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The impact of A.I. on reading and literacy practices: implications for vocational training in the Adriatic-Ionian Region

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Abstract

This study examines the deep transformation of reading practices through artificial intelligence (IA) integration and its implications for vocational training systems in the Adriatic-Ionian region. The research analyzes the shift from conjunctive to connective cognitive models, exploring how this transition challenges educational institutions and creates opportunities for regional economic development. Building on action research theory and critical pedagogy, the study identifies two emerging literacy types - semantic web literacy and critical AI literacy - as essential for maintaining professional autonomy in algorithmically-mediated environments. The paper proposes a "Think/Do/Rethink" framework that repositions vocational education and training (VET) from traditional knowledge transmission to community-based learning ecosystems. Key findings reveal that the cultural and linguistic diversity of the Adriatic-Ionian region, often perceived as a barrier to integration, actually represents a strategic asset for developing human-centered approaches to digital transformation. The study concludes that successful adaptation requires epistemological regeneration of VET systems, integration of applied AI ethics in curricula, and reconceptualization of training institutions as digital territorial welfare infrastructure.

JEL Classification: *I25, O33, R11, R58, J24, O31*

Keywords:*artificial intelligence, vocational training, digital literacy, regional development, Adriatic-Ionian cooperation, professional autonomy*

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1. Introduction

The advent of artificial intelligence (AI) in educational and professional contexts is representative of what Floridi (2014) terms a "fourth revolution" – a profound transformation comparable only to those initiated by Copernicus, Darwin, and Freud. In the context of reading practices, librarians and cultural workers are instrumental in facilitating this transition from the "literate infosphere" to the "digital infosphere". This shift in information processing, knowledge construction, and professional skill development is characterised by the profound and irreversible impact of artificial intelligence. The global discourse on AI in education has intensified significantly in recent years. UNESCO's (2019) comprehensive analysis identifies six critical challenges that must be addressed: the development of comprehensive public policy frameworks for AI in sustainable development; the assurance of inclusion and equity in AI-enabled education, particularly for least developed countries; the preparation of teachers for AI-powered learning environments while ensuring AI developers understand educational contexts; the development of quality and inclusive data systems to support effective AI implementation; the enhancement of research that meaningfully informs both practice and policy-making; and the establishment of ethical frameworks for data collection, use, and dissemination. These challenges are especially pronounced in contexts characterised by linguistic diversity, varying levels of digital maturity, and heterogeneous educational systems – conditions that are exemplified by the Adriatic-Ionian region.Building on UNESCO's framework, Chaudhry and Kazim (2022) provide a high-level overview of AI in Education (AIEd), emphasizing how AI can reduce teachers' workload through automation of routine tasks, enable contextualized learning through adaptive systems, revolutionize assessment practices, and support the development of intelligent tutoring systems. Crucially, they highlight the ethical dimensions of AIEd and examine how the COVID-19 pandemic has accelerated both the adoption of AI technologies and the urgency of research into their educational implications. Their work underscores that AI's role in education extends beyond mere technological integration - it fundamentally reshapes the relationship between educators, learners, and knowledge itself.
More recently, Spigarelli et al. (2024) have explored the intersection of entrepreneurship education and digital humanities, demonstrating how universities must adapt to rapid changes in the labor market brought about by digital and green transitions. Their analysis emphasizes the growing need for integration between STEM disciplines and social sciences and humanities - a perspective that directly informs our understanding of vocational education and training (VET) in the digital age. This integration becomes particularly critical when considering how AI literacy must be developed not merely as technical

competency but as a form of humanistic education that preserves critical thinking, ethical reasoning, and cultural awareness.Aside from these recent contributions, there remains a significant gap in studies specifically addressing the impact of AI on vocational training systems in the Adriatic-Ionian region. This region, comprising ten countries with varying levels of digital maturity, multiple linguistic traditions, and heterogeneous educational systems, presents unprecedented challenges and opportunities for reinventing vocational training in the age of artificial intelligence.

This study addresses three interconnected research questions: First, how does the cognitive shift from the conjunctive to the connective model reshape professional practice in cultural mediation roles? Second, what transformations are necessary for professional education to maintain its relevance while preserving human agency in algorithmically mediated environments? Third, how can the cultural diversity of the Adriatic-Ionian region become a strategic asset rather than an obstacle in digital transformation processes?The COVID-19 pandemic has accelerated digital transformation, revealing both the potential and the limits of technological acceleration. This article examines how educational institutions can manage the tension between efficiency-driven automation and human-centered learning approaches. This study, through a conceptual framework that goes beyond techno-determinist views, proposes a "post-humanist professional education" - an approach that recognizes the transformative power of technology while maintaining a critical focus on human autonomy, cultural specificity, and social justice.

2. Theoretical Framework: from alphabetic to algorithmic mediation

2.1. Cognitive transformation and the connective turn

The transition from print-based to digitally-mediated reading represents more than a change in information processing mechanisms; it constitutes a fundamental transformation in cognitive architecture and epistemological frameworks. As Hayles (2012) demonstrates in her analysis of contemporary technogenesis, humans and technics co-evolve, with our tools not merely extending our capabilities but actively reshaping our neural pathways and cognitive processes. The shift from what we might term "conjunctive" thinking - characterized by sustained attention, linear progression, and deep immersion in single texts - to "connective" thinking - marked by rapid context-switching, pattern recognition across disparate sources, and parallel processing of multiple information streams - reflects this co-evolutionary dynamic.

