been extensively studied from communication and media perspectives, the computational validation of bias measurement instruments remains limited. Explainable Artificial Intelligence (XAI) offers a way to address both challenges by functioning as a tool for bias analysis and as a methodological framework that can be transferred to other image-based contexts, including textbooks, social media content, and digital advertising. Most existing gender bias indices in advertising are based on expert coding protocols supported by theoretical frameworks. However, it remains unclear whether these indices reflect visual patterns that can be detected automatically from the images themselves or whether they depend primarily on human interpretation. In addition, many XAI workflows require commercial services or advanced computational infrastructures, limiting their accessibility in educational settings. As a result, there is still a need for practical and reproducible approaches that allow researchers and educators to apply explainable AI techniques using freely available tools. This study presents an XAI-based workflow designed to validate the Gender Bias Density Index (IDS), a composite indicator that incorporates biological, demographic, cultural, and socioeconomic dimensions of gender bias in advertising images. A local generative AI model was used to extract ten continuous visual features from each image through a structured prompt. The prompt was designed to maintain consistency between the extracted features and the variables considered during manual coding. The entire process was executed locally, without external APIs or associated costs. The extracted features were subsequently used as input variables for an XGBoost regression model trained to predict IDS values obtained through expert coding. To avoid data leakage, the dataset was divided into independent training and testing subsets (70/30), and model performance was evaluated using R^2 and MAE metrics. The model achieved a high R^2 value, indicating that IDS scores can be predicted from automatically extracted visual features without relying on the manual coding variables used to construct the index. This finding suggests

that the index captures identifiable visual patterns rather than solely reflecting subjective expert judgement. From an educational perspective, the workflow provides a practical way for students to investigate how AI systems identify and quantify social bias in visual content. Because the same methodology can be applied to advertising, textbooks, educational materials, or social media images, it offers a flexible framework for classroom activities focused on critical AI literacy. An additional advantage is that the entire process can be implemented using free local models, making it accessible to institutions with limited resources. The results show that XAI workflows based on local open models can serve both research and educational purposes. Beyond supporting the empirical validation of the Gender Bias Density Index, the proposed approach provides a transferable framework that educators and researchers can adapt to other image-based bias analysis tasks. The combination of explainability, accessibility, and methodological transparency makes this workflow particularly suitable for promoting critical AI literacy in higher education.

Epistemic Fragility in the Digital Age: A Systematic Review of the Cognitive Externalization, Memory and Critical Thinking

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Keywords: Cognitive Externalization, Artificial Intelligence, Memory, Critical Thinking, Epistemic Competence

Abstract: The integration of digital technologies and artificial intelligence (AI) into everyday activities has reshaped how individuals' access, process, and utilize information. While these technologies have expanded opportunities for learning and knowledge construction, they have also raised concerns about the externalization of cognitive processes and its consequences for memory, critical thinking, and epistemic competence. This study presents a systematic literature review of publications from 2016 to 2026, aiming to examine the relationship between cognitive externalization (cognitive offloading), digital technology use, and higher-order cognitive functions. Following the PRISMA methodology, empirical studies and specialized reviews were selected and analyzed across three key dimensions: memory, critical thinking, and epistemic competence. The findings indicate a complex but non-deterministic relationship between technology and cognition. The available evidence suggests that repeated cognitive offloading practices can shape subsequent cognitive strategies, potentially encouraging greater reliance on external resources. Based on these findings, the concept of epistemic fragility is introduced to characterize the emerging tension between increasing access to information and a diminishing capacity to critically evaluate, justify, and transform that information into knowledge. The central challenge of the digital era, therefore, is not necessarily the deterioration of cognitive abilities, but rather the transformation of epistemic agency in environments increasingly shaped by digital technologies and AI.

Recognizing the Strategic Value of AI: Implications for Management Education and Leadership Development

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Keywords: Artificial Intelligence, AI Relevance Awareness, Management Education, Leadership Development, Strategic Decision-Making

Abstract: Artificial intelligence (AI) is increasingly influencing how organizations make decisions, develop strategies, and respond to changing market conditions. As AI becomes embedded within business operations, future managers and leaders are expected to understand not only AI technologies but also their strategic relevance for organizational development and competitiveness. Despite growing interest in AI education and training, organizations continue to experience challenges in translating awareness of AI opportunities into meaningful transformation initiatives. Existing research has primarily focused on AI adoption, technological implementation, and organizational readiness. Comparatively limited attention has been given to the cognitive stage preceding adoption, specifically how managers recognize AI as strategically relevant and how such awareness influences subsequent organizational actions. This gap is particularly important for management education and leadership development, where strategic understanding of AI may represent a critical capability for future decision-makers. This study draws on quantitative survey data collected from Hungarian SME retailers. Statistical analyses, including exploratory factor analysis, reliability assessment, regression analysis, and mediation testing, were employed to examine the relationships among AI Relevance Awareness, AI Readiness, AI Orientation, AI-Driven Solutions, and organizational outcomes associated with omni-channel capability development. The findings indicate that AI Relevance Awareness plays a significant role in shaping organizational readiness and contributes to subsequent stages of AI-enabled transformation. The results further suggest that successful organizational transformation is not driven solely by technological investments but by managers' ability to recognize the strategic value of AI and align organizational resources accordingly. These findings extend current understanding of AI adoption by highlighting the importance of managerial cognition as a precursor to organizational change. For management education and leadership development, the results suggest that preparing future leaders should involve developing strategic AI awareness alongside technical and analytical competencies. The study demonstrates that recognizing the strategic value of AI represents an important foundation for organizational transformation. Management education programs should therefore place greater emphasis on developing AI-related strategic awareness, critical evaluation skills, and decision-making capabilities. Future research may further explore how educational interventions influence AI awareness and readiness across different organizational and industry contexts.

Aliados 360: A Multi-Agent Generative AI Framework for Complex Thinking and Responsible Innovation in Business Education

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Keywords: Generative AI, GPT Agents, Complex Thinking, Business Education, Role-Based Learning, Human-AI Interaction, Responsible Innovation

Abstract: Generative Artificial Intelligence (GenAI) is transforming higher education through new forms of interaction, personalization, and knowledge construction. In business education, however, many applications remain focused on efficiency and content generation rather than on developing higher-order competencies. To address this challenge, Aliados 360 was developed as an educational innovation initiative that uses specialized GPT agents to support learning through role-based simulations. Although previous studies have explored educational chatbots and AI-supported simulations, limited research has examined how multi-agent GenAI environments can strengthen complex thinking and decision-making competencies in business education. Little is known about how human–AI interaction can be designed to promote reflective learning, learner agency, and responsible innovation. This study presents the design and implementation of Aliados 360 within an MBA program at a business school in Peru. The framework incorporates four GPT agents representing key stakeholders: Strategic Partner, Customer, Investor, and Regulator. Students interacted with these agents while developing sustainable business projects. A mixed-method approach combined qualitative analysis of student interactions and reflections with competency-based assessments focused on complex thinking development. Preliminary findings suggest that Aliados 360 contributes to a deeper understanding of human–AI interaction in business education. Rather than using Generative AI solely as a productivity or content-generation tool, the framework positions AI agents as cognitive partners that stimulate reflection, challenge assumptions, and expose students to multiple stakeholder perspectives. Through interactions with agents representing customers, investors, regulators, and strategic partners, students engaged in evidence-based reasoning, contrasted viewpoints, and developed a holistic understanding of entrepreneurial decision-making in complex environments. The study contributes to the emerging field of human–AI collaboration by providing insights into how educational interactions between learners and multiple AI agents can be intentionally designed to strengthen higher-order competencies. The framework extends chatbot-based approaches by positioning AI as a cognitive partner that supports reflection, perspective-taking, and evidence-based decision-making in business education. The findings suggest that the educational value of Generative AI lies not only in the quality of its outputs but also in the design of interactions that promote critical thinking, systems thinking, ethical reasoning, and strategic decision-making. These insights advance current discussions on AI-enhanced learning by demonstrating how business education can leverage AI

technologies to foster complex competencies while preserving learner agency, human judgment, and responsible innovation. Aliados 360 demonstrates the potential of multi-agent GenAI ecosystems to support complex thinking and responsible innovation in higher education. The study provides an initial framework for understanding how human–AI interaction can be designed to enhance learning beyond information generation, positioning AI as a cognitive partner in competency development. Future research should examine the long-term effects of multi-agent learning environments across educational contexts.

Problem-First Computational Thinking: A QDSV-Inspired Framework for Teaching AI and Advanced Computing

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Keywords: QDSV, Problem-First Learning, AI Literacy, Computational Thinking, Semantic Problem Representation

Abstract: Artificial intelligence education often moves quickly from problem statements to models, libraries, notebooks, metrics, or code. While this accelerates experimentation, it can leave students with a limited understanding of how a problem should be formulated before it is automated. This contribution proposes a problem-first pedagogical framework, inspired by QDSV (Quantum Declarative Semantic Value), to help students formulate computational problems through intent, context, structure, representation, implementation, and evidence before selecting a technical path. The approach is educational rather than hardware-specific. Students first learn to represent a problem independently of any specific model, algorithm, circuit, or execution backend. The framework supports AI literacy, responsible AI education, and advanced computational thinking by helping learners distinguish between a problem, its representation, its implementation, and the evidence used to interpret its outcomes. An illustrative classroom activity asks students to begin with a familiar real-world problem, describe its intent, identify relevant context and entities, define how it should be represented, and decide what evidence would help interpret the result. Only after this formulation step do students compare possible realizations, such as a rule-based approach, a machine-learning model, a simulation, a circuit-oriented representation, or another advanced execution environment. The expected contribution is a pedagogical framework for teaching problem formulation before automation, especially in interdisciplinary courses where students work with AI tools but do not yet have deep technical experience in modeling, programming, or quantum computing.

