

A Unified AI Fluency Framework for Mass Adoption

A six-tier AI fluency competency model that synthesises international AI literacy frameworks and anchors each tier to published, psychometrically validated measurement instruments, with a proposed validation agenda.

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ABSTRACT

AI literacy has moved from an academic concern to a policy obligation: the EU AI Act has required AI literacy measures from providers and deployers since February 2025, UNESCO published AI competency frameworks for students and teachers in 2024, the OECD and European Commission released the AILit Framework in 2026, and PISA 2029 will assess media and AI literacy. Yet the field remains fragmented. Policy frameworks describe what learners should be able to do but rarely specify how progress is measured, while a growing set of validated measurement instruments is seldom connected to curricula or progression models. This paper proposes the Comprehensive AI Fluency Framework (CAFF), a six-tier competency model (from AI awareness to ecosystem leadership) organised around seven cross-cutting domains, including a domain for directing and supervising agentic AI systems, and five specialised pathways. Its distinguishing feature is measurement anchoring: each tier is mapped to existing instruments reviewed in the literature (SAIL4ALL, MAILS, PAILQ-6, AILQ, the AI Literacy Test and the ChatGPT Literacy Scale), and gaps where no validated instrument exists are made explicit. CAFF is a conceptual framework derived from a narrative review; it has not yet been empirically validated. The paper therefore sets out provisional benchmarks and a staged validation agenda covering content validity, structural validity, measurement invariance and predictive validity.

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A Unified AI Fluency Framework for Mass Adoption: A Six-Tier Competency Model Anchored to Validated AI Literacy Instruments

Working paper · Version 2.0 (28 September 2026)

Revision note. Version 2.0 substantially revises v1.2 (December 2025). The reference list was checked source by source; entries that could not be verified were removed and misattributed statistics corrected. Statements in v1.2 describing pilot studies, enterprise case studies, expert review panels and outcome data have been removed, because no such studies were carried out: CAFF is a conceptual framework and is presented as one. The framework has also been aligned with the final AILit Framework published by the OECD and European Commission in 2026, which superseded the 2025 consultation draft.

1. Introduction

Within roughly two years, AI literacy has shifted from a research topic to an institutional obligation. Article 4 of the EU Artificial Intelligence Act has required providers and deployers of AI systems to take measures to ensure a sufficient level of AI literacy among their staff since 2 February 2025 (European Union, 2024). UNESCO published companion AI competency frameworks for students and for teachers in September 2024 (UNESCO, 2024a, 2024b). The OECD and the European Commission released the AILit Framework for primary and secondary education in 2026, after consulting on a 2025 draft (OECD & European Commission, 2026), and PISA 2029 will, for the first time, assess 15-year-olds' Media and Artificial Intelligence Literacy (OECD, n.d.).

Labour-market pressure points the same way. Employers surveyed for the World Economic Forum's *Future of Jobs Report 2025* expect 170 million jobs to be created and 92 million displaced between 2025

and 2030, and expect 39% of workers' core skills to change over the same period (World Economic Forum, 2025). Organisational evidence suggests that adoption, not access, is the bottleneck: in McKinsey's 2025 global survey, 23% of respondents reported that their organisations were scaling an agentic AI system somewhere in the enterprise, but mostly in only one or two functions (McKinsey & Company, 2025); MIT NANDA's analysis of enterprise deployments reported that the large majority of generative AI pilots produced no measurable profit-and-loss impact (Challapally et al., 2025). Human factors matter as well: in Slack's 2024 Workforce Index, 48% of desk workers said they would be uncomfortable telling their manager they had used AI for common tasks, citing fears of appearing lazy, less competent, or of cheating (Slack Workforce Lab, 2024).

Two literatures have grown up to meet this need, largely in parallel. The first consists of competency frameworks, from the conceptual foundations laid by Long and Magerko (2020) and Ng et al. (2021) to the policy frameworks of UNESCO, Digital Promise (2024) and the OECD and European Commission. These describe what learners should know and be able to do. The second consists of measurement instruments: validated scales and tests such as MAILS (Carolus et al., 2023), the AI Literacy Test (Hornberger et al., 2023), SAIL4ALL (Soto-Sanfiel et al., 2025), the AILQ (Ng et al., 2024), PAILQ-6 (Grassini, 2024) and the ChatGPT Literacy Scale (Lee & Park, 2024). A systematic review of these scales found 22 validation studies of 16 instruments, with generally good structural validity and internal consistency but little evidence on content validity, responsiveness, cross-cultural validity or measurement error (Lintner, 2024).

The gap between the two literatures is practical. A training designer who adopts a competency framework has little guidance on which instrument would show that a learner has progressed from one level to the next; a researcher holding a validated scale has little guidance on where its scores sit in a developmental sequence. Frameworks written before 2024 also say little about directing and supervising AI agents that plan and execute multi-step tasks.