Historically, print culture encouraged what Carr (2010) describes as a specific mode of consciousness: deep reading characterized by sustained concentration, sequential processing, and the development of complex internal representations of textual meaning. The neurological consequences of centuries of print-based reading include enhanced capacities for abstract reasoning, critical analysis, and reflective thought. However, as Carr's research on neuroplasticity reveals, the brain's remarkable adaptability means that our intensive engagement with digital media is producing measurable changes in neural architecture. Regular internet use, characterized by rapid scanning, frequent interruptions, and constant decision-making about where to direct attention, strengthens certain neural pathways while allowing others to atrophy. Contemporary digital technology encourages fundamentally different cognitive patterns. Rather than the linear, sustained attention demanded by printed books, digital environments reward what Hayles (2012) terms "hyper reading" - rapid scanning across multiple sources, pattern recognition in scattered data, and the ability to navigate through hyperlinked information networks. This is not simply a degradation of traditional reading skills but the development of new cognitive capabilities adapted to information-rich, digitally-mediated environments. The challenge for vocational education lies in recognizing that both

modes - deep reading and hyper reading - represent valuable cognitive skills, each appropriate to different contexts and purposes. Baron (2015) demonstrates that this cognitive transformation extends beyond reading practices to encompass broader patterns of attention, memory, and knowledge construction. Digital natives, shaped from early childhood by screen-based interaction, exhibit different patterns of information seeking, evaluation, and retention compared to those primarily formed by print culture. These differences have profound implications for professional practice: where traditional models of expertise emphasized deep knowledge within bounded domains, contemporary professional competence increasingly requires the ability to navigate across domains, synthesize information from diverse sources, and adapt rapidly to changing contexts. Critically, this transformation occurs not in isolation but within what Scholz (2012) terms "digital labor" contexts, where cognitive work itself becomes subject to platform logics, algorithmic management, and data extraction. Computer systems do more than handle information; they actively shape what we perceive as real, making it increasingly difficult to distinguish between online and offline existence. Reading practices are now mediated by algorithmic recommendations, shaped by platform affordances, and constrained by systems that prioritize engagement metrics over comprehension or critical reflection. For vocational training systems, these transformations necessitate reconceptualizing what literacy means in the twenty-first century. Rather than viewing digital reading practices as deficient versions of print-based reading, we must recognize them as different modes of engagement with distinct strengths and limitations. The task is not to preserve print culture unchanged but to develop pedagogical approaches that cultivate both sustained attention and agile navigation, both deep analysis and rapid synthesis - preparing professionals capable of moving fluidly between cognitive modes as contexts require.

2.2 Professional autonomy in the age of algorithmic capitalism

The integration of AI into cognitive work creates what economists call "skill-biased technological change", but this expression fails to adequately capture the transformation underway. Beyond making some skills obsolete and creating demand for new ones, AI radically restructures the relationship between human judgment and automated decision-making. For cultural mediators - librarians, teachers, researchers, and information professionals - this transformation poses existential challenges. Traditionally, professional credibility and authority derived from expertise in organizing, curating, and transmitting information. Today's algorithmic systems, performing these functions with greater speed and scalability, raise fundamental questions about the future role of human intermediaries.

Turkle (2017) demonstrates how technologically mediated relationships alter not only efficiency but also the nature of human connections and meaning-making processes. Her research reveals that the presence of digital devices, even when not actively used, reduces the quality of face-to-face interactions and diminishes empathetic engagement. For professionals whose core competencies involve human interaction - teaching, counseling, cultural mediation - this has profound implications. The apparent threat of automation, however, holds potential for professional renewal. As routine information tasks automate, space opens for what might be termed "hybrid intelligence": human judgment integrated with computational power.Recent research by Prasetya et al. (2025) demonstrates that AI is reshaping vocational education globally through multiple mechanisms: personalizing learning experiences to individual student needs and learning styles; improving curriculum development through data analytics that reveal skill gaps and labor market demands; and enhancing practical training through automation and robotics, particularly in manufacturing and logistics sectors. Their bibliometric analysis reveals that while AI offers significant potential for improving accessibility, inclusivity, and equity in quality education, it also raises critical ethical concerns including data privacy violations, algorithmic bias that may perpetuate existing inequalities, and the infrastructure readiness challenges facing developing regions. Crucially, their

work demonstrates AI's contributions to the United Nations Sustainable Development Goals (SDGs), particularly SDG 4 (quality education access), SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation, and infrastructure) - positioning vocational training as central to sustainable development agendas.The Austrian case provides a concrete European example of how these challenges are being addressed through policy frameworks. Cedefop and ReferNet's (2025) analysis of Austria's strategy for artificial intelligence in education and training reveals a comprehensive approach initiated in 2017 through the Association Industry 4.0 Austria, which brought together experts to reflect on how qualifications and competences for the digital age could be developed in initial and continuing education. The 2018 Artificial

Intelligence Mission Austria 2030 defined seven fields requiring adaptation, including qualification and training as a central pillar. Working groups involving approximately 150 experts from science, business, and administration developed strategic action plans identifying five priority fields for action: strengthening STEM (mathematics, computer science, natural sciences and technology) education; fostering interdisciplinary competencies; developing AI literacy across educational levels; creating continuous learning pathways; and establishing ethical frameworks for AI deployment. This coordinated approach demonstrates how national-level strategy can guide VET system transformation while maintaining flexibility for local adaptation.Compagnucci's (2023) systematic review of entrepreneurship education provides crucial insights for understanding how VET systems can develop not merely technical skills but entrepreneurial mindsets and capabilities. His analysis of empirical results, policy frameworks, and methodological approaches reveals that effective entrepreneurship education goes beyond business plan development to cultivate broader competencies: opportunity recognition, creative problem-solving, resilience in the face of setbacks, and the ability to mobilize resources and build networks. These meta-competencies prove particularly valuable in AI-mediated environments where specific technical skills rapidly obsolesce while adaptive capacity and entrepreneurial orientation retain long-term value. His work demonstrates that entrepreneurship education, when properly designed, significantly impacts students' entrepreneurial intentions, skills development, and career trajectories - outcomes directly relevant to VET's mission of preparing students for dynamic labor markets.