From Invisible to Supported: An AI-Augmented Sociometric System for Early Detection of Social Isolation in Digital Higher Education

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Keywords: AI-Enhanced Learning Analytics, Social Isolation, Augmented Sociometry, Social Network Analysis, Personalized Academic Support

Abstract: Social isolation in digital higher education is a structurally invisible yet consequential phenomenon: students who remain relationally disconnected from their peer cohort despite nominal platform activity face significantly elevated risks of dropout, disengagement, and academic underperformance. Existing learning management systems (LMS) are blind to this problem, monitoring individual behavioral engagement while entirely ignoring relational structure. This paper presents AIAS (AI-Augmented Sociometric System), an intelligent analytics layer that transforms passive Moodle interaction logs into actionable relational intelligence for instructors. AIAS integrates social network analysis (SNA), Sentence-BERT semantic quality scoring, and Louvain community detection into a composite Isolation Risk Score (IRS) that produces a two-dimensional relational profile per student: structural network position and communicative engagement quality. Grounded in Design Science Research (DSR) and piloted on OULAD-calibrated data, AIAS surfaces a population consistently misclassified as engaged by conventional analytics. Beyond technical contribution, AIAS is framed as an equity instrument: socially isolated students are disproportionately drawn from marginalized groups, and making relational invisibility computationally detectable is a prerequisite for inclusive, personalized support in AI-enhanced higher education.

Algorithmic Governance and Digital Fairness in Online Hospitality Platforms: Theoretical Implications of the EU AI Act and DSA for Emerging Markets

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Keywords: Digital Fairness, Algorithmic Transparency, Dark Patterns, Platform Governance, EU AI Act

Abstract: Digital platforms such as Booking.com and Airbnb have evolved from neutral intermediaries into platform-based market orchestrators that shape consumer choice through ranking systems and interface design (Gawer, 2021). These mechanisms constitute a choice architecture (Thaler & Sunstein, 2008) that structurally influences decision-making. The EU Digital Services Act (DSA; European Union, 2022) and AI Act (European Union, 2024) address these dynamics, yet a critical gap persists between formal legal compliance and substantive fairness as experienced by consumers and businesses. Platform governance literature has traditionally prioritised efficiency over substantive fairness (Gawer, 2021). Ethical marketing principles (Laczniak & Murphy, 2019) were developed before widespread algorithmic mediation. Legal scholarship confirms that transparency obligations do not automatically produce substantive consumer protection (Busch, 2021) and that disclosure without interpretability leaves oversight gaps (Wieringa, 2020). To the authors' knowledge, no integrated framework has yet operationalised digital fairness as a testable construct in hospitality markets or examined these dynamics in an EU candidate market with limited enforcement capacity. Albania, harmonising via Law No. 124/2024 (aligned with GDPR, December 2024) but with limited publicly documented algorithmic audit capacity, represents precisely this rule-taker context. The study integrates platform governance theory (Gawer, 2021), ethical marketing (Laczniak & Murphy, 2019), and digital fairness governance frameworks (Busch, 2021; OECD, 2022) into a mechanistic explanatory model. Digital fairness is operationalised across three dimensions: (a) consumer autonomy, (b) substantive transparency, and (c) absence of structural manipulation. The empirical component draws on a survey of adult accommodation platform users in Albania, analysed through a mixed-methods design combining quantitative structural modelling and qualitative content analysis. Findings reveal what this study terms the Digital Autonomy Paradox: consumers who recognise algorithmic manipulation activate transparency-seeking behaviour, converting dark pattern awareness into a sense of informed agency rather than experienced constraint. Algorithmic transparency partially mediates the relationship between dark pattern awareness and perceived consumer autonomy. Legal awareness operates as a substitutable autonomy resource: its protective value is greatest where platform transparency is lowest, establishing a boundary condition with direct policy implications. The model confirms that platform governance and algorithmic design are meaningful predictors of experienced digital fairness. This study contributes three findings for AI governance and education. First, platforms can

satisfy DSA transparency obligations while producing choice architectures that constrain consumer autonomy, legal compliance, and substantive fairness are empirically distinct. Second, the substitution effect implies that digital literacy education is most valuable where platforms are least transparent, a principle potentially transferable to AI-mediated educational contexts. Third, the Albanian rule-taker case demonstrates that AI Act provisions may generate asymmetric protection outcomes in candidate countries with limited enforcement capacity. Transparency mandates must be complemented by structured digital literacy programmes aligned with SDG 4 (quality education).

Digital Governance and Smart Regionalism: Adaptive Integration Between Hungary and the Western Balkans

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Keywords: Digital Governance, Smart Regionalism, Adaptive Integration, Intelligent Governance Systems, Regional Transformation

Abstract: Digital transformation is increasingly reshaping the nature of regional integration, governance coordination, and institutional interaction across Europe. Within transitional regions such as the Western Balkans, integration processes are no longer driven solely by trade liberalization or physical connectivity. Instead, they increasingly depend on the capacity of governance systems to coordinate digital infrastructures, intelligent policy mechanisms, and adaptive regional-development strategies in a coherent and sustainable manner. Against this background, the paper explores the relationship between digital governance and smart regionalism in the evolving integration dynamics between Hungary and the Western Balkan Six (WB6). The study introduces digital governance as a strategic dimension of contemporary regional integration, arguing that intelligent coordination systems are gradually becoming as important as traditional economic and infrastructural factors. Rather than understanding regional cooperation exclusively through economic proximity, the paper examines how digital readiness, administrative interoperability, adaptive governance capacity, and institutional coordination increasingly shape the effectiveness of regional transformation processes. The analysis builds upon doctoral research examining economic integration and sustainable development dynamics between Hungary and the Western Balkans during the period 1990–2021. Integrating perspectives from institutional-gravity modelling, governance studies, and digital transformation frameworks, the paper explores how smart policy coordination and intelligent governance systems contribute to adaptive regional integration across South-East Europe. Particular attention is devoted to the interaction between digital governance mechanisms, regional sustainability agendas, and evolving frameworks of institutional cooperation. The paper further argues that fragmented governance systems frequently limit the transformative potential of digital regional integration by weakening coordination between technological infrastructures, administrative systems, and long-term strategic objectives. In contrast, adaptive governance architectures capable of integrating digital systems with regional-development strategies increasingly support more resilient and intelligent forms of regional cooperation. By linking digital governance with smart regionalism, the study contributes to current debates on intelligent governance systems beyond narrowly technological perspectives. More broadly, it positions adaptive regional integration as a multidimensional process in which digitalization,

institutional coordination, and governance innovation become structurally interconnected dimensions of contemporary regional transformation.

HTGAE: A Novel Hybrid Temporal Graph Attention Ensemble for Explainable Student Dropout Prediction in Higher Education

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Keywords: Student Dropout Prediction, Graph Attention Network, Ensemble Learning, Educational Data Mining, Explainable AI

Abstract: Student dropout in higher education is one of the major global challenges that affects student success, institutional performance, and socioeconomic development. The student dropout rate remains high across many countries despite increased access to tertiary education. In the United States, approximately 32.9% of college students drop out each year, while only 62.3% complete their degrees within 4 years without delay. In India, more than 32,000 students reportedly discontinued higher education between 2019 and 2023 due to factors such as incorrect program choices, poor academic performance, personal circumstances, and medical issues. Student dropout also poses a challenge to achieving the United Nations Sustainable Development Goal 4 (SDG-4) and to India's National Education Policy (NEP) 2020, which aims to increase the Gross Enrolment Ratio (GER) in higher education from 26.3% to 50% by 2035. Consequently, there is a growing need for intelligent Student Dropout Prediction (SDP) systems that can identify at-risk students early and facilitate timely interventions to improve retention and graduation outcomes. In recent years, a variety of Machine Learning and Deep Learning approaches have been proposed for Student Dropout Prediction (SDP). However, most existing studies emphasize predictive accuracy and insufficiently address complex student relationships, temporal learning behaviors, model interpretability, and intervention planning. Additionally, few studies have integrated graph-based representation learning, temporal sequence modeling, model explainability, and adaptive intervention mechanisms within a singular framework. To address these limitations, a novel Hybrid Temporal Graph Attention Ensemble (HTGAE) framework for student dropout prediction in higher education is proposed in this study by integrating advanced feature engineering, Graph Attention Networks (GATs), Transformer-based temporal learning, and gradient-boosting models within an ensemble architecture to capture complex interactions among academic, demographic, financial, behavioral, and socioeconomic factors influencing student attrition. Four novel indicators, viz., Academic Stability Index (ASI), Financial Vulnerability Score (FVS), Engagement Deficit Ratio (EDR), and Progression Momentum Score (PMS) are introduced through feature engineering to enhance predictive performance. Explainable Artificial Intelligence (XAI) is incorporated through SHAP-based interpretation to improve transparency and institutional trust. Additionally, a dynamic risk-scoring mechanism and a rule-based intervention engine are integrated to support personalized retention

planning and continuous student monitoring. By integrating graph attention mechanisms with temporal learning, the framework effectively identifies complex patterns associated with student dropout. The risk indicators provide detailed insights into academic consistency, financial challenges, engagement behavior, and progression trends. SHAP-based explainability supports transparent interpretation of predictions, enabling educational stakeholders to determine the most influential factors contributing to student attrition. The dynamic risk-scoring mechanism classifies students into multiple risk levels, allowing institutions to efficiently prioritize support efforts. Collectively, these features surpass traditional dropout prediction systems and support the development of an intelligent, data-driven student retention ecosystem. This research introduces a novel HTGAE framework that integrates predictive analytics, explainable artificial intelligence, and adaptive intervention planning to predict student dropout in higher education. The framework leverages Graph Attention Networks, Transformer-based temporal learning, ensemble modeling, and SHAP-driven explainability to address key limitations of existing methods and to facilitate proactive student retention strategies.

