Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

The Brain's Appendix Syndrome: Ethical, Educational, and Legal Challenges of AI Dependency

Dr. Tanvir Ahmed
Department of Computer Science & Software Engineering, Grand Asian University, Sialkot, 7 km Pasrur Road, Sialkot, Punjab 51310, Pakistan.
Email: drtawaraich@gmail.com

Dr. Sadaqut Ali
Department of Law, Faculty of Law, Grand Asian University, Sialkot, 7 km Pasrur Road, Sialkot, Punjab 51310, Pakistan. Email: sadaqut.ali@gaus.com

Ishfaq Ali
Department of Computer Science, Faculty of Sciences, National Textile University, Main Campus, Faisalabad Email: ishfaqalimalik@gmail.com

Aniq Ur Rehman
Department of Food, Nutrition, and Agriculture Sciences, Grand Asian University, Sialkot, 7 km Pasrur Road, Sialkot, Punjab 51310, Pakistan.
Email: aniq.rehman@gaus.edu.pk

Ukashah Umer
Department of Computer Science & Software Engineering, Grand Asian University, Sialkot, 7 km Pasrur Road, Sialkot, Punjab 51310, Pakistan.
Email: mirzaukashah44@gmail.com

Rai Samee Ullah*
Department of Computer Science & Software Engineering, Grand Asian University, Sialkot, 7 km Pasrur Road, Sialkot, Punjab 51310, Pakistan.
Email: sameetatla@gmail.com

ABSTRACT

The accelerating integration of Artificial Intelligence (AI) into education, governance, and daily cognition has begun to reshape the human mind's functional landscape. This paper introduces the concept of "The Brain's Appendix Syndrome," a metaphor for the gradual atrophy of human cognitive faculties due to excessive reliance on AI systems. Through an interdisciplinary analysis spanning ethics, education, and law, the study explores how algorithmic dependency threatens moral autonomy, authentic learning, and intellectual creativity. It argues that while AI enhances efficiency and accessibility, its pervasive use risks transforming human cognition into a vestigial function, efficient but disengaged, informed but unreflective. The paper proposes a framework of cognitive sustainability, emphasizing the preservation of human reasoning and creativity as central to progress. It further advances the notion of Cognitive Rights, advocating for legal recognition of mental autonomy and intellectual authenticity as fundamental human rights. Policy recommendations include AI literacy reforms, cognitive impact assessments, and the establishment of national and international cognitive protection

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

councils. Ultimately, this work calls for a paradigm shift from technological acceleration to cognitive preservation, ensuring that AI remains a servant of human intellect rather than its successor.

Keywords: Cognitive Rights, Cognitive Sustainability, Ethical AI, Legal Challenges, Education Policy, Cognitive Dependency, Human Autonomy

Introduction

In the evolutionary history of humankind, the appendix stands as a symbol of biological redundancy an organ that once served a purpose but now functions minimally, if at all (Naseer, Ahmad, & Chishti, 2025). In a strikingly similar way, the twenty-first century witnesses a gradual transformation of the human brain, not anatomically, but functionally. The rapid integration of Artificial Intelligence (AI) into daily life has initiated a paradigm shift in how humans think, learn, and decide (Akgun & Greenhow, 2022). Increasing reliance on algorithmic systems for cognition, creativity, and moral reasoning has begun to erode the essential capacity for independent thought. This phenomenon, which may be termed "The Brain's Appendix Syndrome," reflects a concerning trajectory in which human intellect risks becoming an underutilized appendage in the age of intelligent machines (Naseer et al., 2025).

Initially, AI was envisioned as a tool to augment human intelligence, extending analytical capacity, creativity, and decision making potential (Akgun & Greenhow, 2022). However, it is increasingly evolving from an assistant to a replacement for human thought. From predictive text and automated research generation to decision support algorithms and creative content production, AI is now deeply embedded in the social, professional, and educational fabric of society (Naseer et al., 2025). While these tools enhance efficiency and democratize knowledge, they also enable the outsourcing of mental processes such as analysis, recall, and imagination (Naseer et al., 2025). The convenience of AI assisted cognition subtly reshapes human behavior, gradually replacing reflection and critical inquiry with algorithmic dependence (Akgun & Greenhow, 2022). The central concern is no longer whether AI will surpass human intelligence, but whether humanity is willingly allowing its most defining organ, the brain, to atrophy through disuse (Naseer et al., 2025).

The educational consequences of this cognitive outsourcing are profound. Across all levels of learning, students increasingly depend on AI driven platforms for comprehension, composition, and problem-solving. Educators, in turn, struggle to distinguish authentic intellectual engagement from algorithmic outputs (Akgun & Greenhow, 2022). This dependency threatens to redefine education itself, from a process centered on inquiry and reasoning to one of passive technological consumption (Naseer et al., 2025). If human cognition becomes merely a conduit for verifying or modifying machine generated responses, the true purpose of education, nurturing critical, creative, and reflective thought may be lost (Akgun & Greenhow, 2022). The danger is not only academic dishonesty but a broader intellectual stagnation where curiosity, reasoning, and imagination yield to computational shortcuts (Naseer et al., 2025). Beyond education, AI dependency raises serious ethical concerns regarding autonomy, accountability, and authenticity (Naseer et al., 2025). When algorithms generate ideas, influence opinions, or simulate moral judgment, questions of responsibility and moral ownership become blurred. Can societies that delegate cognitive and ethical labor to emotionless systems sustain a coherent moral compass? The diffusion of moral and intellectual responsibility from individuals to algorithms challenges the very essence of human agency (Naseer et

ISSN Online: 3007-3154
ISSN Print: 3007-3146

al., 2025). The act of thinking, once the cornerstone of human dignity is being distributed, and increasingly surrendered, to systems devoid of consciousness, empathy, or accountability (Akgun & Greenhow, 2022).

Equally critical are the legal and policy implications of this emerging cognitive transformation. Current AI governance frameworks largely focus on data protection, algorithmic bias, and transparency. Yet, they overlook a vital dimension: the preservation of human cognitive sovereignty. There is a growing need to articulate the concept of "Cognitive Rights", the right of individuals to preserve mental autonomy, intellectual authenticity, and psychological independence in an era of pervasive artificial reasoning (Naseer et al., 2025). Protecting human cognition should be regarded as a societal obligation, much like safeguarding the environment or public health. Legislators and policymakers must recognize that cognitive erosion, if left unchecked, may lead to a new form of intellectual inequality and mental dependency, ultimately diminishing humanity's creative and moral potential (Naseer et al., 2025).