The regional case study by Campolucci et al. (2024) on Industry 5.0 implementation offers concrete evidence of how these theoretical frameworks translate into practice. Their analysis of Campetella Robotic Center, a family-owned medium-sized enterprise in the Marche region (adjacent to the Adriatic-Ionian area), demonstrates the transition from Industry 4.0's techno-centric approach to Industry 5.0's human-centric model emphasizing sustainability, resilience, and human-centricity. Founded in 1897 and specialized in industrial automation and robotics for plastic injection molding, Campetella exemplifies how companies can integrate advanced technologies while maintaining focus on human operators' wellbeing, continuous upskilling through corporate academies, and environmental sustainability through energy-efficient systems. Their academy model - providing timely, needs-based training that responds to both internal requirements and client demands - offers a template for how VET institutions might reimagine their relationship with industry partners, moving from periodic formal training to ongoing, adaptive learning ecosystems.This requires new skills: understanding algorithmic biases, recognizing system limitations, maintaining ethical oversight, and cultivating distinctively human capabilities - empathy, contextual judgment, and creative problem-solving. The challenge for VET systems is to prepare professionals capable of navigating this hybrid space, neither rejecting technology as a threat nor uncritically accepting it, but rather developing critical AI literacy that enables informed and autonomous engagement with algorithmic systems.

2.3 Regional diversity as strategic asset

The Adriatic-Ionian region's linguistic and cultural diversity, often framed as an obstacle to integration, actually represents a strategic advantage in developing human-centered approaches to AI adoption. The European Union Strategy for the Adriatic and Ionian Region, substantially revised in May 2025, explicitly recognizes this potential. The 2025 Action Plan (SWD(2025) 114 final) marks a renewed phase of regional cooperation focused on innovation, connectivity, climate resilience, and economic convergence across the Adriatic-Ionian Region.

The revised EUSAIR introduces several innovations highly relevant to vocational training transformation. First, it establishes a fifth pillar on "Improved Social Cohesion," explicitly addressing socio-economic disparities, youth engagement, and social inclusion - concerns central to ensuring that digital transformation benefits all segments of society rather than exacerbating existing inequalities. This new pillar acknowledges that technological change without social cohesion risks creating fractured societies where benefits accrue primarily to those already advantaged. Second, the 2025 Action Plan integrates three horizontal priorities that directly support the type of VET transformation we propose: Enlargement (supporting EU accession processes while building regional capacity); Capacity Building (strengthening institutional capabilities for managing digital transformation); and Research, Innovation and Development (fostering knowledge creation and transfer). These priorities create frameworks within which VET

institutions can access resources, share best practices, and develop collaborative approaches to common challenges. Third, the Action Plan identifies three cross-cutting themes that intersect with vocational training: Circular Economy (requiring new skills in sustainable production and consumption); Green Rural Development (addressing the specific needs of rural areas that make up significant portions of the region); and Digitalization (ensuring that technology adoption serves human needs rather than purely efficiency metrics). These themes provide concrete domains where VET can demonstrate relevance by preparing workers for emerging green and digital economies.

The region's multilingual environment reveals both challenges and opportunities for AI adoption. Standardized, one-size-fits-all approaches to digital literacy prove inadequate in contexts where cultural specificities shape how communities engage with technology. AI systems trained primarily on English-language datasets often perform poorly when deployed in multilingual, culturally diverse contexts. This limitation creates space for developing more inclusive, culturally-responsive technological solutions that respect linguistic diversity rather than treating it as an obstacle to overcome.

Moreover, varying levels of digital maturity across member states - from highly digitized economies like Slovenia and Italy to countries still building foundational digital infrastructure - create opportunities for mutual learning. Advanced digital economies can share technical expertise and policy frameworks, while regions where face-to-face community practices remain strong offer models for maintaining human connection in digital environments. This bidirectional knowledge exchange recognizes that "digital backwardness" may preserve valuable social practices that purely technological societies risk losing.

The EUSAIR framework thus provides institutional infrastructure for the type of regionally-coordinated yet locally-adapted VET transformation we advocate. Rather than imposing uniform standards, it enables countries to learn from each other's experiments, share resources for developing common tools (such as AI literacy curricula), and coordinate policies while respecting national autonomy in implementation. This approach aligns with our argument that successful digital transformation requires combining global awareness of technological trends with deep understanding of local cultural contexts.

3. Analytical framework: the Think / Do / Rethink methodology

3.1 Action Research as epistemological stance

This study adopts an action research methodology grounded in Lewin's (1946) foundational work, but extends it to address contemporary digital transformation challenges. Rather than presenting empirical findings from concluded research, the paper develops a conceptual framework designed to guide ongoing practice - what might be termed "framework for action" rather than "findings from observation". This methodological choice reflects recognition that digital transformation occurs too rapidly for traditional research cycles. By the time empirical studies are completed and published, technological conditions have evolved, potentially rendering specific findings obsolete even as theoretical insights retain value. The alternative approach proposed here - developing theoretical frameworks that practitioners can adapt to local contexts - offers greater utility for policymakers and educational leaders navigating rapid change. This does not diminish the importance of empirical validation, which we address in our discussion of future research directions. Rather, it acknowledges that actionable frameworks, even when not yet fully validated empirically, can guide experimentation and learning in real-world settings where decisions cannot wait for perfect evidence.

Our framework draws on multiple theoretical traditions. From critical pedagogy, particularly Freire's emphasis on dialogic education and conscientization, we derive the principle that educational transformation must engage learners as active subjects rather than passive recipients of predetermined content. From organizational learning theory, especially Argyris and Schön's concept of double-loop learning, we take the understanding that sustainable change requires questioning fundamental assumptions rather than merely adjusting tactics. From action research itself, we adopt the commitment to cyclical processes of planning, action, observation, and reflection, where each iteration informs subsequent cycles.

3.2 The Three-Phase Cycle

Think Phase: Critical analysis and philosophical grounding

The thinking phase moves beyond superficial problem identification to address fundamental epistemological questions that often remain implicit in technology integration discussions. What constitutes knowledge in algorithmically-mediated environments where information is filtered, ranked, and presented according to opaque criteria? How does professional identity transform when core competencies become automated or augmented by AI systems? What ethical frameworks should guide AI integration in educational contexts where power asymmetries between technology providers and educational institutions risk creating dependencies that constrain pedagogical autonomy?