Generative AI and the Strategic Competency Deficit: An Exploratory Study of Advanced Management Graduates in Organizational Contexts

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Keywords: Generative AI, Management Education, Strategic Competency, Doctoral Training, MBA

Abstract: Generative Artificial Intelligence, Gen AI as it is popularly known as, is getting integrated into higher education rapidly. Student's learning experience, research and knowledge production is inseparable from the usage of AI. While the narrative on AI usage in academia largely focusses on integrity concerns, a lesser visible, yet a deeper concern is emerging, that of graduates who are unemployable. This unemployability is either they fail to meet the skill expected from the industry or it is surface level fluency in AI. These issues not only hamper their strategic reasoning and critical thinking but also question the very competency doctoral or MBA level graduates needs to have. The primary argument put forth by this work is the fact that an over reliance on gen AI in advanced management programs is resulting in a competency gap, a gap so evident when they are exposed to harsh realities of the corporate world that requires independent, yet a strategic judgement. Based on an exploratory qualitative study, involving semi-structured interviews with advanced management graduates, the study examines how dependency on AI during doctoral and graduate training translates into deficits in problem framing, strategic thinking and autonomous decision making in an organizational setting. Preliminary findings support arguments for AI usage in terms of enhanced productivity and quality of output. However, the participants lament their inability to construct original arguments, justify strategic recommendations and navigate ambiguous organisational problems without the assistance of AI. By shifting the analytical lens from the impact of AI in the classroom to organisational consequences, the study contributes to emerging literature on AI in higher education. The study presents an underexplored dimension of the AI in education debate. Findings of the study have significant implications on the way business schools must design doctoral and MBA curricula. The need of the hour is to assess development of competences and prepare graduates for the strategic demands of modern-day organization. An AI integrated management education framework is proposed to preserve and develop strategic thinking as a core graduate outcome.

Structural Role Injection in Handlebars-Templated LLM Prompts: A Security Risk for Prompt-Based Educational AI Tools

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Keywords: Prompt Injection, Large Language Models, Educational AI Tools, Prompt-Template Security, Trustworthy AI

Abstract: AI tutors, automated graders, and classroom chatbots are increasingly built on large language models whose prompts are assembled from templates, with student- or web-supplied content inserted into a fixed instruction skeleton. Handlebars is a widely used templating engine for this and the default prompt format in Microsoft Semantic Kernel. Its double-brace {{x}} expression HTML-escapes the inserted value and is documented as the safe default; its triple-brace {{{x}}} expression inserts it raw. We show that this choice silently governs an educational application's exposure to structural role injection, where attacker-controlled input (for example, text a student submits to an AI tutor) carries chat role delimiters that forge a higher-privilege instruction turn and override the teacher-defined behaviour. A model-free analysis establishes the mechanism: Handlebars escaping rewrites angle brackets but not square brackets, colons, or Markdown hashes, so it neutralises ChatML, Llama-3, and XML role delimiters (survival rate 0.00) while leaving Llama-2 [INST], legacy Human:/Assistant:, and Markdown ### delimiters intact. We run 5760 trials across seven delimiter families, two attack objectives, and four models at a combined API cost of 1.63 USD. The most susceptible model follows an injected task-hijack instruction in 97% of raw and 91% of escaped trials, with protection concentrated only in angle-bracket delimiter schemes; a robust model resists almost entirely. The escaped default protects only the delimiter schemes whose characters HTML escaping happens to cover and cannot substitute for a structural separation of instruction and data. We translate the findings into concrete guidance for educators and developers deploying prompt-based AI tools.

AI-Assisted Marketing Copywriting in Higher Education: Exploring the Pedagogical Potential of the Doubao Agent in a Quasi-Experimental Study

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Keywords: AI AgenT, Generative AI, Marketing Copywriting, Quasi-Experiment, Higher Education

Abstract: Generative artificial intelligence tools are increasingly embedded in the writing practices of undergraduate students, yet the pedagogical implications of different AI configurations remain poorly understood. In particular, no empirical study has compared the effects of a purpose-configured AI agent against those of a standard conversational dialogue interface on the quality and originality of applied creative writing. This study addresses that gap by deploying the Doubao platform in a two-week exploratory quasi-experiment involving a purposive sample of 30 third-year undergraduate students. First, participants will complete a baseline marketing copywriting task without AI assistance to establish their unaided proficiency and ensure group comparability. Participants will then be assigned to produce marketing copy using either a task-configured Doubao agent or the standard Doubao dialogue box. The former serves as the experimental group and the latter as the comparison group. All submissions will be evaluated using four instruments: a text-similarity duplication-rate check, the Grammarly web platform for system-based writing quality analysis, rubric-based AI-chatbot assessment, and rubric-based human expert assessment, supplemented by thematic analysis of students' written perceptions. The study aims to examine within-group changes in copywriting performance, between-group differences in output quality and originality, and students' perceptions of the AI-assisted learning experience. It is anticipated that the mode of AI mediation, rather than the mere fact of AI use, will prove a consequential variable in marketing copywriting pedagogy. Implications for curriculum design, assessment practice, and the intentional integration of AI agents in applied writing education will be discussed in light of the findings.

Democracy, Deliberation, and Epistemic Humility in AI

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Keywords: Artificial Intelligence, Epistemic Democracy, Epistemic Humility, Collective Intelligence, Deliberative Mini-Publics

Abstract:

This work proposes a conceptual framework that integrates four complementary dimensions: democracy understood as an epistemic practice; artificial intelligence conceived as an infrastructure for the production and mediation of knowledge; ethical-epistemic literacy as a necessary condition for critical participation in complex sociotechnical environments; and the institutional design of university deliberative spaces oriented toward democratic technological governance. These areas of research are often developed relatively independently. Consequently, there remains a lack of integrated conceptual frameworks capable of connecting epistemic democracy, ethical-epistemic literacy, and the design of AI-mediated deliberative environments. In response, we propose the notion of epistemic humility as a normative principle capable of guiding civic education processes. From this perspective, ethical-epistemic literacy is not limited to maximizing cooperation, efficiency, or transparency, but rather seeks to preserve the conditions necessary for critical disagreement, acknowledgment of uncertainty, and exposure to error. It also addresses the growing need to explore how these principles can be translated into concrete institutional mechanisms that democratize technological development processes and strengthen forms of collective intelligence compatible with these epistemic conditions. On this basis, the paper explores the possibility of developing an interdisciplinary model of a deliberative mini-public applicable to the university context. This space aims to harness the collective knowledge of students, researchers, and social stakeholders to participate in the evaluation and direction of technological development, incorporating artificial intelligence tools without compromising the conditions of critique, revisability, and error correction characteristic of an epistemically robust democracy. This project adopts an exploratory and interdisciplinary design that combines conceptual analysis, participatory design, and elements of action research. The initial phase seeks to develop a normative and methodological framework that integrates epistemic democracy, ethical literacy in AI, and epistemic humility as guiding principles for deliberative processes mediated by artificial intelligence. Subsequently, the framework will be implemented and evaluated at Universidad Siglo 21 through the establishment of deliberative mini-publics composed of students from different disciplinary areas, including Engineering, Digital Business, Artificial Intelligence, Social Sciences, and Humanities. The project envisages the co-design of an experimental AI-supported application for conducting deliberative activities aimed at promoting critical reflection on

the social impacts of technological development, particularly in relation to vulnerable populations. Data generated through discussions, workshops, and collaborative design sessions will be analyzed using qualitative methods inspired by grounded theory, with the aim of identifying emerging categories, challenges, and design principles. Additionally, mechanisms to foster the social appropriation of AI technologies will be explored through collaboration with community stakeholders, institutional engagement initiatives, and the Observatory for the Future at Universidad Siglo 21.

Advancing Educational Innovation Through Explainable Artificial Intelligence (XAI)

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Keywords: Explainable Artificial Intelligence, (XAI), Trustworthy AI, Educational Technology, Higher Education, Transparency

Abstract: The study explores how explainable AI can be used in education to build learning systems that are more honest and clear. This shows that XAI can help teachers and students alike to better understand AI-generated results, learn about fair and unbiased AI solutions, and make smart choices that protect learners and promote fairness. Thus, although XAI is a useful addition to the AI-based education field, however, there remain numerous challenges including complexity, implementation difficulties, the quality of explanations, and acceptance of users. Supported explanation is important when using educational AI. This study aims to ensure that such technology is used both appropriately and safely. This approach helps move the conversation forward on trustworthy AI, whilst simultaneously providing fresh ideas and insights for future studies vis-à-vis how educational technology can be developed in such a way so as to ensure fitness-of-purpose. Moreover, the study will provide policy and practice recommendations that will be of benefit to regulators, policy-makers, accreditation bodies, administrators, teachers, and learners.

Exploring Pharmacy Students' Acceptance of AI Tools in Pharmacy Education: A UTAUT2-Based Qualitative Study

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Keywords: Artificial Intelligence, Pharmacy Education, Undergraduate Pharmacy Students, UTAUT2, Technology Acceptance, AI Literacy, Qualitative Research, Focus Groups

Abstract: Artificial intelligence (AI) tools are increasingly utilized by pharmacy students to support learning, revision, assessment preparation, and clinical reasoning. However, there is limited evidence regarding undergraduate pharmacy students' perceptions, usage patterns, and evaluations of AI within their educational experiences. This study explored undergraduate pharmacy students' acceptance and utilization of AI tools in pharmacy education, employing the updated Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as the analytical framework. Focus group discussions (FGs) were conducted with undergraduate pharmacy students across multiple academic years. Data were analyzed inductively, then deductively mapped to UTAUT2 constructs. Second coding and member checking enhanced the trustworthiness of the findings. Four focus groups were conducted with 20 undergraduates in total. Students valued AI because it helped them study more efficiently and manage dense course material, reflecting performance expectancy. Tools such as ChatGPT were perceived as familiar and user-friendly, indicating effort expectancy, though students noted that effective responses required precise prompting. AI adoption was shaped by peer influence, instructor guidance, and educational exposure. Students emphasized that access to AI tools alone was insufficient; practical training, verification skills, and pharmacy-specific guidance were necessary. Comparisons between free and paid tools focused on usefulness and accessibility,

with advanced features appreciated only when they enhanced learning without fostering over-reliance. Despite the routine integration of AI into study practices, concerns were raised about dependence, weakened critical thinking, academic misconduct, and unsafe use in clinical decision-making. Responsible integration of AI in pharmacy education necessitates applied AI literacy training rather than mere access. Pharmacy curricula should incorporate instruction on prompting, source verification, ethical considerations, and clinical boundaries to promote safe and critical use of AI in both learning and clinical decision-making.