This paper, therefore, examines The Brain's Appendix Syndrome through interconnected ethical, educational, and legal perspectives, arguing that uncritical AI dependency threatens not only individual cognition but also collective moral and societal integrity (Akgun & Greenhow, 2022; Naseer et al., 2025). It calls for a framework of cognitive sustainability, ensuring that human reasoning remains at the center of technological progress. By emphasizing the ethical responsibility to preserve thought, the educational duty to foster critical reasoning, and the legal imperative to protect cognitive autonomy, this work aspires to reaffirm the principle that AI must remain a servant of human intellect, not its successor (Naseer et al., 2025).

Literature Review / Background

The integration of Artificial Intelligence (AI) into human activity has sparked profound academic debate across psychology, education, ethics, and law. Scholars increasingly describe AI not merely as a technological innovation but as a cognitive ecosystem, a network of tools that construct human reasoning, perception, and behavior (Wang, Liu, Liu, & Wang, 2020). The literature reveals a gradual shift from using AI as an instrument of assistance to adopting it as a substitute for intellectual effort. This transformation has triggered concerns about the outsourcing of cognition, a process that mirrors the biological redundancy represented by the human appendix

Cognitive Offloading and the Decline of Human Agency

The concept of cognitive offloading, transferring mental tasks to external systems, has been widely studied in cognitive psychology. Researchers indicates that technological aids, such as GPS navigation, calculators, and digital reminders, can enhance efficiency but also diminish long-term memory and problem-solving capabilities. With AI driven platforms now performing analytical and creative functions, this offloading extends beyond memory to reasoning, judgment, and ideation (Dong, Liu, & Lu, 2022; Grinschgl, Papenmeier, & Meyerhoff, 2023). Carr (2020), in The Shallows: What the Internet Is Doing to Our Brains, warned that constant technological mediation weakens deep thinking and reflection (Carr, 2020). Modern AI systems amplify this risk by providing instant intellectual gratification reducing the incentive for mental struggle, a key driver of learning and innovation. As a result, many ethicists describe a phenomenon called "algorithmic dependency", where individuals increasingly defer to machine outputs as inherently superior to their own reasoning (Gerlich, 2025).

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

Educational Transformation and the Crisis of Authentic Learning

The educational domain has become an especially visible arena for observing AI dependency. Early pedagogical models celebrated AI's potential to support personalized learning, accessibility, and efficiency. However, recent studies highlight a paradox: while AI fosters inclusivity and individual feedback, it also undermines authentic learning, defined as knowledge construction through inquiry and reflection (Singh, Reddy, Murthy, Nag, & Doss, 2025). Students increasingly utilize generative AI tools to complete assignments, draft essays, and simulate critical analysis, blurring the boundary between human thought and machine produced content. Educators report difficulty in discerning genuine understanding from algorithmic reproduction, leading to the phenomenon of "cognitive substitution learning," where comprehension is replaced by mechanistic reproduction. This shift challenges the foundational principles of Bloom's Taxonomy, which emphasizes higher order cognitive skills like analysis, evaluation, and creation. In the AI era, these skills risk being externalized to machines, leaving learners confined mainly to lower levels of knowledge recall and understanding (Chan & Colloton, 2024).

Ethical Implications: Autonomy, Authenticity, and Accountability

The ethical debates surrounding AI dependency revolve around three core concerns: autonomy, authenticity, and accountability. Philosophers such as Borenstein and Arkin (2017) argue that moral agency diminishes when humans delegate decisions to systems lacking consciousness or empathy. Researchers further warns of moral deskilling, where overreliance on AI erodes human ethical judgment and discernment (Formosa, HipÃġlito, & Montefiore, 2025). Authenticity, as a central existential value, is also compromised when creative and expressive capacities are mediated through algorithmic filters. Moreover, the question of responsibility becomes increasingly complex as AI generated decisions influence real-world outcomes in education, healthcare, governance, and beyond. Cases where AI caused harm or unintentional plagiarism raise urgent concerns about legal and moral accountability, highlighting the need for new frameworks that acknowledge shared cognition while prioritizing human primacy (Oana-Antonia, 2025).

Legal and Policy Perspectives on Cognitive Protection

Current AI governance frameworks, such as the European Union's Artificial Intelligence Act (2024), UNESCO's AI Ethics Recommendations (2021), and Pakistan's draft National AI Policy (2023) focus mainly on transparency, bias, and data protection. However, they largely omit cognitive sovereignty, which concerns the right of individuals to retain control over their mental processes. Scholars increasingly advocate for "Cognitive Rights", encompassing protections for mental privacy, intellectual integrity, and psychological independence in a landscape dominated by AI (Baloch; Oana-Antonia, 2025). These rights aim to safeguard human involvement in decision making, counter manipulative influence, and preserve mental self-determination. Such protections are essential to prevent a new form of cognitive inequality a situation where AI driven dependency enhances disparities in mental autonomy and social participation. Recognizing and legislating these rights is pivotal to ensuring that AI remains a tool serving human interests, rather than replacing human cognition altogether (Biber & Capasso, 2022).