This phase draws extensively on applied AI ethics and roboethics - emerging fields that grapple with the practical implications of deploying intelligent systems in human contexts. It requires what might be termed "philosophical literacy": the capacity to engage with abstract questions about technology's relationship to human flourishing, not as academic exercise but as practical necessity for informed decision-making. Educational leaders must wrestle with questions about the purposes of education itself: Are we primarily preparing workers for existing labor markets, or cultivating capacities for democratic citizenship and human development that may not align with immediate economic demands? For the Adriatic-Ionian context, this phase must address cultural specificity rather than assuming universal models of technology integration. How do different linguistic communities engage with AI systems developed

primarily for English-dominant contexts? What indigenous knowledge traditions - whether Italian craft traditions, Greek philosophical heritage, or Balkan communal practices - offer insights for human-centered technology design that resist homogenizing pressures of global technological systems? How can regional cooperation frameworks facilitate shared learning while respecting local autonomy and avoiding the imposition of standardized solutions that may work poorly in diverse contexts?

The Austrian experience, documented by Cedefop and ReferNet (2025), demonstrates the value of structured deliberation involving diverse stakeholders. Their process brought together approximately 150 experts from science, business, and administration to develop strategic action plans through iterative workshops. This model of collective intelligence - pooling diverse perspectives to generate shared understanding - offers a template for how the Adriatic-Ionian region might approach its own strategic planning for AI in VET. The five fields of action they identified provide a starting point for regional adaptation: strengthening STEM education while maintaining humanities integration; fostering interdisciplinary competencies that bridge technical and social knowledge; developing AI literacy accessible across educational levels; creating continuous learning pathways that support lifelong adaptation; and establishing ethical frameworks that embed human values in AI deployment from the outset.

Do Phase: participatory implementation

The implementation phase emphasizes co-creation rather than top-down reform, recognizing that sustainable transformation requires active engagement from all stakeholders - educators, students, community members, and local organizations. Drawing on Jenkins' (2009) participatory culture framework, this approach acknowledges that educational change succeeds only when those affected by it participate meaningfully in shaping it. This is not merely a normative commitment to democratic participation but a pragmatic recognition that implementation imposed without genuine buy-in typically fails or produces Potemkin compliance where surface changes mask continued adherence to old practices.

Concrete interventions must be adapted to local contexts, but several types of initiatives exemplify the principles we advocate. AI Literacy Consulting Desks represent not merely technical training facilities but spaces for ethical deliberation about appropriate technology use. Rather than teaching people to use AI tools uncritically, these spaces would facilitate conversations about when AI should be used, what tradeoffs different choices involve, and how to maintain human judgment in decision-making processes.

The Campetella example documented by Campolucci et al. (2024) demonstrates how corporate academies can provide timely, needs-based training that responds to emergent requirements rather than following rigid predetermined curricula. VET institutions might adopt similar models, creating responsive training environments where curricula adapt continuously based on feedback from learners and employers.

Critical Thinking Laboratories would develop capacity to deconstruct algorithmic bias and recognize information manipulation. As Prasetya et al. (2025) document, algorithmic bias represents one of the most serious challenges in AI deployment, potentially perpetuating existing inequalities through seemingly neutral technological systems. These laboratories would not merely teach abstract concepts but provide hands-on

experience with real algorithmic systems, enabling learners to investigate how different algorithms produce different results, how training data biases propagate into system outputs, and how to question automated decisions rather than accepting them uncritically. Community Knowledge Networks would link formal educational institutions with informal learning spaces - libraries, cultural centers, makerspaces, community organizations - to create integrated ecosystems where learning occurs across multiple sites and contexts. This addresses the artificial separation between formal education and community life, recognizing that significant learning happens outside institutional walls and that VET systems should connect with rather than isolate themselves from broader community knowledge resources. Cross-Border

Learning Circles would leverage regional diversity through structured peer exchange programs where educators, students, and practitioners from different Adriatic-Ionian countries collaborate on shared challenges.

The EUSAIR framework's emphasis on capacity building and research, innovation, and development (SWD(2025) 114 final) provides institutional infrastructure for such exchanges. These learning circles would enable participants to encounter different approaches to common problems, disrupting assumptions that current practices represent the only possible ways of doing things and fostering innovation through exposure to alternative models.