The Flood Emulator as a Virtual Laboratory: An AI-Enhanced Learning Environment for Risk Assessment and Early-Warning Education in Engineering

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Keywords: AI-Enhanced Learning Environment, Virtual Laboratory, Surrogate Modeling, Deep Learning, Flood-Risk Education, Early-Warning Systems, Engineering Education

Abstract: Physics-based hydrodynamic models such as HEC-RAS (Hydrologic Engineering Center's River Analysis System) are the standard tool for flood-hazard assessment, but computing a single flood scenario produced by a levee breach can take from hours to days, depending on the model's spatial domain and the configurations adopted. This latency effectively keeps such models out of interactive teaching and confines students to passively observing a precomputed result, with little room for the what-if exploration through which physical intuition is built. The same delay makes the operational logic of flood early-warning—where a hazard map is only useful if produced in time to act—difficult to experience rather than merely describe. This contribution reframes a validated deep-learning flood emulator, developed as a master's thesis at Universidad de los Andes (a SAMYRAD partner institution), as a real-time virtual laboratory for flood-risk and early-warning education in engineering. The emulator is a multitask convolutional neural network of the U-Net type with Feature-wise Linear Modulation (FiLM) conditioning, trained in PyTorch to reproduce a HEC-RAS hydrodynamic model of a reach of the Bogotá River (Chía, Colombia). From the conditions of each scenario it predicts, simultaneously, maximum flood-depth and maximum flow-velocity maps—the two variables used to classify the actual hazard to people, vehicles, and infrastructure. Its adjustable inputs—breach location, hydrograph characteristics, and breach-activation level—act as the controls of the laboratory, and the model was trained and validated across 93 hydrodynamic scenarios, including unseen breach locations and unseen return periods. Critically for teaching, it reduces the per-scenario runtime from roughly 12–30 hours to about 63 seconds on CPU and under four seconds on GPU. The virtual laboratory transforms training because it changes what students can observe and how fast they can do it. With the traditional hydrodynamic model, a single flood takes hours or even days to simulate, so a student sees only one or two scenarios and must wait a long time for each result. By producing predictions in seconds, the emulator lets students explore many scenarios in a single session and compare them rapidly. This immediacy is what makes the learning didactic: students grasp how depth and velocity behave across the domain, and how these variables respond to changes in terrain, land cover, and discharge. The tool also makes tangible a core principle of risk management—that traditional modeling does not run in real time, whereas an AI-based emulator generates the maps in near real time, which is precisely what early-warning systems require. Students therefore not only learn flood hydraulics faster, but experience first-hand

why computational speed matters for hazard-based decision-making. At this stage the educational deployment is a grounded proposition rather than an evaluated intervention: the emulator is built and validated, and its use as a learning environment is the contribution advanced here. Ongoing work will pilot the virtual laboratory in a graduate hydraulics course and measure its effect on students' understanding of flood hazard and early-warning logic. Because the approach rests on physically universal inputs—topography, hydraulic roughness, and hydrograph characteristics—the laboratory is transferable to other leveed river systems, offering a replicable template for embedding risk-oriented AI into engineering education.

Impact of Generative AI on Efficiency and Quality in E-Learning Course Development: A Comparative Study of AI-Assisted Instructional Design

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Keywords: Generative AI, E-Learning, Instructional Design, Course Development, Articulate 360, Higher Education, Educational Innovation

Abstract: The growing and wide adoption of generative artificial intelligence (AI) tools such as ChatGPT, Claude, and Gemini is reshaping instructional design. While these tools are widely used to support e-learning development, empirical evidence on their effect on curriculum and course content design, production efficiency, and instructional quality remains limited. This study investigates how AI-assisted course development influences both the speed and the quality of e-learning instructional design and production. Drawing on the development of more than 30 online courses built in Articulate 360, the study examines the role of AI tools across content creation, assessment design, content review, and learning frameworks. Using an exploratory quantitative approach, the study analyses development time, content accuracy, assessment quality, and learning-objective alignment, and compares outcomes across different AI tools. It further considers instructional designers' perceptions of AI usefulness and the level of human oversight required to maintain pedagogical standards. The findings clarify whether AI integration can reduce development time without compromising instructional quality, and inform best practices for embedding AI in instructional design workflows. This research contributes empirical evidence to the emerging literature on human-AI collaboration in educational content development, and provides design and management insights for educators and policymakers into the efficiency and quality of e-learning AI-assisted instructional design and quality governance.

Artificial Intelligence for Integrated Water Resources Management in Madagascar: Opportunities, Challenges, and Policy Implications

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Keywords: Artificial Intelligence, Integrated Water Resources Management, Water Governance, Madagascar, Climate Change Adaptation

Abstract: Madagascar faces increasing water resource challenges due to climate variability, population growth, environmental degradation, and limited institutional capacity. These pressures highlight the need for innovative approaches to support Integrated Water Resources Management (IWRM) and improve water governance. Recent advances in artificial intelligence (AI) offer new opportunities for enhancing water resource planning, monitoring, and decision-making through data-driven solutions. This study explores the potential contribution of AI technologies to the implementation of IWRM in Madagascar and assesses the associated governance and policy implications. The research adopts a mixed-methods approach grounded in a post-positivist epistemological framework. A comprehensive review of scientific literature, policy documents, and international case studies is combined with qualitative analysis of Madagascar's water governance context. The study examines the applicability of AI-based tools, including machine learning models for hydrological forecasting; remote sensing and Geographic Information Systems (GIS) for water resource monitoring; predictive analytics for drought and flood risk management; and intelligent decision-support systems for policy planning. Preliminary findings indicate that AI can significantly improve the efficiency and effectiveness of water management by enhancing data integration, forecasting accuracy, and early warning capabilities. AI-supported systems may also strengthen evidence-based policymaking and facilitate adaptive management in response to climate change. However, challenges related to data availability, technical expertise, digital infrastructure, financial resources, and institutional coordination remain significant barriers to implementation in Madagascar. The study concludes that successful integration of AI into IWRM requires strategic investments in data systems, capacity building, interdisciplinary collaboration, and supportive governance frameworks. By identifying both opportunities and constraints, this research contributes to the growing discourse on digital transformation for sustainable water governance and supports progress toward Sustainable Development Goal 6 (Clean Water and Sanitation) and Sustainable Development Goal 13 (Climate Action).

Digital Inequalities and Equity in the Adoption of Generative Artificial Intelligence in Mexican Higher Education: Evidence from ENDUTIH 2024

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Keywords: Artificial Intelligence, Generative AI, Educational Equity, Digital Divide, Digital Skills

Abstract: The rapid expansion of Generative Artificial Intelligence (GenAI) is transforming teaching, learning, and knowledge production in higher education. Tools such as ChatGPT, Gemini, and Copilot are increasingly integrated into academic and professional activities. However, their educational benefits depend on digital access, connectivity, and technological competencies. In countries with persistent socioeconomic inequalities, ensuring equitable participation in AI-enhanced education remains a major challenge. Although previous research has emphasized the educational potential of GenAI, limited attention has been paid to the structural digital inequalities that shape opportunities to access, use, and benefit from these technologies. In Mexico, empirical evidence linking digital divides to AI readiness for higher education remains scarce. This study employed a descriptive and exploratory design based on secondary analysis of the 2024 National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH). Indicators of internet access, computer ownership, digital skills, and educational uses of the internet were examined across socioeconomic groups as enabling conditions for AI readiness. To strengthen the interpretation of the findings, methodological triangulation contrasted the nationally representative ENDUTIH data with evidence from the Digital Education Council AI in Higher Education Latin America Survey 2026. Together, these datasets relate structural conditions for digital inclusion in Mexico to patterns of AI adoption and AI literacy in higher education across Latin America. Substantial digital inequalities persist across socioeconomic groups. Internet access ranges from 94.0% in high-income households to 45.4% in low-income households, while computer ownership declines from 76.8% to 17.2%. Although basic digital activities such as messaging (93.1%) and information searching (89.4%) are widespread, advanced competencies—including office software use (38.6%) and online operations (34.8%)—remain much less common. Despite 81.3% of internet users reporting educational uses of the internet, opportunities to participate effectively in AI-enhanced learning are unevenly distributed. When contrasted with evidence of widespread AI adoption among Latin American university students, these findings suggest that high levels of AI use may conceal important disparities in AI readiness. Access to AI should therefore not be interpreted as evidence of equitable preparedness to benefit from AI-supported learning.

The equitable integration of GenAI requires moving beyond a narrow focus on technological innovation. Policymakers and educational institutions must address disparities in connectivity, access to devices, and digital competencies that determine AI readiness. Without targeted policies to reduce these inequalities, AI expansion may reinforce existing educational disadvantages rather than promote inclusion. Achieving equity in the AI era requires not only technological innovation but also meaningful digital access, AI-relevant competencies, and inclusive educational opportunities for all.