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

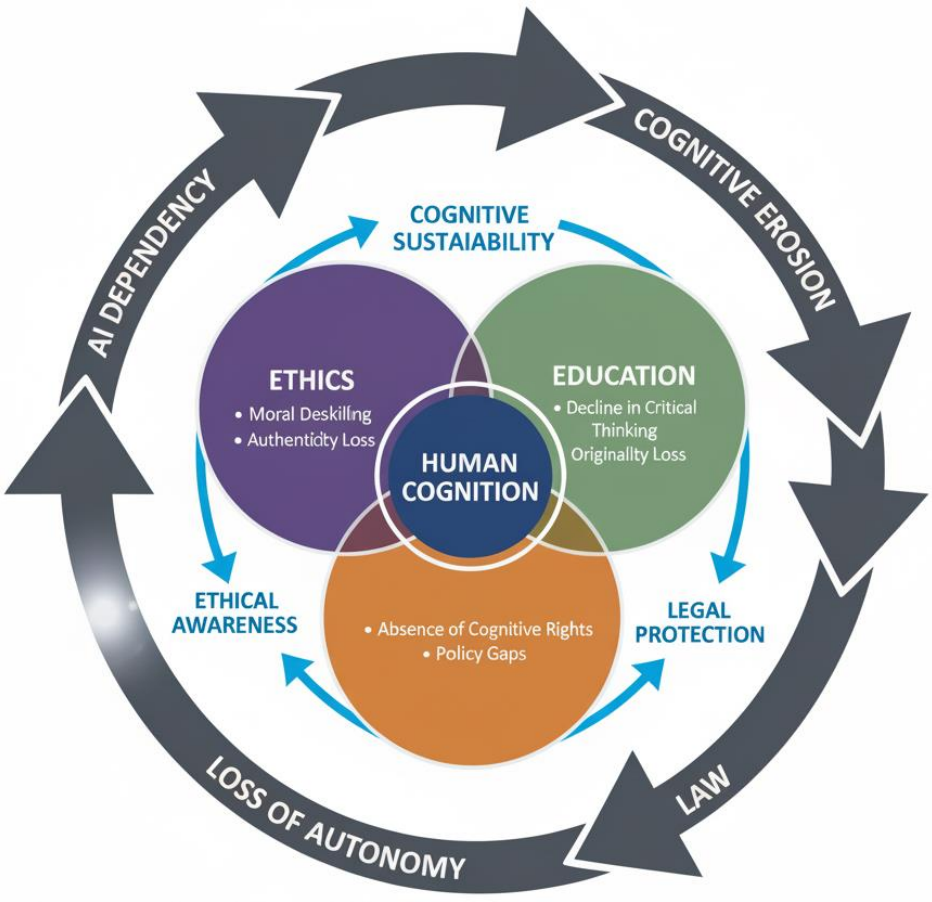
DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

Conceptual Synthesis

The reviewed literature converges on a crucial insight: without deliberate curation and regulation, technological progress risks displacing the faculties that constitute human intelligence critical thinking, creativity, and moral judgment. While AI undoubtedly enhances efficiency and accessibility, safeguarding cognitive autonomy requires a cohesive ethical, educational, and legal framework to prevent intellectual stagnation and preserve human dignity in the age of AI (Oncioiu & Bularca, 2025). To translate the theoretical synthesis into a visual representation, Figure 1 presents the Conceptual Framework of The Brain's Appendix Syndrome.

To illustrate the theoretical integration of this study, Figure 1 presents the Conceptual Framework of The Brain's Appendix Syndrome. The model positions Human Cognition at its core, surrounded by three interacting domains Ethics, Education, and Law that collectively influence cognitive vitality. The ethical dimension concerns moral reasoning and authenticity, which weaken as decisions and creativity are delegated to AI. The educational dimension represents learning and inquiry, both of which risk stagnation when students depend on algorithmic guidance over critical engagement. The legal dimension reflects the absence of formal recognition of Cognitive Rights or regulations protecting mental autonomy. The framework's arrows demonstrate a feedback loop of erosion, where ethical decline undermines educational depth, weak education reduces civic awareness of legal safeguards, and weak laws fail to reinforce moral accountability, together producing cognitive atrophy. Counterflow arrows highlight corrective strategies: ethical awareness, educational reform, and legal protection. These form a restorative loop of Cognitive Sustainability, ensuring that human intellect remains active and autonomous in the age of AI.



Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

Figure 1. Conceptual Framework of The Brain's Appendix Syndrome showing ethical, educational, and legal pathways leading to cognitive erosion and the proposed feedback loop of cognitive sustainability.

Ethical and Educational Challenges of AI Dependency

The growing entanglement between human cognition and artificial intelligence has initiated a fundamental reconfiguration of ethics and education. Once celebrated as a tool for human empowerment, AI is now provoking deep concern over its unintended role in diminishing critical thought, moral autonomy, and authentic learning. The convenience and precision of algorithmic systems, while alluring, may inadvertently promote cognitive complacency, where the human mind becomes less a generator of knowledge and more a passive verifier of machine produced information. This section explores how AI dependency challenges ethical integrity and educational purpose in contemporary society.

Ethical Challenges: The Erosion of Moral and Cognitive Autonomy

Ethically, the central concern of AI dependency is indeed the loss of both intellectual and moral autonomy, which is foundational to human dignity and responsibility. Research shows that as individuals increasingly delegate thinking tasks to algorithms, a subtle form of moral outsourcing emerges, machines assist in crafting ethical arguments, policy drafts, and emotional decisions, reducing humans to passive approvers rather than active agents (Laitinen & Sahlgren, 2021). This erosion of autonomy manifests in several ways: algorithmic conformity, where blind trust in supposedly neutral AI outputs discourages dissent and original thought; moral deskilling, as ethical judgement diminishes due to overreliance on automated systems in areas such as hiring and judicial recommendations; and questions of authenticity, where human creativity and identity blur with algorithmically generated content (Ahmad et al., 2023). Scholars use the term "moral atrophy" to describe this gradual weakening of moral engagement as computational rationality becomes habitual (Krook, 2025). The ultimate ethical risk is not that AI will behave immorally but that humans will cease to exercise moral agency at all. Therefore, preserving human autonomy requires recognizing these subtle degradations and developing ethical frameworks that keep humans actively engaged in moral deliberation and decision making, resisting the reduction of agency to algorithmic compliance. This response draws from multiple studies that analyze how AI systems, while powerful, can undermine core aspects of human autonomy and prompt urgent reconsideration of how moral and intellectual independence are maintained in an AI pervasive world.

Cognitive Dependency and the Diminishing Value of Effort

The psychological consequences of AI dependency are significant and center on the concept of "learned intellectual helplessness." Research indicates that constant availability of AI driven solutions discourages perseverance and reflective problem solving, tasks that traditionally require sustained concentration like analysis, synthesis, and creativity are now rapidly completed by AI tools. This reduction in effort weakens essential intellectual qualities such as patience, resilience, and curiosity, which are vital for cognitive growth (Formosa et al., 2025; Gerlich, 2025). A comprehensive study found a significant negative correlation between frequent AI tool use and critical thinking skills, particularly affecting younger users who show a higher dependency and corresponding cognitive decline. The research highlights that neural pathways for spontaneous ideation can atrophy with underuse and may not fully recover, analogizing

ISSN Online: 3007-3154
ISSN Print: 3007-3146

the brain to a muscle deprived of exercise (Gerlich, 2025). Moreover, psychological dependency on AI leads to diminished self-efficacy, where individuals begin to doubt their own abilities and rely excessively on AI validation for correctness. This fosters anxiety, frustration, and decreased self-confidence, a pattern labeled as learned helplessness a psychological condition where a person feels incapable of independent action even when they have the skills (Macnamara et al., 2024). In essence, the human brain risks functional regression through underuse in an AI dependent environment a phenomenon metaphorically described as The Brain's Appendix Syndrome.