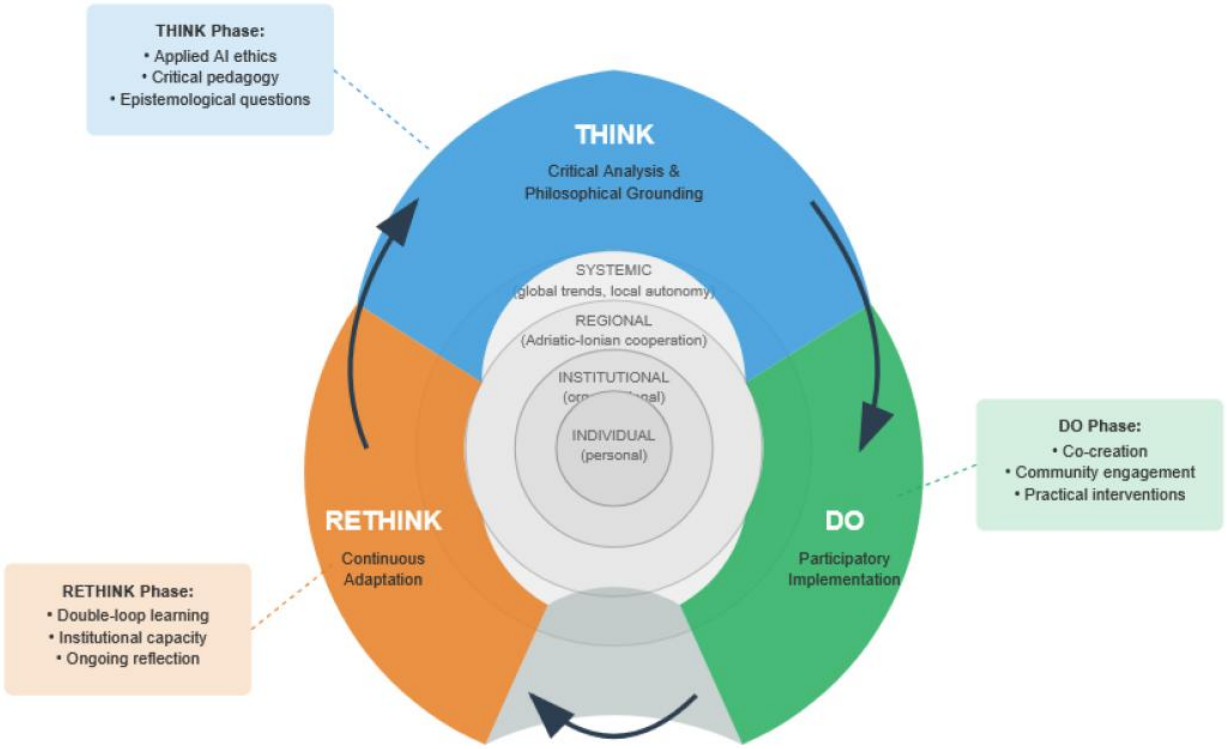
Rethink Phase: continuous adaptation

The reflection phase recognizes that digital transformation is not a destination but an ongoing process requiring sustained attention and willingness to question fundamental assumptions. This requires building institutional capacity for what organizational theorists term "double-loop learning" - not merely adjusting tactics when strategies fail, but questioning whether the strategies themselves remain appropriate. Single-loop learning asks "Are we doing things right?" Double-loop learning asks "Are we doing the right things?" For VET systems navigating digital transformation, this distinction is crucial. Many institutions have adopted technologies without questioning whether their fundamental missions and structures remain appropriate. They digitize existing practices - putting lectures online, automating administrative processes - without reconsidering whether those practices serve educational purposes effectively. Double-loop learning would prompt deeper questions: Does the traditional model of time-limited, age-segregated, institution-centered education serve contemporary needs? Should VET focus primarily on preparing people for first careers, or on developing adaptive capacities for navigating multiple career transitions? How should institutions balance standardization (which enables quality control and credential recognition) with customization (which serves diverse learner needs)?

This reflection must extend beyond individual institutions to address systemic questions. How do funding structures incentivize or constrain innovation? Do accreditation systems reward genuine transformation or merely compliance with established norms? Are labor market signals about skill needs reliable guides for curriculum development, or do they reflect employer preferences that may change rapidly or even work against broader social interests?

For VET systems, this means developing adaptive capacity that monitors how technological changes affect labor markets, adjusts curricula in response to emerging skill demands, and maintains critical awareness of whether efficiency gains come at cost of educational quality or social equity. The Compagnucci (2023) framework for entrepreneurship education emphasizes this adaptive dimension, showing how effective programs continuously evolve based on feedback about entrepreneurial intentions, skill development, and career outcomes rather than following static models assumed to work universally.

Figure 1: The Think/Do/Rethink Cycle for VET Digital Transformation



The Think/Do/Rethink framework operates simultaneously across four levels of integration, enabling VET systems to adapt continuously while maintaining coherence between individual development, institutional reform, regional cooperation, and engagement with global trends.

3.3 Multi-Level Integration

The framework operates simultaneously across four levels, represented in the concentric circles of Figure 1. At the individual level, it addresses personal AI literacy development and critical thinking capacity, recognizing that transformation ultimately depends on individuals' capabilities and dispositions. At the institutional level, it tackles organizational structures and pedagogical approaches, acknowledging that individual capabilities can flourish only within enabling institutional environments. At the regional level, it leverages Adriatic-Ionian cooperation mechanisms for shared innovation, pooling resources and knowledge across borders while respecting national sovereignty. At the systemic level, it engages with global digital transformation trends while maintaining local autonomy, avoiding both parochial isolation from international developments and uncritical adoption of external models that may not fit local contexts. This multi-level approach acknowledges that transformation at any single level proves insufficient. Individual skill development without institutional reform leads to frustration as capable individuals encounter organizational barriers to applying their knowledge. Institutional change without regional coordination creates inefficiencies as each institution reinvents solutions to common problems. Regional initiatives disconnected from global trends risk obsolescence as technologies evolve rapidly in international contexts. Systemic engagement without local adaptation produces superficial change as imported models fail to take root in resistant local soil.

The challenge lies in maintaining coherence across levels while allowing appropriate autonomy at each. This requires what might be termed "subsidiarity in educational governance" - decisions made at the most

appropriate level, with higher levels providing frameworks and resources rather than dictating details. Regional cooperation would establish broad principles and shared infrastructures, but national and local authorities would determine specific implementations. Institutions would adapt regional frameworks to their contexts, while individuals would exercise agency within institutional structures.

4. Discussion: toward community-based VET ecosystems

4.1 Redefining Literacy for Algorithmic Environments

The emergence of new literacy types represents more than adding new skills to existing curricula; it requires fundamental reconceptualization of what literacy means in contemporary contexts. Table 1 systematically compares two forms that prove particularly critical for professional practice in algorithmically-mediated environments.

Table 1: New Literacy Types for Algorithmically-Mediated Environments

Dimension	Semantic Web Literacy	Critical AI Literacy
Definition	Capacity to navigate structured data architectures underlying digital information systems	Capacity to understand and critique algorithmic systems, maintaining agency in AI-mediated environments
Key Competencies	• Understanding ontologies, metadata, and linked data structures • Recognizing how information architecture shapes knowledge • Navigating non-linear, hyperlinked structures • Evaluating data quality and provenance	• Technical knowledge (how ML models work) • Ethical awareness (whose interests are served) • Practical skills (maintaining autonomy) • Addressing algorithmic anxiety • Demanding transparency and accountability
Practical Applications	• Effective use of search engines and databases • Creating and managing digital collections • Metadata creation and curation • Understanding how algorithms prioritize information	• Recognizing algorithmic bias • Evaluating automated recommendations • Understanding filter bubbles • Questioning automated decisions • Advocating for algorithmic accountability
Implications for VET	Transforms users from passive consumers to critical navigators of information ecosystems; requires integration across all disciplines, not just technical fields	Positions citizens as active participants in shaping AI development; requires curriculum integration of AI ethics and governance alongside technical instruction

Note: *Both literacy types represent foundational competencies for meaningful participation in digital environments rather than specialized expertise. VET systems must integrate these literacies across curricula rather than treating them as standalone technical subjects.*

Semantic web literacy involves capacity to navigate the structured data architectures underlying digital information systems. Unlike traditional reading, which processes linear text according to sequential logic, semantic web literacy requires understanding ontologies (formal representations of concepts and their relationships), metadata systems (structured information about information), and linked data structures (networks of interconnected information resources). This technical knowledge becomes literacy - a foundational competency for meaningful participation in digital environments - rather than specialized expertise required only for information professionals. More fundamentally, semantic web literacy develops awareness of how information architecture shapes knowledge itself. When search algorithms prioritize certain sources based on criteria users rarely examine, when recommendation systems create filter bubbles by showing people content similar to what they previously engaged with, when metadata categories determine what information can be discovered and what remains invisible - these technical features have epistemological consequences that affect what people can know and how they understand the world. Semantic web literacy enables recognition of these dynamics, transforming users from passive

consumers who accept system outputs uncritically into critical navigators who understand how their information environments are constructed and constrained.