Decolonising AI Literacy: A Contextual Pedagogy Framework for a South African University

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Keywords: AI Literacy, Contextual Pedagogy, Epistemic Justice, Indigenous Knowledge, South African Higher Education

Abstract: Generative AI technologies such as ChatGPT are transforming higher education by altering the methods through which students learn, compose, research, and execute academic tasks. However, several university solutions contribute to being predominately compliance-orientated, focusing on acceptable use, plagiarism prevention, and policy enforcement. In the South African context, this is inadequate since AI education must address curriculum transformation, include indigenous knowledge, and facilitate students' progression from passive AI consumption to contextual innovation and knowledge generation. Current literature and institutional AI policies often position students as users of AI rather than as contributors to local knowledge ecosystems. Additionally, most AI literacy approaches are shaped by Western assumptions and fail to adequately address South African realities, including indigenous knowledge systems, contextual relevance, and the development of context-specific datasets and examples that reflect local student experiences. This study is a conceptual, how-to paper. It draws on critical literature synthesis across generative AI, AI literacy, decolonial pedagogy, and digital education to develop a practical framework for teaching AI in South African higher education. No primary data was collected. Instead, the paper integrates scholarship and pedagogical reasoning to propose an applied model that lecturers can adapt across disciplines. The study presents a South African Contextual AI Pedagogy Framework based on six pillars: contextual relevance, incorporation of indigenous knowledge, critical AI literacy, student innovation, participation in contextual datasets development, and ethical reflective engagement. The primary assertion is that AI education must go beyond just instructing students on responsible AI use to empowering them to analyze AI outputs, detect bias, contextualize instances, and enhance AI knowledge systems relevant to South African contexts. The paper concludes that generative AI pedagogy in South African higher education should move beyond compliance-driven models toward a transformative approach that supports epistemic inclusion, student agency, and locally relevant innovation. By embedding this transformative AI curriculum, universities can better prepare graduates to shape AI systems and knowledge production that reflect South African needs. Future research should test and refine the framework through classroom-based implementation studies and student-focused evaluations.

Integrating Artificial Intelligence in Journalism Education: Educators as Interpreters and Facilitators of Technological Innovation

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Keywords: Journalism Education, Artificial Intelligence, Educators, Innovation

Abstract: From introducing students to technologies such as the internet to search information to mobile technology to gather audio, video and images for reporting, and more recently, social media to gather insights about communities, educators have played an important role in preparing media and journalism students for the world they are emerging into. Machines and artificial intelligence are increasingly assisting or replacing humans in journalistic work, serving important roles in the processes of gathering, filtering, composing and sharing news (Nechushtai & Lewis, 2019; Thurman et al., 2019). The potential of AI to generate content that is pertinent to the journalism and media domain is apparent and of potentially high-quality written expression with accurate grammar, devoid of typographical errors (Pavlik, 2023). Evidence shows that while AI tools enhance efficiency, they also blur the boundaries of editorial autonomy as journalists navigate the complexities of technological reliance and traditional norms of independence (Cools & De Vreese, 2025). Drawing on the diffusion of innovations theory (Rogers, 1962) and 15 in-depth interviews with media and journalism educators in leading European and North American universities, this study maps out how AI tools and AI literacy are being adopted and integrated in journalism education. In so doing, the paper examines how educators serve as interpreters and facilitators of technology, transcending the traditional role of 'teaching' and operating as normative actors and catalysts for change (Jaakkola & Uotila, 2022). The study dives into aspects of school curricula and classroom instruction, investigating the practices, pedagogical approaches, as well as perceived challenges and ethical considerations guiding AI adoption in media and journalism education in Europe and North America. The study found that most journalism educators are early adopters and are at the persuasion stage in the five-stage process of the adoption and diffusion of innovation theorised by Rogers (1962). While stray interest among educators in integrating AI literacy and AI tools in education is visible, also visible are cross-disciplinary approaches and collaborations with other university departments such as technologies department to seek additional information for integrating AI in journalism education. More than half the respondents expressed concern about the need to equip students with the knowledge and skills needed to navigate a media landscape responding rapidly to changes brought in by AI such as automated workflows. Innovative approaches are being explored to integrate AI technology into their curricula including designing AI-based classroom assignments to train students in the practical application of the technology and understanding the technology's strengths and weaknesses. Beyond core journalism education, educators found additional use cases for AI in classrooms. These include transcribing lectures, analysing and critiquing course syllabus, exploring class activities, strengthening educators' capacity to do more active learning,

generating examples to help illustrate complicated ideas, creating detailed lesson plans, and as an iterative assistant to help educators clarify their own thinking. Concerns about the lack of institutional support to help educators develop conceptual understanding of AI and the misuse of the technology by students for assignments emerged as recurring themes. Concern among educators about the potential of the technology to be misused by students for course work, limiting students' ability to build core journalistic skills such as writing, reporting, and editing also was a recurring theme. The study sought to uncover the perceptions and implications of AI tool usage across different functional areas of the media and journalism education ecosystem in universities by including educators from multiple departments. While educators in the US emphasise the need to help students develop a technological mindset, European educators believed it was more important to ensure AI is adopted, integrated and understood by journalism students in a responsible way.

Bridging the AI Gap: One Belief at a Time

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Keywords: Reflective Practice, Teacher Reflection, Generative AI, Self-Study, Knowledge Building

Abstract: Throughout history, innovations have required educators to adapt their beliefs, mindsets, and approaches to teaching and learning. The need for educators to evolve as educational ecosystems evolve is not new. Yet, the sudden release of and access to generative AI did not allow educational institutions and educators to prepare for its impacts. For educators to address the challenges of AI in their classrooms, they need to understand their own beliefs and perspectives about it. Research on GAI in relation to teachers and education focuses on professional development, classroom management, and task optimization, with a gap remaining in exploring teachers' education and professional agency with respect to GAI (Garzón et al., 2025; Mustafa et al., 2024). In conducting this self-study, we take a step towards addressing this gap by proactively understanding our beliefs and practices about GAI to identify the challenges we faced as educators and propose a solution to address them. To explore the role of our beliefs, perspectives, and experiences in shaping our responses to GAI, we engaged in reflective practice through collaborative self-study (Pithouse-Morgan, 2022). We conducted the reflection in two phases. In phase one, regarding the integration of AI in our teaching journeys, we used the following prompt to write reflections: "Write your story with generative AI." In phase two, we used the following prompt for writing reflections: "Write your ideal story with generative AI." These self-generated texts were written individually. Using dialogue, we collaboratively reviewed the texts for common and emergent ideas and themes. Our analysis showed that we initially viewed GAI negatively due to concerns about students using it to submit work that was not their own. Through reflection, we recognized that addressing AI productively requires a shift to a growth mindset that sees AI as a workable educational tool. Many of our concerns stemmed from a lack of training and support in understanding GAI. We discovered that we both strongly believed in teaching students to use AI responsibly and ethically. We further concluded that the current adoption of AI in education has been flawed, as students became experienced users before educators, and we believe that future innovations should follow a top-down approach in which educators develop expertise first and then guide student use. To better prepare educators for emerging technologies such as generative AI, we propose creating a Knowledge Building community where educators collaboratively improve ideas, share expertise, and address authentic challenges. Grounded in principles such as improvable ideas, symmetric knowledge advancement, and real ideas and authentic problems, this approach encourages educators to view AI as a tool that can be refined and aligned with educational goals rather than inherently positive or negative (Scardamalia, 2002). By sharing knowledge and experiences, educators can overcome gaps in training and professional development while

collectively solving real-world classroom challenges. The principles of community knowledge, collective responsibility, and democratizing knowledge further foster a supportive environment in which every contribution is valued, helping educators learn from one another and ensuring that no member is left behind (Scardamalia, 2002).

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Interpretable Machine Learning for Early Academic Risk Detection Among First-Year Engineering Students in Introductory Physics Courses

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Keywords: First-Year Engineering, Academic Risk, Interpretable Machine Learning, Learning Analytics, SEM, CHAID, Higher Education

Abstract: First-year engineering students often encounter academic and adjustment difficulties in foundational mathematics and physics courses, which may affect their progression and persistence. Prior academic preparation, adaptation to university demands, study organisation, well-being, and perceived subject relevance can influence early performance. Artificial Intelligence and learning analytics offer opportunities to identify academic vulnerability and support timely decision-making; however, their educational value depends on producing transparent and actionable outputs rather than opaque risk scores. Current approaches frequently prioritise predictive performance while providing limited insight into how academic, behavioural, motivational, contextual, and well-being factors jointly shape risk. This study therefore examines whether explanatory modelling and interpretable machine-learning profiling can generate transparent early-risk profiles for first-year engineering students enrolled in introductory physics courses. A quantitative explanatory and exploratory profiling design was applied to 691 students enrolled in Physics I and Introduction to Physics at a private multi-campus university in Mexico. Data were collected across three academic cohorts using a baseline questionnaire comprising 39 questions and 49 items covering prior academic preparation, physical well-being, family and social context, study organisation, previous educational experience, and perceived subject relevance. Responses were anonymously linked to first-month course grades. Data preparation included scale verification, missing-data screening, category harmonisation, and correlation analysis. Structural Equation Modelling was used as an exploratory explanatory procedure to identify variables associated with early academic performance. The resulting variables were examined using Chi-square Automatic Interaction Detection to generate interpretable profiles associated with course non-passing. Mann–Whitney U and Kruskal–Wallis tests were used to examine grade differences

across relevant groups. Early performance was associated with prior secondary-school achievement, perceived adequacy of previous knowledge, academic status, scholarship context, sleep, time management, and perceived career relevance of physics. Students reporting stronger preparation, better organisation, adequate sleep, and greater subject relevance generally achieved higher grades. CHAID results further indicated that vulnerability emerged from combinations of factors rather than from a single characteristic. Lower prior grades, insufficient preparation, previous academic difficulties, and contextual conditions appeared jointly in several non-passing profiles. The study contributes an interpretable profiling approach that can help tutors and student-support teams understand why students may require assistance and identify differentiated responses, including prerequisite reinforcement, time-management guidance, and motivational or well-being support. The findings remain exploratory because the decision-tree profiles have not yet been externally validated and some terminal groups are small. Future research should re-estimate the explanatory model, compare SEM with path analysis, validate the CHAID model across cohorts or out-of-sample data, and incorporate machine-learning benchmarks, calibration, fairness assessment, and longitudinal outcomes. These developments would support the transition toward a transparent AI-assisted early-alert system for first-year engineering education.