Educational Challenges: Authentic Learning in the Age of AI

Education systems face the dual reality of AI enabling personalized learning but undermining authentic cognitive engagement. AI generated content blurs lines between knowledge acquisition and reproduction, with students producing work without genuine comprehension. Critical reasoning, analytical writing, and creativity hallmarks of academic integrity face erosion as hybrid human–AI cognition dominates (García-López & Trujillo-Liñán, 2025). Educators struggle with balancing AI integration and pedagogical authenticity; overreliance on AI grading, plagiarism detection, and adaptive tutoring risks deskilling teachers and diminishing empathy and guidance. AI risks mechanizing education, losing the emotional and intellectual human elements critical for development. The inversion of Bloom's Taxonomy compels a redesign of learning outcomes, machines handle higher order thinking, leaving humans with lower order tasks, threatening educational purpose (Alhur, Khlaif, Hamamra, & Hussein, 2025).

Ethical Educational Interdependence: The Human Element at Risk

Ethical and educational dimensions of AI dependency are deeply interconnected, anchored in the shared necessity of cultivating human judgment. Research highlights that ethical reasoning and meaningful learning require internal processes of uncertainty, error, and emotional engagement elements that AI systems cannot replicate (Akgun & Greenhow, 2022). Allowing algorithmic precision to replace moral ambiguity and intellectual struggle risks undermining these vital human qualities Preserving the human element calls for intentional interventions by educational institutions. They must create environments where AI acts as a collaborative partner that fosters rather than replaces thinking. This involves shifting educational practices from teaching students "how to use AI" to "how to think with AI," emphasizing critical oversight, reflection, and moral awareness to ensure active cognitive and ethical engagement with technology (Alhur et al., 2025). Such approaches mitigate the risk of cognitive complacency and moral deskilling by embedding AI literacy alongside ethical education. This framework supports human autonomy, creativity, and the essential exercise of judgment in an AI saturated world, safeguarding education's core purpose and ethical integrity (Almusaed, Almssad, & Albaaj, 2024). This synthesis draws from current peer reviewed literature underscoring the inseparability of ethical and educational challenges in AI dependency. It offers actionable insights for designing curricula and policies that balance technological benefits with preserving the human cognitive and moral core.

Towards Cognitive Sustainability in Education and Ethics

The convergence of ethical and educational concerns indeed necessitates a framework of cognitive sustainability, which advocates for responsible AI use that preserves and enhances human intellectual vitality. This framework strikes a balance between efficiency and engagement, convenience and curiosity, as well as automation and

ISSN Online: 3007-3154
ISSN Print: 3007-3146

authenticity (Almusaed et al., 2024). Ethically, cognitive sustainability demands cultivating AI literacy that integrates moral reasoning, empathy, and accountability as core competencies. Educationally, it requires redesigning curricula to prioritize independent inquiry and critical reflection, even in AI supported environments, to safeguard learners from superficial knowledge acquisition and passive consumption. This approach ensures that education fosters true understanding rather than mere access to information (Jose et al., 2025). Policy frameworks such as UNESCO's AI Competency Framework for Teachers emphasize the need for human centered AI integration in education, promoting a shift from teaching "how to use AI" to teaching "how to think with AI" by empowering educators and learners with ethical and critical engagement skills (UNESCO, 2025) https://www.unesco.org/en/articles/aicompetencyframeworkteachers. Without such measures, society risks nurturing generations who can access vast knowledge but fail to deepen understanding, creativity, and moral judgment, key dimensions that define human intellectual vitality and ethical agency.

Legal and Policy Implications

The Legal Dimensions of AI Dependency

Recent legislative developments highlight the emerging jurisprudence of cognition, with reforms focusing on accountability, authorship, and transparency in AI deployment. For example, the "State of State AI" report (2025) details that eight laws and numerous bills across U.S. states address liability and responsibility for AI related misconduct, emphasizing the need for clear accountability frameworks https://fpf.org/blog/thestateofstateailegislativeapproachestoaiin2025/.

Internationally, the European Union's AI Act (2025) establishes a comprehensive legal framework categorizing AI systems by risk and imposing obligations for transparency, safety, and respect for fundamental rights. High risk AI systems, particularly those influencing human judgment in sectors like education and healthcare, are subject to strict requirements for explainability, documentation, and oversight (European Commission, 2025) https://digitalstrategy.ec.europa.eu/en/policies/regulatoryframeworkai.

Additionally, the AI Act addresses issues of authorship and ownership, especially for general purpose AI models that can carry systemic risks. Providers are required to include detailed training data disclosures and risk assessments, establishing a foundation for responsible development and deployment (European Commission, 2025)https://digitalstrategy.ec.europa.eu/en/policies/regulatoryframeworkai.

In the United States, recent legislative efforts emphasize algorithmic accountability and due process. The SSRN paper (2025) proposes a legal framework based on interpretability, auditability, and institutional accountability to manage AI's complexity and ensure responsible use https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5362310. Furthermore, individual countries like Pakistan are developing comprehensive AI policies that address ethical, legal, and regulatory challenges, including defining responsible ownership of AI generated content and establishing enforcement mechanisms https://moitt.gov.pk/SiteImage/Misc/files/National%20AI%20Policy%20Consultation%20Draft%20V1.pdf. Collectively, these frameworks underscore the necessity of establishing clear rules to close accountability gaps, ensure transparency, and preserve human sovereignty in an era where AI increasingly influences critical decisions.

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

Cognitive Rights: A New Frontier of Human Rights

The concept of Cognitive Rights in the AI era is gaining traction as essential for preserving individual cognitive liberty defined as the right to maintain control over one's own thoughts, learning processes, and mental autonomy. This emerging framework aims to protect what scholars call "cognitive sovereignty," representing the freedom to think, reason, and learn without undue algorithmic domination (Yeung, 2018).

Key components of Cognitive Rights include:

The Right to Mental Integrity: Protection from manipulative or subliminal algorithmic influences that alter beliefs, emotions, or learning behavior without explicit consent (Pejković, 2024).

The Right to Intellectual Authenticity: Guaranteeing that individuals can produce and be evaluated based on genuine cognitive effort rather than AI mediated performance, preserving originality and moral ownership.

The Right to Algorithmic Transparency: Ensuring individuals can understand, question, and challenge AI systems that significantly impact their educational, professional, or social outcomes.