This paper proposes the Comprehensive AI Fluency Framework (CAFF) to connect the two. Its contributions are:

1. A six-tier progression model extending from basic awareness to ecosystem leadership, so that the same framework can serve school, higher-education, workforce and leadership contexts.
2. Seven cross-cutting domains, including a dedicated domain for agentic AI interaction and orchestration.
3. Measurement anchoring: an explicit mapping from each tier to existing instruments, with the gaps where no validated instrument exists made visible rather than papered over.
4. Provisional benchmarks and a validation agenda that specify how the framework itself should be tested.

CAFF is a conceptual contribution. It has not been piloted or validated, and its benchmarks are proposals to be calibrated, not established cut scores.

2. Background

2.1 From AI literacy to AI fluency

Long and Magerko (2020) defined AI literacy as a set of competencies that enable individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool online, at home and in the workplace. Their 17 competencies and 15 design considerations remain the most widely used conceptual starting point. Ng et al. (2021), reviewing the early literature, organised AI literacy around four aspects: knowing and understanding AI, using and applying AI, evaluating and creating AI, and AI ethics.

This paper uses AI fluency for the practical, performance-oriented end of that spectrum: the ability not only to understand AI but to work with it effectively, to judge when its output can be trusted, and to integrate it into real tasks. Fluency is treated here as a developmental continuum rather than a threshold, which is why CAFF is organised as a sequence of tiers.

2.2 International and policy frameworks

UNESCO (2024). The *AI Competency Framework for Students* sets out 12 competencies across four dimensions: a human-centred mindset, the ethics of AI, AI techniques and applications, and AI system design, each at three progression levels. The companion framework for teachers is organised around five areas: a human-centred mindset, the ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional development (UNESCO, 2024a, 2024b).

Digital Promise (2024). Digital Promise's framework organises AI literacy around three modes of engagement (*Understand*, *Evaluate* and *Use*) supported by six practices: algorithmic thinking; data analysis and inference; data privacy and security; digital communication and expression; ethics and impact; and information and mis/disinformation (Digital Promise, 2024).

OECD and European Commission, AILit (2026). The AILit Framework, *Empowering Learners for the Age of AI*, is intended as an international reference for AI literacy in primary and secondary education. The final version organises 19 competences into four domains, *Engage with AI*, *Create with AI*, *Manage AI* and *Shape AI*, with a learner progression; it refined a consultation draft released in May 2025 (OECD & European Commission, 2026). AILit is closely connected to the PISA 2029 Media and Artificial Intelligence Literacy (MAIL) assessment, which will simulate realistic online and generative-AI environments to assess students' ability to engage with digital content and AI systems effectively, ethically and responsibly (OECD, n.d.).

Regulation. Article 4 of the EU AI Act makes AI literacy a legal duty for providers and deployers, with the required level depending on staff members' technical knowledge, experience, education and training, and on the context in which AI systems are used (European Union, 2024). The provision creates demand for workforce-oriented, role-differentiated AI literacy that school-focused frameworks do not directly address.

2.3 Measuring AI literacy

Lintner's (2024) COSMIN-based systematic review identified 22 studies validating 16 AI literacy scales aimed at the general population, higher-education students, secondary-school students and teachers. Most scales showed good structural validity and internal consistency; few had been tested for content validity, reliability over time, construct validity or responsiveness, and none for cross-cultural validity or measurement error. Instruments relevant to CAFF include:

- **MAILS (Meta AI Literacy Scale).** A modular self-report instrument grounded in established competency models that, unusually, adds psychological competencies (for example, AI self-efficacy and self-competency) to the usual knowledge and use facets (Carolus et al., 2023).
- **AI Literacy Test.** A performance-based knowledge test for university students with detailed psychometric reporting (Hornberger et al., 2023).
- **SAIL4ALL.** A 56-item instrument for adult populations covering four themes (*What is AI?*, *What can AI do?*, *How does AI work?*, *How should AI be used?*), usable in true/false or five-point Likert formats, with validity evidence from three UK samples (Soto-Sanfiel et al., 2025).
- **AILQ.** A 32-item questionnaire for secondary students covering affective, behavioural, cognitive and ethical dimensions, validated with 363 Hong Kong secondary students (Ng et al., 2024).
- **PAILQ-6.** A brief six-item, seven-point self-report measure of perceived AI literacy suited to settings where longer instruments are impractical (Grassini, 2024).
- **ChatGPT Literacy Scale.** A 25-item scale covering technical proficiency, critical evaluation, communication proficiency, creative application and ethical competence, validated with 822 college students (Lee & Park, 2024).