Educating for Human Distinctiveness in the Age of AI: Implications for Higher Education

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Keywords: Artificial Intelligence, Higher Education, Professional Identity, Human Distinctiveness, Identity Work, Professional Development, Future of Work

Abstract: The growing integration of artificial intelligence (AI) into professional environments is transforming expectations regarding skills, employability, and how individuals maintain professional relevance in increasingly AI-mediated labor markets (World Economic Forum, 2025; Cheng et al., 2025). Higher education institutions have largely responded by strengthening digital literacy and AI-related competencies. However, as intelligent systems increasingly perform analytical, technical, and knowledge-intensive tasks, questions arise about how universities can cultivate capacities that distinguish humans in the workplace. Identity Work scholarship suggests that disruptive contexts often trigger self-reflection and identity reconstruction, prompting individuals to reassess their professional identities and aspirations (Ibarra, 1999; Sveningsson & Alvesson, 2003; Brown, 2015). This invites a reconsideration of higher education's mission beyond technological proficiency. Current discussions on AI in higher education have largely emphasized AI literacy, digital competencies, and technological adaptation (UNESCO, 2025; World Economic Forum, 2025). Less attention has been devoted to understanding how universities might foster human capacities that remain distinctive and valuable in contexts where intelligent systems increasingly complement or substitute professional activities. Although previous studies have highlighted the role of professional capital in employability and career development (Bourdieu, 1986; Tomlinson, 2017), limited research has examined the educational implications of professional identity reconstruction in AI-mediated environments. This work-in-progress adopts a qualitative conceptual design grounded in an interpretive tradition. It employs an integrative literature review and conceptual synthesis to examine how insights from Identity Work scholarship, professional capital perspectives, and AI-mediated work may inform higher education. Relevant studies were reviewed to develop a framework for fostering human capacities in AI-integrated contexts. The conceptual synthesis suggests that the growing integration of AI into professional environments calls for reconsidering how higher education prepares future professionals. Four interrelated themes emerged from the literature review: reflexivity, ethical judgment, relational intelligence, and adaptability. These capacities appear particularly relevant as intelligent systems increasingly complement analytical and knowledge-intensive tasks. Building on Identity Work scholarship, professional capital perspectives, and recent discussions on AI in education, this study proposes that these capacities may represent dimensions of human distinctiveness in AI-mediated work environments. This perspective shifts attention from AI literacy alone toward identity-oriented and human-centered

educational experiences and offers a preliminary framework for supporting students in sustaining professional relevance and cultivating meaningful careers. The age of AI offers higher education an opportunity to reconsider professional preparation beyond technical competencies and AI literacy. This conceptual study suggests that fostering reflexivity, ethical judgment, relational intelligence, adaptability, and authentic self-expression may help individuals sustain professional relevance in AI-mediated work environments. By emphasizing identity-oriented and human-centered learning experiences, universities may better support students in navigating uncertainty and developing meaningful professional identities. Future research could empirically examine how these capacities are cultivated and experienced across diverse higher education contexts.

From Static LMS to Autonomous Agents: Reimagining Moodle-Based Open and Distance E-Learning Delivery for the Agentic AI Era in Kenya

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Keywords: Agentic AI, Moodle, ODeL, Learning Management Systems, Kenya, Higher Education, Institutional Readiness

Abstract: The rapid evolution of artificial intelligence (AI) progressed beyond generative tools toward agentic systems capable of autonomous planning, decision-making, and task execution. While Learning Management Systems (LMS) such as Moodle had underpinned Open and Distance e-Learning (ODeL) delivery across Kenyan higher education institutions, their architecture remained largely static, offering limited capacity for autonomous, adaptive learner support. This study addressed a critical gap: the absence of empirical evidence on institutional readiness for agentic AI integration within Moodle-based ODeL ecosystems in Kenya. The study adopted a descriptive survey design across 12 Kenyan higher education institutions that had formally embraced ODeL delivery. A stratified sample of [180] respondents, comprising institutional leadership (Deans/Directors of ODeL), ICT/eLearning directors, ODeL coordinators, and registered ODeL students, was drawn to ensure representation across staff and learner perspectives. Data were collected through structured online questionnaires, supplemented by institutional documentation review, and analysed using descriptive and inferential statistics. Findings revealed that while [≈ 68%] of institutions had customised Moodle to some extent, only [≈ 22%] had piloted adaptive or automated functionality. A chi-square test indicated a significant association between ICT budget allocation and adaptive-functionality adoption, $\chi^2([4], N = [180]) = [11.62]$, $p = [0.020]$. An independent-samples t-test further showed ICT/eLearning directors reported significantly higher perceived readiness ($M = [3.8]$, $SD = [0.6]$) than students ($M = [2.9]$, $SD = [0.8]$), $t([178]) = [4.21]$, $p < [0.001]$, revealing a staff–student perception gap. Infrastructural constraints, weak institutional policy, and equity and data-governance concerns emerged as principal barriers. The study proposed a conceptual readiness framework guiding Kenyan ODeL institutions in reimagining Moodle environments for agentic-AI-driven delivery, addressing equity, scalability, and pedagogy. It concluded that deliberate policy intervention, capacity-building, and infrastructural investment were necessary preconditions for successful transition. This research offers systems librarians, ICT directors, and ODeL administrators an evidence-based roadmap from static LMS infrastructure toward intelligent, autonomous learning ecosystems, aligning with Sustainable Development Goal 4.

AI-Supported Learning and Job Readiness in Vocational Tourism Education: A Comparative Study of Two Albanian Schools

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Keywords: Artificial Intelligence in Education, AI-Supported Learning, Vocational Education and Training, Workforce Readiness, Tourism and Hospitality, Albania

Abstract: Artificial intelligence (AI) is rapidly becoming part of classroom practices and is increasingly recognized for its potential to personalize learning and equip young people with skills required for employment. In vocational education and training (VET), where employability is a central objective, this potential is particularly relevant. Tourism and hospitality represent major sources of employment in Albania, and the preparedness of vocational graduates entering these industries directly influences the local labor market. Examining whether AI-supported learning contributes to vocational students' perceived readiness for employment is therefore important from both educational and economic perspectives. Despite increasing interest in educational applications of AI, uncertainty remains regarding its actual contribution to students' perceived job readiness and how these compares with traditional work-based learning experiences. Furthermore, limited evidence exists on whether these relationships are consistent across institutions or influenced by individual school contexts. Research specifically addressing AI-supported learning in Albanian vocational tourism education remains particularly scarce. This study adopts a quantitative, cross-sectional research design, collecting survey data from tourism and hospitality students at two Albanian vocational schools: "Hamdi Bushati" in Shkodër and "Kolin Gjoka" in Lezhë. Data are analyzed using multiple linear regression, with self-assessed job readiness measured on a five-point Likert scale as the dependent variable. The primary predictors include students' engagement with AI-supported learning tools and the quality of internship or work-based learning experiences, both measured on five-point scales. The model also incorporates a school indicator and a school × AI interaction term, while controlling for gender, age, grade level, and previous work experience. Four hypotheses examine whether AI-supported learning (H1) and internship quality (H2) positively predict perceived job readiness, whether job readiness differs across the two institutions (H3), and whether the relationship between AI-supported learning and job readiness varies by school (H4). As the research is ongoing, final findings will be available following the completion of data collection and analysis. The anticipated results suggest that greater engagement with AI-supported learning tools and higher-quality work-based learning experiences may each be positively associated with students' perceived job readiness (H1, H2). Comparisons between the participating schools will help determine whether institutional differences exist in perceived readiness (H3) and whether the contribution of AI-supported learning varies between educational settings (H4). If supported, these

relationships would indicate that AI-based learning tools can complement, rather than substitute for, meaningful practical training, while highlighting the influence of institutional context on students' learning experiences. By examining the contribution of AI-supported learning alongside work-based training in an authentic vocational education setting, this study seeks to advance understanding of how AI may contribute to employability and workforce preparation in tourism and hospitality education.