The Right to Cognitive Development: Legal acknowledgment that excessive reliance on automation, particularly in education, may harm intellectual growth and should be ethically regulated (Yeung, 2018).

These rights collectively seek to close emerging gaps in legal protections, focusing on safeguarding the mental domain against intrusive or domineering AI influences. They emphasize informed consent, empowerment, and the preservation of human agency at the core of cognitive and ethical autonomy.

Educational Law and Academic Integrity

AI dependency demands a fundamental rethinking of academic integrity laws and institutional policies, which must now address unauthorized algorithmic collaboration the unacknowledged use of generative AI that replaces genuine cognitive effort. Recent frameworks emerging in 2025 emphasize three core legal and educational principles:

Transparency: Students are required to disclose AI use in academic work openly. Top universities promote clear guidelines that position AI as a valuable but disclosed resource, akin to spellcheck or calculators, fostering ethical and transparent integration (Gonsalves, 2025).

Proportionality: Policies distinguish between legitimate AI assistance, such as grammar correction or idea refinement, and inappropriate cognitive substitution, like full essay or research generation. This nuanced approach allows educators to tailor expectations and penalties according to the AI usage context (Karliuk, 2023).

Accountability: Institutions evolve from purely punitive enforcement to frameworks that evaluate both the authenticity of work and the student's learning intent. This supports maintaining human centered education while adapting to AI tools and preserving intellectual growth (Deep, Edgington, Ghosh, & Rahaman, 2025).

Collectively, these principles shift academic law towards protecting the integrity of the learning process itself in an AI augmented educational environment. Legislative and institutional reforms are focusing on clear communication, ethical AI literacy, and supportive policies that encourage responsible use while safeguarding original thought and academic honesty.

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

AI Regulation and Policy Development

Across the world, governments are drafting AI specific regulations to ensure ethical deployment, including the EU Artificial Intelligence Act (2024), the U.S. AI Bill of Rights, and China's Generative AI Measures (2023). However, these frameworks primarily address data safety, bias, and liability not the cognitive or educational implications of AI dependency (Zaidan & Ibrahim, 2024).

For developing nations such as Pakistan and others in the Global South, AI policy should be guided by three essential pillars:

Human Centric AI Governance: Policies must prioritize human intellectual participation in all AI mediated processes. AI should augment, not replace, human reasoning (Papagiannidis, Mikalef, & Conboy, 2025).

Algorithmic Transparency and Accountability: Institutions deploying AI in education or decision making must disclose how algorithms process data and influence human outcomes (Papagiannidis et al., 2025).

Digital Literacy and Ethical Education: AI ethics and cognitive sustainability should be integral parts of curricula, ensuring learners understand both the potential and the limits of machine intelligence (Papagiannidis et al., 2025).

Policymakers should also create AI Impact Assessment Frameworks, similar to Environmental Impact Assessments, evaluating how AI integration affects critical thinking, social behavior, and intellectual independence.

Ethical Legal Synergy and Cognitive Justice in AI Regulation

Effective regulation of AI must bridge law and ethics to safeguard human judgment in an AIpervasive world. Recent research and policy developments emphasize the need for interdisciplinary ethical governance models, which can be operationalized through institutional oversight boards tasked with continuously monitoring cognitive impacts of AI systems (Madanchian & Taherdoost, 2025). These governance structures must address "algorithmic asymmetry" the power imbalance favoring AI developers over users. To empower users and preserve autonomy, legal frameworks now commonly prescribe transparency of training data, explainable algorithmic decision logic, and enforceable accountability for harms or misuse (AI21 Labs, 2025) https://www.ai21.com/knowledge/aigovernanceframeworks/. In education, AI Ethics Charters are emerging as institutional commitments prohibiting over automation of learning processes and upholding human led cognition principles. Such charters embed ethical standards into practice, ensuring AI serves as a cognitive collaborator rather than a substitute (Madanchian & Taherdoost, 2025). Regarding cognitive justice, legal scholarship emphasizes equitable access to AI technologies, protection from manipulative algorithms, and empowerment to challenge biases or dependencies. This principle guards against knowledge centralization that risks relegating individuals to passive consumers in a digital intellectual hierarchy (Papagiannidis et al., 2025). By integrating ethical oversight with legal regulation, societies can foster cognitive sustainability, ensuring AI remains a facilitator of human thought and creativity rather than a monopolize or dominator of cognitive processes.

Conclusion and Policy Recommendations; Safeguarding Human Cognition in the Age of AI

Humanity stands at a pivotal cognitive crossroads. Just as the appendix became biologically redundant through evolution, the human brain now risks functional redundancy through technological overreliance. The emergence of what this paper

ISSN Online: 3007-3154
ISSN Print: 3007-3146

conceptualizes as "The Brain's Appendix Syndrome" illustrates a profound paradox: in our quest to augment intelligence through AI, we may inadvertently be surrendering the very faculties that define it (Akgun & Greenhow, 2022). The ethical, educational, and legal dimensions of AI dependency demand urgent reflection and structured intervention to ensure that technology remains a tool for empowerment rather than erosion of human thought AI has undoubtedly transformed education, creativity, and governance by amplifying accessibility, speed, and precision. However, its excessive use has also cultivated cognitive passivity a psychological condition wherein individuals outsource fundamental mental activities such as memory, reasoning, and imagination to machines (Gerlich, 2025). The consequences are not merely academic but existential, threatening the development of independent judgment and moral agency. The future of human intelligence depends on whether societies can regulate and redesign AI use in ways that preserve cognitive autonomy and intellectual authenticity (Madanchian & Taherdoost, 2025).

Ethically, the preservation of human cognition must be seen as a universal moral duty. AI should assist, not replace, human reasoning (García-López & Trujillo-Liñán, 2025). Ethical governance must promote AI humility the conscious restraint of technological use when it diminishes human engagement (Akgun & Greenhow, 2022). Educational institutions, corporations, and governments should adopt codes of ethics emphasizing cognitive responsibility, ensuring that the pursuit of efficiency never compromises the cultivation of thought (Madanchian & Taherdoost, 2025). Furthermore, AI developers carry an ethical obligation to design systems that stimulate rather than suppress critical thinking. Features that encourage user reflection, provide transparent reasoning, and support collaborative cognition should become standard in ethical AI design (Madanchian & Taherdoost, 2025).