Critical AI literacy encompasses capacity to understand and critique algorithmic systems beyond merely using them competently. This includes technical knowledge about how machine learning models work - not necessarily the mathematical details but conceptual understanding of how systems learn from data, make predictions, and generate outputs. It extends to ethical awareness: who benefits from automated systems and whose interests do they serve? When facial recognition systems work better for some demographic groups than others, when predictive policing algorithms target certain neighborhoods disproportionately, when hiring algorithms screen out qualified candidates based on subtle biases in training data - these are not mere technical problems but ethical issues requiring critical engagement. Critical AI literacy also addresses what might be termed "algorithmic anxiety" - the discomfort many feel when encountering opaque automated systems that make consequential decisions about their lives. Rather than accepting this opacity as inevitable technological reality, critical AI literacy demands transparency and accountability. It positions citizens as active participants in shaping how AI systems develop rather than passive recipients of technological change imposed by corporations and technologists. For VET systems, this means cultivating not merely technical competence in using AI tools but critical consciousness about their social implications and the confidence to question and challenge automated decisions when appropriate.

4.2 The Philosopher-Artist-Librarian: reconceptualizing professional identity

The transformation of cultural mediator roles requires moving beyond traditional professional models that emphasize specialized expertise in bounded domains. The proposed "philosopher-artist-librarian" framework suggests professionals must simultaneously embody three dimensions that conventional professional training often treats as separate. Thinking philosophically entails engaging with fundamental questions about knowledge, technology, and human flourishing - not as abstract theorizing divorced from practice but as practical necessity for informed choices about technology integration. When educators decide whether to adopt AI-powered adaptive learning systems, they implicitly make philosophical commitments about the nature of learning, the purposes of education, and the appropriate role of human judgment versus automated optimization. Making these commitments explicit through philosophical reflection enables more deliberate choices aligned with educational values rather than default adoption of whatever technologies vendors promote most aggressively.

Creating artistically involves finding original solutions to unprecedented challenges, maintaining improvisational capacity in face of uncertainty, and cultivating comfort with ambiguity. As routine tasks automate, distinctively human creativity becomes primary value-add. This requires moving beyond rule-following competence to develop what might be termed "productive discomfort" - the ability to work effectively in situations where established procedures don't apply and where solutions must be invented rather than retrieved from memory or implemented from manuals. The Campetella example (Campolucci et al., 2024) demonstrates this dimension through their emphasis on innovation driven by internal requirements rather than external prescriptions, showing how organizations that cultivate creativity adapt more successfully to changing circumstances. Mediating culturally involves connecting institutions with communities, facilitating learning across differences, and promoting social inclusion. This traditional library function gains new urgency as digital divides threaten to exacerbate existing inequalities. Cultural mediators in the digital age must bridge not only different information resources but different ways of engaging with technology, translating between expert and non-expert understandings, and ensuring that benefits of technological change reach marginalized communities rather than concentrating among already-advantaged populations.

This reconceptualization challenges credentialing systems that privilege technical expertise over philosophical depth or creative capacity. It suggests VET systems must cultivate what might be termed "meta-competencies" - not specific skills that can be listed on competency frameworks but capacity to learn continuously, adapt to changing contexts, and maintain critical awareness amid rapid transformation. This proves difficult for institutions accustomed to defining qualifications in terms of measurable, demonstrable competencies. How does one assess philosophical literacy or creative capacity in ways that satisfy quality assurance requirements while avoiding reductive metrics that miss what matters most?

4.3 From social library to community VET

The evolution from "social library" to "community VET" represents more than semantic shift; it signals fundamental reconceptualization of learning institutions' role in social fabric. Traditional models positioned libraries and training centers as repositories - places where knowledge resided in codified form, waiting to be accessed by those who sought it out. This model assumed relatively stable knowledge that could be collected, organized, and transmitted through established procedures. The community VET model

reimagines these institutions as catalysts - dynamic spaces where knowledge co-creates through interaction between diverse participants, where the institution's role shifts from holding knowledge to facilitating its emergence through collaborative processes. This transformation involves several key elements that work together to create genuinely new institutional forms rather than merely updating traditional models with digital tools. Physical-digital integration creates seamless learning environments where digital tools enhance rather than replace face-to-face interaction. The pandemic's forced digitization demonstrated that purely online delivery often diminishes educational quality, particularly for learners requiring substantial support or for learning objectives involving complex social interactions. The challenge lies in thoughtful integration that leverages technology's strengths - accessibility across distances, flexibility in timing, capacity for individualized pacing - while preserving human connection's irreplaceable contributions to motivation, accountability, and collaborative learning.

Prosumer participation, drawing on participatory culture frameworks, positions learners as active contributors rather than passive recipients. Students don't merely consume knowledge delivered by instructors; they create content, share expertise developed through experience, and contribute to collective learning that enriches everyone involved. This requires significant pedagogical transformation from lecture-based transmission toward facilitation of collaborative knowledge construction. Instructors become designers of learning environments and facilitators of collaborative processes rather than primary sources of authoritative knowledge. This shift proves challenging for educators trained in transmission models, requiring substantial professional development and willingness to cede some traditional authority.Territorial embeddedness recognizes that effective learning connects to local contexts rather than treating all places as interchangeable sites for implementing standardized programs. Community VET addresses specific community needs, leverages local cultural resources, and creates pathways for graduates to contribute to regional development rather than preparing them exclusively for employment in global labor markets that may require geographic mobility. The EUSAIR framework's emphasis on green rural development and social cohesion (SWD(2025) 114 final) explicitly supports this territorial dimension, recognizing that sustainable development requires strengthening local capacities rather than merely integrating regions into global flows that may extract value without leaving lasting benefits.