Teaching With Generative AI: Results and Insights for a Multiple-Case Study of Teaching Practices Across Disciplines

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Keywords: GenAI Literacy, Teaching Practices, Multiple-Case Study, Empirical Research, Mixed-Methods Approach

Abstract: Generative AI (GenAI) has gained prominence as a learning tool with promising outcomes in education, and it has driven digital transformation, particularly in higher education institutions (HEIs). Despite this, there is little research on how educators in HEIs are tailoring GenAI across different curricula through the lens of a GenAI literacy framework. This work in progress (WIP) seeks to understand how educators use GenAI at a Colombian university across five courses from different disciplines to benefit cognitive, metacognitive, affective, and social learning dimensions, using a GenAI literacy framework proposed by Kong et al. (2024). A plethora of research highlights the potential of GenAI tools for the educational process based on their technical features. At the same time, few studies rely on empirical evidence from students and teachers in educational settings. This gap makes it difficult to analyze the impacts and implications of incorporating GenAI tools into students' learning process. The issue becomes more complex amid the relatively new emergence of GenAI tools in education and the development of new GenAI literacy frameworks. Then, this study preliminarily seeks to address the issues mentioned. This research is a multiple-case study in which information on students and teachers were collected from five courses across the faculties of Education, Medicine, Social Sciences, Sciences, and Engineering in a Colombian university. The study adopted a mixed-methods approach. The information sources in the approach included Likert scale surveys, non-participant observations, focus groups, and semi-structured interviews. Data were analyzed using thematic analysis for qualitative data, and descriptive and inferential statistics,

including the Mann-Whitney U test for quantitative data. Firstly, the results show that students typically use GenAI tools as assistants for writing, image generation, background information, and data analysis, with an emphasis on the cognitive and affective dimensions of selecting, planning, and executing solutions with IA and empowerment. Secondly, the metacognitive traits of GenAI, including students' reflection and critical thinking, are limited. Thirdly, ethics is addressed in some courses (Education and Social Science) but tangentially in others. Fourthly, for teachers, the idea of AI delegation and its usage risks remains, and to what extent the activities proposed were constructed, whether or not by the students or by AI. Finally, teachers call for a dialogue between the academic community and communities of practice where teachers can exchange learning, challenges, and needs to integrate GenAI into students' learning outcomes. In conclusion, the preliminary findings suggest a partial alignment between teachers' competence in using GenAI and students' learning outcomes when using these tools within each course. However, in most cases, activities involving GenAI do not appear to have an explicit purpose embedded in course design, nor a clear alignment with course learning objectives or the development of competencies related to the use of GenAI. These findings highlight the need to strengthen communities of practice that support faculty development and the exchange of experiences regarding GenAI digital competence and its integration into teaching and learning processes.

Reference:

Kong, S.-C., Cheung, M.-Y. W., & Tsang, O. (2024). Developing an artificial intelligence literacy framework: Evaluation of a literacy course for senior secondary students using a project-based learning approach. Computers and Education: Artificial Intelligence, 6, 100214. https://doi.org/10.1016/j.caeai.2024.100214

Beyond BIM: AI Enabled Project Simulation for Construction Management Education

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Keywords: Construction Management Education, Digital Transformation, Experiential Learning, Gamification, Graduate Employability, Simulation-Based Learning

Abstract: The construction industry is experiencing an unprecedented digital transformation driven by artificial intelligence (AI), automation, and data-centric project delivery. Despite these developments, construction management education has remained comparatively slow in adopting immersive digital pedagogies. While technologies such as Building Information Modelling (BIM) and Computer-Aided Design (CAD) have transformed design-focused disciplines, equivalent educational innovations that holistically support construction planning, coordination, and project management remain limited. Current digital learning technologies predominantly support design visualization and engineering education, with comparatively little emphasis on the experiential development of construction management competencies. There remains a lack of AI-enabled, gamified learning environments capable of simulating the collaborative, dynamic, and decision-intensive nature of construction projects while simultaneously fostering the digital competencies increasingly demanded by industry. This study adopts a conceptual design science approach to develop an AI-enabled gamified project simulation model for construction management education. The model is informed by the authors' established integrated project pedagogy, supported by a critical synthesis of literature on construction education, experiential learning, gamification, AI-enhanced pedagogy, and graduate employability. The resulting model provides a theoretical foundation for the future development and empirical evaluation of an immersive digital learning platform. The work proposes a novel pedagogical model that integrates lifecycle-based project simulation, collaborative role-based learning, AI-assisted decision support, dynamic project scenarios, gamification, and international academic and industry participation. The model repositions students as project coordinators within authentic digital construction environments, facilitating the development of technical, managerial, and digital competencies. By addressing the longstanding absence of construction management-specific simulation environments, the paper contributes a scalable model for preparing graduates to operate within increasingly technology-aided construction industries. This study argues for a fundamental shift in construction management pedagogy from traditional instructional approaches towards immersive, AI-enabled simulation ecosystems. The proposed model provides a conceptual blueprint for strengthening experiential learning, enhancing graduate employability, and aligning construction management

curricula with digital transformation of the construction industry. Future research will focus on the design, implementation, and evaluation of the proposed simulation environment within higher education settings

Towards AI-Assisted Surgical Education: Design and Preliminary Validation of a Wearable Haptic Wristband

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Keywords: Haptic Feedback, Surgical Education, Artificial Intelligence, Medical Training, Wearable Technology

Abstract: This project presents the design, development, and preliminary validation of a low-cost surgical training system based on a wearable haptic wristband and Artificial Intelligence (AI) to support skin suturing training for medical students. Traditional surgical education is constrained by ethical and logistical limitations associated with the "see one, do one, teach one" training model. The proposed device incorporates Linear Resonant Actuators (LRAs) operating between 140 and 220 Hz to deliver selective vibrotactile feedback, stimulating Pacinian and Meissner mechanoreceptors to guide hand movements during suturing. An ESP32-based embedded system controls the actuators and enables real-time wireless operation through IoT technologies. To optimize haptic performance, vibration transmission was analyzed as a function of LRA operating frequency for different elastomer thicknesses. Preliminary results identified an optimal thickness range of 1.5–2.0 mm, providing the best vibration transmission. Directional perception experiments conducted primarily with medical students demonstrated recognition accuracies of up to 80% for the best-performing directions, while 83.3% of participants reported that the wristband had an appropriate weight and produced no discomfort during use. These findings support the feasibility, wearability, and perceptibility of the proposed device. Future work will integrate machine learning models for wound detection and classification, while Ultra-Wideband (UWB) positioning will be incorporated to estimate the needle location in real time and generate precise haptic corrections during suturing. This approach aims to provide objective guidance, improve needle trajectory accuracy, and reduce the surgical learning curve through an accessible and scalable training platform.

Designing and Assessing an Explainable Agentic AI Tool for Clinical Decision-Support Education: A Breast Cancer Risk Prediction Case Study

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Keywords: Agentic AI, Explainable AI, Responsible AI, Clinical Decision Support, Knowledge-Grounded Agents

Abstract: Clinical AI education increasingly requires more than demonstrations of high classification accuracy: learners and practitioners must understand how evidence retrieval, explanation, validation, and safety constraints can be coordinated in reproducible decision-support workflows. This paper presents XAI-BioAgenticCDS, an explainable and knowledge-grounded agentic AI tool designed for clinical decision-support education using breast cancer risk prediction as a case study. Unlike a purely predictive manuscript, the proposed work focuses on an orchestrated multi-agent layer that connects a validated Bayesian-BiLSTM scoring engine with leakage-aware data preparation, leakage-aware stratified validation, XAI modules, medical-knowledge retrieval, and auditable response generation. The underlying WDBC predictor is reused only as the risk-scoring component; the new contribution is the educational and agentic control plane that supports transparent model use, explanation of predictions, validation awareness, guideline grounding, and responsible human-centered interpretation. The educational contribution of the framework is to provide a training-oriented clinical AI environment in which learners can examine how risk prediction, explainability, leakage-aware validation, medical-knowledge grounding, and human oversight are combined in responsible decision-support workflows. The predictive foundation achieved AUC = 0.9985, accuracy = 0.9824, F1-score = 0.9859, Cohen's kappa = 0.9623, and RMSE = 0.0964 across stratified five-fold validation, outperforming LSTM, FT-Transformer, and SAINT baselines. The full-paper evaluation will extend the current performance analysis with leakage-aware validation, fold-level baseline comparison, bootstrap-based confidence intervals, McNemar testing, Holm-corrected comparisons, and calibration-aware metrics to assess both predictive performance and reliability in an educational clinical AI setting. The framework is positioned as an assistive and educational clinical AI tool for teaching responsible decision-support workflows, not as an autonomous diagnostic system.

Teaching Critical Thinking in the Age of AI Through Micro-Strategies for STEM Classrooms

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Keywords: Critical Thinking, STEM Education, Teaching Strategies, Higher Education, Educational Innovation

Abstract: The rapid expansion of Generative Artificial Intelligence (GenAI) has transformed critical thinking (CT) from a desirable educational outcome into an essential competence for responsible learning and professional practice. Effective interaction with AI requires individuals not only to formulate meaningful prompts but also to evaluate evidence, contrast alternative explanations, identify inaccuracies, and justify decisions. Consequently, higher education institutions are increasingly expected to integrate CT explicitly and transversally across all disciplines rather than treating it as an isolated skill. Although CT is widely recognized as a transferable competence, no universally accepted definition or instructional framework exists to guide its systematic development and assessment. Previous work by our research team found that STEM professors conceptualize CT according to the epistemological characteristics of their own disciplines and reported having developed it mainly through academic and professional practice rather than through explicit instruction. While this suggests that CT should be intentionally integrated throughout STEM curricula, professors frequently face practical barriers, including overloaded syllabi, limited classroom time, and the lack of accessible instructional resources. Consequently, little evidence exists regarding which teaching strategies STEM faculty perceive as both effective for developing CT and feasible for routine classroom implementation. This exploratory qualitative study investigated the perceptions of seven Mexican STEM professors regarding practical approaches for fostering CT. Based on a review of the literature, forty evidence-informed micro-strategies that can be incorporated into regular STEM instruction were identified. Participants evaluated each strategy

according to two dimensions: its perceived effectiveness for developing CT and its feasibility for implementation within typical STEM courses. Semi-structured interviews also explored perceived barriers to integrating CT into teaching practice. Participants consistently identified limited instructional time and students' varying levels of cognitive readiness as the principal obstacles to explicitly teaching CT. Nevertheless, 57% reported that the availability of ready-to-use instructional materials would motivate them to adopt CT-oriented activities in their courses. The strategies receiving the highest combined ratings for effectiveness and feasibility emphasized autonomous pre-class study, explicit inductive and deductive reasoning, evidence-based inference, authentic real-world problem solving, and the evaluation of alternative procedures or solutions. These findings suggest that STEM professors favor instructional approaches that can be naturally embedded into existing disciplinary activities rather than requiring substantial curricular redesign. The findings provide preliminary evidence that practical, low-overhead teaching micro-strategies may facilitate the transversal integration of CT into STEM education. Developing accessible repositories of evidence-based instructional materials may therefore represent an effective pathway for supporting faculty adoption and strengthening students' readiness to critically engage with AI-generated information.