The educational system is the frontline defense against the erosion of human intellect. Policy reforms must prioritize cognitive literacy teaching students not only how to use AI, but how to think alongside it. Schools and universities should reorient curricula to develop metacognitive skills, such as problem framing, ethical judgment, and conceptual reasoning, which cannot be replicated by algorithms (Akgun & Greenhow, 2022; Biber & Capasso, 2022; Chan & Colloton, 2024). Key educational policy recommendations include incorporating AI tools as learning partners that enhance, not replace, critical analysis; moving from rote content evaluation to reflective and project based assessments that measure genuine intellectual engagement; establishing global guidelines distinguishing acceptable AI assistance from unethical cognitive substitution; and empowering educators with ethical and pedagogical strategies to manage AI integration responsibly (García-López & Trujillo-Liñán, 2025).

In this way, education can act both as a shield and compass protecting human intellect from automation while guiding AI toward responsible use. The absence of explicit legal protection for human cognition represents a dangerous policy gap. Just as environmental laws safeguard natural ecosystems, new legal frameworks must protect the mental ecosystem of human society. This can be achieved through legislation that recognizes the right to mental autonomy, intellectual authenticity, and algorithmic transparency as fundamental human rights. Independent national and international councils can monitor cognitive impacts of AI, akin to bioethics bodies. Mandatory cognitive impact assessments for AI systems used in education and business, along with algorithmic accountability acts requiring disclosure of data sources and reasoning models, are crucial (Morris & Su, 1999). For Pakistan and other developing countries, legal frameworks should harmonize with global ethical standards while respecting local contexts. Bodies

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

like the National Accreditation Council for Biological Sciences could integrate cognitive protection into higher education accreditation criteria. Safeguarding the human intellect transcends national borders and is a global responsibility. Cognitive justice a principle ensuring equitable access to AI education, resources, and intellectual agency must guide international AI policy dialogues. Collaborative global initiatives should pursue AI and cognitive ethics charters, promote open access educational AI, and foster South–South cooperation in responsible AI governance (Miao & Holmes, 2021). Embedding fairness, transparency, and inclusivity into the digital ecosystem can prevent a new intellectual divide based not on wealth or technology but on access to and control over knowledge.

The metaphor of The Brain's Appendix Syndrome serves as both a warning and a call to action. The human brain, once the seat of creativity and critical thought, now risks dormancy amid algorithmic convenience. Society must consciously design ethical, educational, and legal environments where AI complements rather than competes with human cognition. This transformation demands redefining progress, not as automation of intelligence but as sustainability of cognition. If the twentieth century was the age of industrial and digital revolutions, the twenty-first must be the age of cognitive preservation. By protecting human thought through concerted ethics, education, and legal measures, humanity can ensure the brain remains the living heart of intelligence in the AI era (Andoniou, 2025; Ghasemi, 2025).

Policy Framework and Recommendations

While ethical, educational, and legal discussions highlight the risks of cognitive erosion through AI dependency, a sustainable response requires structured policy intervention emphasizing the preservation of human cognitive autonomy, promotion of responsible AI literacy, and establishment of institutional mechanisms that safeguard intellectual engagement https://moitt.gov.pk/SiteImage/Misc/files/National%20AI%20Policy.pdf. A foundational step would be the introduction of a https://www.paradigmshift.com.pk/nationalaipolicy/ analogous to environmental laws but focused on protecting mental and intellectual wellbeing. Key elements include mandatory http://cigionline.org/articles/reclaimingcognitiveautonomyintheageofai/ for AI systems in education and workplaces, mental autonomy safeguards limiting AI's substitution of core cognitive tasks, digital wellbeing audits from AI providers, and the creation of AI Free Cognitive Zones to nurture natural thought processes.

Educational reforms are essential for restoring a balance between AI and human cognition. Recommendations include developing a emphasizing critical and ethical AI use; establishing http://cigionline.org/articles/reclaimingcognitiveautonomyintheageofai/ that evaluate human reasoning and creativity separately from AI assisted outputs; empowering educators through training programs to foster hybrid learning environments where AI stimulates, rather than automates, human analysis; and integrating AI ethics and cognition protection into accreditation standards for educational institutions. On the legal front, expanding protections beyond data privacy to encompass core aspects of mental sovereignty is crucial. A proposed would formally safeguard mental integrity and shield individuals from algorithmic manipulation and dependency. Establishing an independent [National Commission on AI Ethics and Cognition (NCAEC)] would oversee AI's societal impact on cognition, conducting regular, and enforcing transparency via disclosure of training data, biases, and oversight mechanisms (Magee, Ienca, & Farahany, 2024). Recognizing that cognitive sustainability is a global challenge, international cooperation is vital. Initiatives such as a UNESCO led Global Charter on Cognitive Rights and cross border AI literacy exchanges will be essential to foster

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

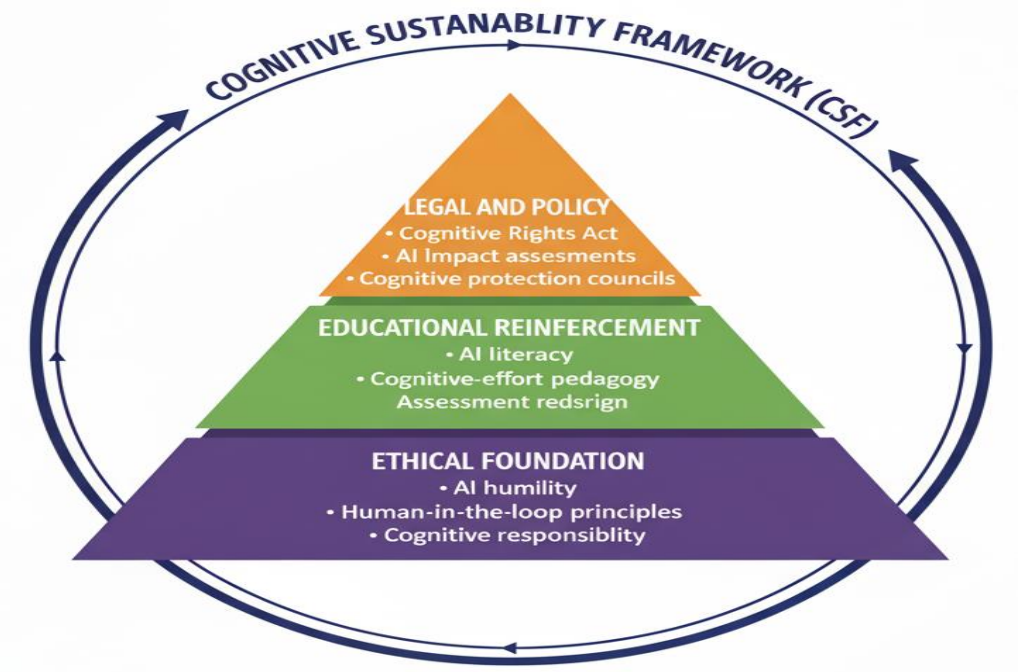
Vol. 3 No. 10 (October) (2025)