Cross-border learning leverages the Adriatic-Ionian region's diversity through structured exchange programs, joint curriculum development, and shared digital platforms. This enables learning across borders without imposing standardization that would erase valuable local differences. The challenge lies

in finding the right balance between coordination (which enables resource sharing and prevents wasteful duplication) and autonomy (which allows context-appropriate adaptation and preserves cultural diversity). The Prasetya et al. (2025) analysis shows how AI technologies themselves can support this balance through adaptive systems that personalize content while maintaining common frameworks.

4.4 Implementation challenges and enabling conditions

Realizing this vision requires confronting significant challenges honestly rather than assuming that good ideas automatically translate into successful practice. Resource constraints affect most VET institutions, particularly in less economically developed parts of the Adriatic-Ionian region. Digital transformation requires substantial investment in infrastructure, professional development, and ongoing technical support - costs that may strain institutional budgets already stretched by competing demands. While EUSAIR and other EU funding mechanisms provide some resources, these rarely cover full costs of sustained transformation. Institutions must therefore make difficult choices about priorities and sequencing, potentially starting with lower-cost interventions that demonstrate value before committing to comprehensive transformations. Institutional inertia proves particularly challenging in educational contexts where established practices are deeply embedded in organizational structures, professional identities, and stakeholder expectations. Faculty comfortable with traditional teaching methods may resist pedagogical innovations perceived as threatening their expertise or requiring substantial additional effort. Administrative systems designed for traditional delivery models may not accommodate flexible, personalized learning pathways easily. Accreditation requirements may constrain innovation by demanding continued conformity to established norms. Overcoming this inertia requires not only leadership commitment but also building coalitions of change agents throughout institutions and demonstrating concrete benefits that motivate broader participation.

Digital divides persist within and across countries, with significant populations lacking reliable internet access, appropriate devices, or sufficient digital literacy to participate effectively in online learning. While expanding access is crucial, it cannot happen instantly, meaning that institutions must maintain hybrid approaches accommodating both digitally-connected and less-connected populations during extended transition periods. Moreover, digital access alone doesn't guarantee meaningful participation; effective engagement requires addressing broader issues of educational access, language barriers, and cultural factors that shape how different groups engage with formal learning opportunities. Professional resistance stems partly from legitimate concerns about technology's implications for pedagogical autonomy, educational quality, and professional working conditions. Educators who have seen previous waves of technological enthusiasm produce disappointing results may approach new initiatives with justified skepticism. Addressing this resistance requires not dismissing concerns but engaging seriously with them, involving skeptics in design processes, and ensuring that transformation serves educational missions rather than merely pursuing technological novelty.

Enabling conditions that support successful implementation include policy frameworks that provide clear direction while allowing local adaptation flexibility. The Austrian AI strategy demonstrates how national-level coordination among diverse stakeholders can create shared understanding and aligned action without imposing rigid standardization. Adequate technological infrastructure - reliable internet connectivity, appropriate hardware and software, user-friendly platforms - provides necessary foundations, though these represent means rather than ends. Most fundamentally, genuine commitment to professional development ensures that technological capabilities translate into effective pedagogical practice rather than remaining underutilized resources.

4.5 Regional positioning and competitive advantage

The Adriatic-Ionian region's successful navigation of digital transformation could create distinctive competitive advantages in increasingly globalized educational and economic landscapes. As innovation laboratory, the region's diversity enables experimentation with varied approaches to common challenges, creating knowledge applicable beyond regional borders. Success in developing human-centered AI integration models could position the region as leader in ethical technology adoption, attracting researchers, entrepreneurs, and institutions seeking alternatives to purely market-driven technological development that prioritizes efficiency over human values. In cultural economy development, integration of AI literacy with rich cultural heritage creates opportunities for innovation in cultural industries - areas where human creativity remains irreplaceable but benefits from technological augmentation. The region's artistic traditions, historical resources, and contemporary cultural production provide contexts where AI tools can enhance rather than replace human creativity, demonstrating models for productive human-AI collaboration applicable across sectors.

For talent attraction, regions offering high-quality, culturally-responsive VET systems attract skilled workers and innovative enterprises seeking workforce with both technical proficiency and critical thinking capacity. As knowledge economies depend increasingly on human capital, educational quality becomes crucial factor in regional competitiveness. Institutions that successfully integrate technological capabilities with humanistic education producing graduates capable of both technical work and critical judgment position their regions advantageously in competition for high-value economic activities.

Perhaps most importantly, community-based approaches to digital transformation can strengthen social cohesion rather than eroding it through technology-driven individualization and fragmentation. Building resilient communities capable of navigating future disruptions requires maintaining social bonds and collective problem-solving capacities that purely technological solutions cannot provide. The EUSAIR emphasis on social cohesion (SWD(2025) 114 final) recognizes that economic development without social integration creates unsustainable situations where technological change benefits some while leaving others behind, generating tensions that undermine long-term prosperity.

5. Conclusions: toward epistemological regeneration

This study demonstrates that digital transformation of reading practices requires more than curriculum updates or technology acquisition - it demands epistemological regeneration of vocational training systems. Three critical elements emerge from our analysis, each necessary but insufficient alone, together constituting a framework for sustainable transformation that preserves human agency while leveraging technological capabilities.

First, VET must move beyond technicist visions that view AI literacy as merely technical skill acquisition in operating particular tools or systems. The proposed framework emphasizes philosophical depth, ethical awareness, and critical thinking capacity as foundational competencies without which technical skills risk becoming instruments of control rather than empowerment. This approach recognizes that in rapidly changing technological environments, meta-skills prove more durable than specific technical knowledge, which rapidly obsolesces as particular systems are replaced by newer versions. The capacity to learn continuously, question fundamental assumptions, and maintain critical awareness of technology's social implications provides more lasting value than mastery of any particular tool, however sophisticated.