Beyond Similarity: Strengthening Academic Integrity and Student Capacity in Online Assessment

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Keywords: Academic Integrity, Online Assessment, Student Development, Turnitin, Higher Education, Capacity Development, Plagiarism Deterrent Technology

Abstract: With the growing use of online assessments in higher education, addressing concerns of authorship, source utilization, and fairness has become increasingly complex. Many institutions rely on Turnitin to uphold academic integrity, yet in practice, they often reduce the tool to a mere similarity score. This reduces its educational value and shifts attention away from how students learn to write, cite, and use sources appropriately. What remains unexplored is how plagiarism-deterrent technologies can be integrated into academic practice in ways that promote student development rather than just identifying potential misconduct. The literature focuses more on detection than on the pedagogical and institutional contexts that make these technologies effective for teaching and learning. This conceptual paper uses a socio-technical lens to examine literature on academic integrity, online assessment, and the usage of Turnitin in higher education. This analysis focuses on four recurrent issues: how similarity reports are interpreted, the criteria staff use to make judgements, the influence of the assessment design on student behaviour, and the support students require to enhance their academic writing practices. The review concludes that a detection-led approach is too insufficient. Staff frequently overread similarity reports, interpret them differently, and do not always support students in comprehending feedback or improving their writing. These findings suggest a more pedagogical approach that integrates institutional policy, assessment design, staff development, and student support. The work proposes a framework for using plagiarism deterrent technologies as part of academic development rather than as standalone policing tools. The paper contends that universities can strengthen academic integrity by combining technology with teaching, guidance, and clearer academic expectations.

AI in Higher Education: Media and Information Literacy Providing the Critical Framework for Bridging Education, Ethics, and Human Rights

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Keywords: AI, Media and Information Literacy, Higher Education, Ethics, Human Rights

Abstract: This work positions Media and Information Literacy (MIL) as a viable response to Generative AI in higher education to set the balance right between technological advances, ethics and human rights. When Generative AI has become accessible to all, not only computer scientists, it has become necessary to empower learners with MIL knowledge, skills, values and attitudes to navigate safely and wisely the complex AI-powered education and information systems. MIL and digital competencies have become an urgent need for digital empowerment in order to get the most of these digital technologies and to build defences against threats to wise human agency, reflective and critical thinking, emotional and social intelligence, academic integrity, and equal opportunities to quality transformative education to all. This goes in line with the strategies of UNESCO that has taken the lead in this regard, targeting the enabling power of MIL as a lifelong evolving skill for over half a century and that has been proactive when it included digital competencies and AI literacy in its open access curricula and publications, promoting ethical, human rights-based and people-centred approaches to AI and harnessing the essential role of education in this regard. AI has been reshaping higher education quickly and steadily in ways never imagined before, raising at the same concerns about academic integrity, ethical accountability, and human rights. By integrating MIL in higher education, universities can cultivate a culture of excellence building generations of reflective, critical, and creative thinkers who are not only technologically proficient but also ethically responsible and civically engaged.

ChatGPT as a Learning Tool for Students in Medical Internship

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Keywords: Generative Artificial Intelligence, Custom GPT, ChatGPT, Medical Education, Medical Internship

Abstract: Generative artificial intelligence (GenAI) is rapidly transforming higher education by enabling personalized learning, immediate feedback, and on-demand academic support. In medical education, these technologies have the potential to help students cope with the intense cognitive demands of clinical training, where limited study time, extensive reading, and simultaneous academic and hospital responsibilities often hinder deep learning. Although ChatGPT has been widely discussed as an educational resource, evidence regarding the pedagogical impact of personalized ChatGPT (Custom GPTs) integrated into authentic medical learning activities remains limited. Current research has primarily examined general-purpose conversational AI or simulated educational settings. Few studies have evaluated the educational value of Custom GPTs specifically designed to support contextualized learning tasks in real clinical training environments. Moreover, there is limited empirical evidence regarding their influence on students' perceived learning efficiency, comprehension of complex content, academic performance, and clinical reasoning. A quantitative pretest-posttest study was conducted with 40 ninth-semester medical students enrolled in a Health Administration course while simultaneously completing their clinical rotations. Personalized ChatGPT assistants were developed to support the analysis of clinical cases and hospital-management cases involving decision-making. Before the activity, students received explicit instruction on prompt engineering and responsible AI use. Participants completed five-point Likert-scale questionnaires immediately before and after the intervention to assess perceived time efficiency, agility in study processes, comprehension of course content, and academic performance. Descriptive statistics and paired Student's t-tests ($\alpha = 0.05$) were used to evaluate changes following the intervention. Students reported statistically significant improvements across all evaluated dimensions ($p < 0.001$). Perceived comprehension and academic performance exhibited the greatest gains, increasing by approximately 32%, while perceived study agility and time efficiency improved by 25% and 22%, respectively. The structured interaction with personalized GPTs enabled students to analyze authentic medical-administrative cases, construct evidence-based arguments, and receive contextualized explanations tailored to the learning objectives. These findings suggest that Custom GPTs function not merely as information retrieval systems but as pedagogical mediators that scaffold reasoning, reduce unnecessary cognitive load, and foster self-

regulated learning when accompanied by explicit instructional guidance. Personalized ChatGPT assistants represent a promising educational innovation for medical education by enhancing perceived learning efficiency, conceptual understanding, and academic performance within authentic clinical training contexts. Their effectiveness appears to depend on thoughtful instructional design, explicit prompt engineering, and ethical guidance rather than on technology alone. Future research should evaluate long-term learning outcomes, objective measures of clinical reasoning, and comparative effectiveness against general-purpose AI assistants across diverse healthcare disciplines.

Exploring the Role of Artificial Intelligence-Supported Digital Learning in Enhancing Early Literacy Development Among Foundation Phase Learners in South African Primary Schools

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Keywords: Artificial Intelligence, Digital Learning, Early Literacy Development, Foundation Phase, Reading Instruction, Sustainable Development Goal 4, South African Primary Schools

Abstract: Within the South African context, persistent challenges in early literacy development continue to affect learner achievement, particularly in under-resourced schools. Despite literacy forming the foundation for future academic success, innovative approaches are needed to support the development of reading, writing, vocabulary, and comprehension skills among Foundation Phase learners. This study explores the role of AI-supported digital learning in enhancing early literacy development among Foundation Phase learners in South African primary schools. The study was guided by Lev Vygotsky's Sociocultural Theory and adopted the qualitative case study research approach drawing from the interpretive paradigm to explore fifteen (n = 15) foundation Phase teachers from three selected primary schools experiences who were purposively selected to participate using semi-structured interviews and photovoice to generate data from them and the data was thematically analysed. The findings from the study identified different opportunities and challenges associated with the use of AI technologies in supporting emergent literacy, reading fluency, vocabulary development, and learner engagement. It also revealed how AI-driven educational tools could contribute to inclusive and sustainable literacy practices that support equitable access to quality education. Meanwhile, the findings of this study also provided insights for teachers, school leaders, policymakers, and educational technology developers on the effective integration of AI in Foundation Phase literacy instruction as well as contribute to the ongoing discussions on the use of artificial intelligence to advance literacy education and supports the achievement of United Nations Sustainable Development Goals, particularly Goal 4, which seeks to ensure inclusive, equitable, and quality education for all.

Changes in the Structure of the Labor Market in the Era of the "Neural Network Explosion" and Corresponding Transformations in the Higher Education Sector

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Keywords: AI, Lifelong Learning, Role of University, Labour Market Transformations

Abstract: The aim of the project is to investigate the main trends in the transformation of the labor market and analyze the impact of these transformations on the structure and content of higher education. Rethinking the socio-economic structure of the new era. The special role of corporations in the modern world. The concept of permanent employment. A comprehensive approach to the individual. Increasing the role of hobbies, pet projects, social initiatives, volunteering. The ability to adapt as a key skill of modernity. Options for accumulating experience during training and the role of universities in this.

Human–AI Collaboration in Computational Agrochemistry Education: Integrating Generative AI and Deep Learning for Molecular Discovery and Research Training

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Keywords: Human-AI Collaboration, Generative AI, Deep Learning in Education, Research-Based Learning, Computational Agrochemistry

Abstract: Artificial intelligence is reshaping scientific discovery and transforming the ways students learn and conduct interdisciplinary research. Despite the growing availability of generative AI and deep learning models, examples demonstrating their integration into authentic research-based learning environments remain limited, particularly in computational agrochemistry. This work presents a human–AI collaborative framework developed as part of undergraduate research to illustrate how generative AI, deep learning, and molecular modeling can support interdisciplinary scientific training. The workflow combined large language models, the deep learning-based protein–ligand prediction model Boltz-2, AutoDock Vina, PLIP, PyMOL, RDKit, and Python-based analysis to guide the identification and prioritization of candidate sugarcane ripening agents targeting GA20-oxidase. Starting from a library of 8597 compounds, successive AI-assisted stages progressively reduced the search space through affinity prediction, molecular docking, structural interaction analysis, physicochemical characterization, and multicriteria decision-making. Beyond the scientific outcome, the workflow provided an authentic environment for developing computational thinking, data interpretation, hypothesis generation, and human-guided evaluation. Artificial intelligence acted not as a replacement for researchers but as a collaborative partner that accelerated analysis while preserving human supervision and critical judgment. The study demonstrates how generative AI and deep learning models can enhance undergraduate research and interdisciplinary STEM education by enabling students to participate in realistic scientific discovery processes. This case study highlights the potential of human–AI collaboration to foster research competencies, computational literacy, and sustainable innovation at the intersection of artificial intelligence, education, and agricultural sciences.

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