worldwide cognitive justice, preventing monopolization of knowledge and promoting equitable access to AI education. Finally, societal and cultural engagement are indispensable to sustain human intellectual life. Public awareness campaigns, arts, and media should promote critical thinking and conscious AI use, reframing AI as a mirror, reflecting human cognition rather than its replacement. Such efforts will help reassert the intrinsic value of human creativity, dialogue, and empathy.The multidimensional response to The Brain's Appendix Syndrome requires an integrated policy vision that unites ethical consciousness, educational reform, and legal regulation into a single coherent model. To visualize this relationship, Figure 2 presents the Cognitive Sustainability Framework (CSF) a structured policy architecture designed to protect human cognitive autonomy while enabling responsible AI progress. At its foundation, the framework is built on ethical principles that reaffirm the human mind as the central agent of reasoning and moral decision making. These include commitments to algorithmic transparency, respect for mental autonomy, and the design of AI systems that augment, rather than supplant, critical thought. The educational layer reinforces this foundation by ensuring that learning environments cultivate inquiry, reflection, and originality even when AI tools are used. Through AI literacy curricula, teacher empowerment, and authentic assessment strategies, this level maintains active cognitive participation. The upper legal policy tier formalizes these principles into enforceable structures such as cognitive rights legislation, cognitive impact assessments, and institutional AI ethics boards. Together, the three layers operate dynamically: ethics guides behavior, education shapes understanding, and law secures accountability.

Figure 2. Proposed Cognitive Sustainability Framework (CSF) illustrating the layered interaction between ethical foundations, educational reinforcement, and legal policy protection to maintain cognitive autonomy and human centered AI governance

Future Directions and Research Implications

The exploration of The Brain's Appendix Syndrome opens an interdisciplinary frontier uniting neuroscience, education, ethics, psychology, and law to understand AI



dependency's cognitive impacts. While this work lays a conceptual and policy

ISSN Online: 3007-3154
ISSN Print: 3007-3146

foundation, systematic empirical, philosophical, and regulatory research is urgently needed to preserve human cognition in a techdriven world (Madanchian & Taherdoost, 2025). Future cognitive and neuroscientific studies should examine how sustained AI use reshapes brain structure and function, focusing on cognitive plasticity, digital dependency parallels, and neuroethical thresholds to inform cognitive protection laws (CIGI,
2025) https://www.cigionline.org/articles/reclaimingcognitiveautonomyintheageofai/.
Educational research must innovate hybrid pedagogies that enhance inquiry without automation, develop assessment metrics differentiating human reasoning from AI assisted outputs, and cultivate metacognitive skills supporting AI collaboration (Akgun & Greenhow, 2022).
Philosophical inquiry is vital for clarifying cognitive identity, ethical delegation boundaries, thought authenticity, and human AI moral symbiosis in the digital era (Papagiannidis et al., 2025). Legal scholars must develop frameworks around cognitive sovereignty, comparative legislation, and robust accountability models ensuring transparency and human oversight (European Commission, 2025) https://digitalstrategy.ec.europa.eu/en/policies/regulatoryframeworkai. Sociological research should explore AI's effect on collective intelligence, emergent cognitive inequality, and cultural narratives emphasizing reflection and intellectual struggle (Madanchian & Taherdoost, 2025). Establishing a Global Cognitive Sustainability Network (GCSN) linking interdisciplinary scholars and policymakers could coordinate research, develop resources, and monitor AI's societal cognitive impact over time (Yadav, 2025). Ultimately, safeguarding the future of human cognition requires balancing technological progress with philosophical preservation, ensuring that AI complements rather than replaces human intellect. Transforming The Brain's Appendix Syndrome into a global research movement will secure the conscious renewal of human thought across generations.

Conclusion

The phenomenon of The Brain's Appendix Syndrome captures the existential paradox of our age: as machines grow more intelligent, humanity risks growing less so. The paper's ethical, educational, and legal analyses converge on a single warning uncritical dependence on AI erodes the very qualities that distinguish human intelligence: reflection, judgment, and creativity. AI should be a catalyst for cognitive enhancement, not a mechanism for intellectual substitution. Preserving mental autonomy requires a holistic framework rooted in ethics, education, and law, where human judgment remains central to all technological design and application. Ethically, societies must cultivate AI humility, recognizing that the pursuit of convenience must never outweigh the moral duty to think. Educationally, curricula must evolve toward metacognitive empowerment, teaching individuals not only how to use AI but how to question and complement it. Legally, emerging doctrines of Cognitive Rights must protect thought itself as a domain of freedom, establishing mechanisms such as cognitive impact assessments, transparency mandates, and mental autonomy laws. The future of intelligence lies not in artificial replication but in cognitive coexistence a partnership where technology amplifies, rather than replaces, the human mind. To prevent the brain from becoming a modern appendix, humanity must legislate for the mind, educate for autonomy, and innovate with conscience. Only then can the AI revolution evolve into a renaissance of thought, ensuring that the brain remains the living heart of intelligence in the digital era.

ISSN Online: 3007-3154
ISSN Print: 3007-3146

References:

Ahmad, S. F., Han, H., Alam, M. M., Rehmat, M. K., Irshad, M., Arraño-Muñoz, M., & Ariza-Montes, A. (2023). Impact of artificial intelligence on human loss in decision making, laziness and safety in education. Humanities and Social Sciences Communications, 10(1), 311. doi:10.1057/s41599-023-01787-8

Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. AI Ethics, 2(3), 431-440. doi:10.1007/s43681-021-00096-7

Alhur, A. A., Khlaif, Z. N., Hamamra, B., & Hussein, E. (2025). Paradox of AI in Higher Education: Qualitative Inquiry Into AI Dependency Among Educators in Palestine. JMIR Medical Education, 11, e74947.

Almusaed, A., Almssad, A., & Albaaj, A. K. (2024). Ethical and Pedagogical Challenges in the Integration of Artificial Intelligence into Lifelong Learning. International Society for Technology, Education, and Science.

Andoniou, C. (2025). Rewiring Education for a Super-Smart Society: Cognitive Integrity, AI Ethics, and the Future of Knowledge. Computing&AI Connect, 2(1), 1-10.