Second, the transformation requires reconceptualizing professional identity for cultural mediators and other knowledge workers. The philosopher-artist-librarian model suggests professionals must develop

hybrid capabilities combining technical proficiency with philosophical literacy, creative problem-solving, and community engagement capacity. This challenges existing credentialing systems and professional development programs to cultivate broader competency profiles than current narrow specializations typically permit. It requires moving beyond credential accumulation toward cultivating dispositions - curiosity, critical awareness, ethical commitment - that enable adaptive learning across career spans that may involve multiple occupational transitions. Third, successful adaptation depends on positioning VET as digital territorial welfare infrastructure rather than isolated educational service disconnected from broader community life and regional development strategies. Community VET models that integrate physical and digital spaces, facilitate participatory knowledge creation, and connect to regional economic development strategies offer pathways for maintaining human agency while leveraging algorithmic capabilities. This requires institutional transformation going beyond superficial digitization to reconceive fundamental missions and structures, positioning educational institutions as central elements in regional ecosystems supporting economic development, social cohesion, and democratic participation.

For the Adriatic-Ionian region specifically, cultural and linguistic diversity represents strategic asset rather than integration barrier, contrary to assumptions that often frame diversity as obstacle requiring homogenization. The region's heterogeneity enables experimentation with varied approaches to digital transformation, creating opportunities to develop models that balance technological efficiency with human-centered values. Rather than imposing uniform solutions, regional cooperation through EUSAIR frameworks can facilitate mutual learning where different countries' experiments inform each other's ongoing adaptations. The 2025 Action Plan's emphasis on social cohesion, capacity building, and cross-cutting themes of circular economy, green rural development, and digitalization (SWD(2025) 114 final) provides enabling framework for coordinated action respecting local autonomy.

The proposed Think/Do/Rethink methodology provides flexible framework adaptable to diverse local contexts while enabling coordinated regional action. Its emphasis on philosophical grounding, participatory implementation, and continuous adaptation acknowledges that successful change requires not only good ideas but sustained commitment to working through implementation challenges, learning from setbacks, and adjusting approaches based on accumulated experience. This contrasts with change models assuming that once correct solution is identified, implementation becomes mere execution of predetermined plans. Digital transformation's complexity and rapid evolution require more adaptive approaches that maintain strategic direction while allowing tactical flexibility.

Future Directions

Empirical validation represents crucial next step. While this conceptual framework provides theoretical grounding and practical guidance, systematic empirical research is needed to assess implementation outcomes, identify which elements transfer effectively across contexts, and reveal which require substantial local adaptation. Comparative studies across different regional contexts could determine whether principles valid in the Adriatic-Ionian region extend to other areas with different cultural configurations, economic conditions, and institutional histories. Such studies would enrich theoretical understanding while providing practical guidance for practitioners adapting frameworks to their specific situations.

Measurement development creates metrics for assessing success in developing new literacies, measuring professional autonomy maintenance, and evaluating community VET ecosystem effectiveness. This would enable evidence-based policy refinement replacing reliance on assumptions or anecdotal evidence. Challenges include developing measures that capture what matters most - critical thinking, creative

capacity, ethical awareness - without reducing these to simplistic metrics that miss essential qualities while generating spurious precision. Balancing rigor with relevance requires ongoing dialogue between researchers committed to methodological soundness and practitioners concerned with capturing meaningful outcomes. Longitudinal analysis tracking how AI technologies continue evolving and their impacts on labor markets over extended timeframes would inform curriculum adaptations and strategic planning. Short-term studies risk being overtaken by technological changes before findings can inform practice, while long-term tracking enables anticipating trajectories rather than merely reacting to already-evident changes. This requires substantial investment in sustained research infrastructure and researcher commitment to multi-year projects, both challenging in contemporary academic environments favoring quick publication over patient investigation.

Cross-sector integration exploring connections between VET transformation and broader economic development strategies would examine how skilled workforce development contributes to regional competitiveness and innovation capacity. Education cannot be treated as isolated sector but must connect to economic development, social policy, cultural preservation, and democratic governance. Understanding these connections enables more integrated policy frameworks where different sectors align efforts toward shared goals rather than working at cross-purposes through uncoordinated interventions. Ethical framework elaboration developing more detailed applied AI ethics frameworks specifically adapted to educational contexts would address questions about appropriate technology use, data privacy, algorithmic accountability, and the balance between efficiency and pedagogical quality. Generic ethics principles require contextual adaptation to address education's distinctive purposes and the particular vulnerabilities of educational settings where power asymmetries and developmental considerations create special responsibilities.

The creation of an "Adriatic-Ionian VET Community Network" could provide institutional infrastructure for coordinating these research and implementation efforts while preserving local specificities. Such a network would facilitate peer learning, resource sharing, and collaborative innovation - demonstrating how regional diversity can catalyze rather than constrain educational transformation. It could serve as living laboratory where different approaches are tried, evaluated, and refined through structured exchange among practitioners, policymakers, and researchers.

Ultimately, the challenge is not whether to integrate AI in vocational training - that transformation is already underway regardless of whether educators choose to engage with it deliberately. The question is how to do so in ways that preserve human autonomy, promote social justice, and leverage cultural diversity as strength rather than obstacle. The framework proposed here offers conceptual guidance for that navigation, but successful implementation requires ongoing commitment, willingness to experiment and learn from failures, and determination to rethink fundamental assumptions about education's purpose in an algorithmically-mediated world. The stakes are high: poorly managed digital transformation risks exacerbating inequalities, eroding human capacities, and subordinating educational purposes to technological imperatives. Successfully managed transformation, conversely, could enhance educational quality, expand access, and develop human potentials in ways that serve both individual flourishing and collective wellbeing.

Acronyms

	extended form
AI	Artificial Intelligence
VET	Vocational Education and Training
EUSAIR	EU Strategy for the Adriatic and Ionian Region
SDG/SDGs	Sustainable Development Goal(s)
AIEd	Artificial Intelligence in Education
STEM	Science, Technology, Engineering, Mathematics

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