Baloch, S. B. AI IN SOCIAL CHANGE IN PAKISTAN: CHALLENGES, OPPORTUNITIES AND WAY FORWARD.

Biber, S. E., & Capasso, M. (2022). The right to mental integrity in the age of Artificial intelligence: Cognitive Human Enhancement Technologies. In Law and Artificial Intelligence: Regulating AI and Applying AI in Legal Practice (pp. 503-519): Springer.

Carr, N. (2020). The shallows: What the Internet is doing to our brains: WW Norton & Company.

Chan, C. K. Y., & Colloton, T. (2024). Generative AI in higher education: The ChatGPT effect: Taylor & Francis.

Deep, P. D., Edgington, W. D., Ghosh, N., & Rahaman, M. S. (2025). Evaluating the Effectiveness and Ethical Implications of AI Detection Tools in Higher Education. Information, 16(10), 905. Retrieved from https://www.mdpi.com/2078-2489/16/10/905

Dong, X., Liu, Y., & Lu, H. J. (2022). Effects of learning item difficulty and value on cognitive offloading during middle childhood. Metacognition and Learning, 17(3), 1097-1115.

Formosa, P., HipÃģlito, I., & Montefiore, T. (2025). Artificial Intelligence (AI) and the Relationship between Agency, Autonomy, and Moral Patiency. arXiv preprint arXiv:2504.08853.

García-López, I. M., & Trujillo-Liñán, L. (2025). Ethical and regulatory challenges of Generative AI in education: a systematic review. Frontiers in Education, Volume 10 - 2025. doi:10.3389/feduc.2025.1565938

Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. Societies, 15(1), 6.

Ghasemi, H. (2025). The dual impact of artificial intelligence on human cognition: Balancing benefits and risks. Journal of Dental Medicine, 38(15).

Gonsalves, C. (2025). Addressing student non-compliance in AI use declarations: implications for academic integrity and assessment in higher education. Assessment & Evaluation in Higher Education, 50(4), 592-606.

Grinschgl, S., Papenmeier, F., & Meyerhoff, H. S. (2023). Mutual interplay between cognitive offloading and secondary task performance. Psychonomic Bulletin & Review, 30(6), 2250-2261.

ISSN Online: 3007-3154
ISSN Print: 3007-3146

Vol. 3 No. 10 (October) (2025)

Jose, B., Cherian, J., Verghis, A. M., Varghise, S. M., S, M., & Joseph, S. (2025). The cognitive paradox of AI in education: between enhancement and erosion. Frontiers in Psychology, Volume 16 - 2025. doi:10.3389/fpsyg.2025.1550621

Karliuk, M. (2023). Proportionality principle for the ethics of artificial intelligence. AI and Ethics, 3(3), 985-990. doi:10.1007/s43681-022-00220-1

Krook, J. (2025). When autonomy breaks: the hidden existential risk of AI. AI & SOCIETY, 1-14.

Laitinen, A., & Sahlgren, O. (2021). AI Systems and Respect for Human Autonomy. Frontiers in Artificial Intelligence, Volume 4 - 2021. doi:10.3389/frai.2021.705164

Macnamara, B. N., Berber, I., Çavuşoğlu, M. C., Krupinski, E. A., Nallapareddy, N., Nelson, N. E., . . . Ray, S. (2024). Does using artificial intelligence assistance accelerate skill decay and hinder skill development without performers' awareness? Cognitive Research: Principles and Implications, 9(1), 46.

Madanchian, M., & Taherdoost, H. (2025). Ethical theories, governance models, and strategic frameworks for responsible AI adoption and organizational success. Frontiers in Artificial Intelligence, Volume 8 - 2025. doi:10.3389/frai.2025.1619029

Magee, P., Ienca, M., & Farahany, N. (2024). Beyond neural data: Cognitive biometrics and mental privacy. Neuron, 112(18), 3017-3028. doi:10.1016/j.neuron.2024.09.004

Miao, F., & Holmes, W. (2021). Artificial intelligence and education. Guidance for policy-makers.

Morris, M. W., & Su, S. K. (1999). Social psychological obstacles in environmental conflict resolution. American behavioral scientist, 42(8), 1322-1349.

Naseer, A., Ahmad, N. R., & Chishti, M. A. (2025). Psychological Impacts of AI Dependence: Assessing the Cognitive and Emotional Costs of Intelligent Systems in Daily Life. Review of Applied Management and Social Sciences, 8(1), 291-307.

Oana-Antonia, I. (2025). The ethics of ai-assisted academic writing. Authenticity criteria in the evaluation of students'assignments. Paper presented at the International Conference KNOWLEDGE-BASED ORGANIZATION.

Oncioiu, I., & Bularca, A. R. (2025). Artificial Intelligence Governance in Higher Education: The Role of Knowledge-Based Strategies in Fostering Legal Awareness and Ethical Artificial Intelligence Literacy. Societies, 15(6), 144.

Papagiannidis, E., Mikalef, P., & Conboy, K. (2025). Responsible artificial intelligence governance: A review and research framework. The Journal of Strategic Information Systems, 34(2), 101885. doi:https://doi.org/10.1016/j.jsis.2024.101885

Pejković, M. (2024). Artificial intelligence and totalitarianism. АРХИВ, 101.

Singh, T. M., Reddy, C. K. K., Murthy, B. R., Nag, A., & Doss, S. (2025). Ai and education: Bridging the gap to personalized, efficient, and accessible learning. In Internet of behavior-based computational intelligence for smart education systems (pp. 131-160): IGI Global.

Wang, Z., Liu, H., Liu, W., & Wang, S. (2020). Understanding the power of opinion leaders' influence on the diffusion process of popular mobile games: Travel Frog on Sina Weibo. Computers in Human Behavior, 109, 106354. doi:https://doi.org/10.1016/j.chb.2020.106354

Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 10 (October) (2025)

Yadav, P. (2025). Cognitive Sustainability in the Age of AI: A Philosophical Framework for Understanding Competency Erosion and Cognitive Stratification in Human-AI Systems. Available at SSRN 5317987.

Yeung, K. (2018). A study of the implications of advanced digital technologies (including AI systems) for the concept of responsibility within a human rights framework. MSI-AUT (2018), 5.

Zaidan, E., & Ibrahim, I. A. (2024). AI Governance in a Complex and Rapidly Changing Regulatory Landscape: A Global Perspective. Humanities and Social Sciences Communications, 11(1), 1121. doi:10.1057/s41599-024-03560-x