A 2025 preprint reports evidence for a general “A-factor” that accounts for about 44% of variance across AI-interaction tasks, and an 18-item battery covering communication effectiveness, creative idea generation, content evaluation and step-by-step collaboration (Li et al., 2025). Because it has not yet been peer reviewed, CAFF treats it as a promising candidate rather than an established instrument.

Two limitations of this instrument base shape CAFF's design. Most instruments are self-report, and self-assessed and objectively measured AI literacy need not agree; and almost all were validated in high-income, English- or European-language settings, which matters for any framework intended for mass adoption in countries such as India.

2.4 Organisational adoption and agentic AI

Survey evidence from 2024–2025 points to three workforce-relevant patterns. First, adoption is broad but shallow: organisations that report using AI are far more numerous than those capturing enterprise-level value (McKinsey & Company, 2025; Challapally et al., 2025). Second, agentic systems, which plan and execute multi-step tasks, are moving from experimentation to limited deployment (McKinsey & Company, 2025), which requires competencies in task specification, supervision, intervention and permission management that earlier frameworks do not cover. Third, social and cultural barriers such as discomfort about disclosing AI use (Slack Workforce Lab, 2024) mean that AI fluency programmes must address norms and psychological safety as well as skills.

2.5 Cultural and contextual situatedness

UNESCO's *Recommendation on the Ethics of Artificial Intelligence* stresses human rights, diversity and inclusiveness, and the need for AI education to be adapted to local contexts (UNESCO, 2021). Frameworks developed in one cultural and linguistic setting cannot be assumed to transfer to another, and measurement instruments are no exception, as the absence of cross-cultural validation in Lintner's (2024) review shows. CAFF therefore treats local adaptation, translation and re-validation as part of the framework rather than as an afterthought (Section 5.2).

2.6 Gaps addressed

The review suggests five gaps that motivate CAFF:

1. Framework–measurement gap. Competency frameworks rarely specify how progression is measured; instruments rarely specify what developmental level their scores represent.
 2. School–workforce gap. The most developed international frameworks target schools, while regulatory obligations now fall on employers.
 3. Agentic AI gap. Directing and supervising AI agents is largely absent from frameworks written before 2024.
 4. Brevity–rigour trade-off. Comprehensive instruments (for example, 56-item SAIL4ALL) are costly to administer at scale; brief ones (for example, PAILQ-6) measure perception rather than performance.
 5. Contextual validity gap. Almost no instrument has been validated across cultures or languages.
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3. Method

CAFF was developed through a narrative review and conceptual synthesis in three steps.

1. Framework analysis. International and institutional frameworks (Long & Magerko, 2020; Ng et al., 2021; UNESCO, 2024a, 2024b; Digital Promise, 2024; OECD & European Commission, 2026) were compared to identify recurring competency areas and progression logics. Four areas recur across nearly all of them: understanding AI, using and creating with AI, evaluating and managing AI, and shaping AI's design and governance. These became the backbone of CAFF's tiers and domains.
2. Instrument review. Instruments were identified from Lintner's (2024) systematic review and subsequent publications, and characterised by construct, format, target population and available validity evidence.
3. Mapping and gap analysis. Each CAFF tier was mapped to the instruments, or instrument sub-dimensions, whose content best matches its competencies. Where no validated instrument covers a tier's competencies, most notably agentic AI orchestration and organisational leadership, performance tasks and portfolio assessment are proposed instead, and the gap is flagged for instrument development.

This was not a systematic review: searches were not pre-registered, and inclusion was based on relevance and prominence, not on a formal protocol. The synthesis was carried out by a single author. These are important limitations, discussed in Section 7.

4. The Comprehensive AI Fluency Framework (CAFF)

4.1 Design principles

CAFF is built on seven principles:

1. Progression. Competence develops through ordered tiers with explicit advancement criteria.
2. Measurement anchoring. Every tier is linked to existing validated instruments where they exist; where they do not, the gap is stated and performance-based assessment is specified instead.
3. Breadth of application. The same structure serves school, higher-education, workforce and public-sector contexts through specialised pathways.
4. Human-centredness. AI is framed as a tool in service of human judgement, agency and wellbeing, consistent with UNESCO (2021, 2024a).
5. Contextual adaptability. Core competencies are stable; examples, language and assessment are adapted and re-validated locally.
6. Technology-agnostic foundations. Lower tiers can be taught and assessed without access to AI tools, supporting equitable adoption in low-resource settings.
7. Revisability. The framework is versioned and expected to change as AI capabilities, evidence and standards evolve.

4.2 Six-tier competency structure

Each tier below lists its alignment with the AILit domains, candidate instruments, core competencies, learning outcomes, assessment methods and provisional benchmarks. The benchmarks are proposals for calibration studies (Section 6.4); none of the instruments cited publishes cut scores corresponding to CAFF tiers.

Tier 1: AI Awareness and Digital Citizenship

AILit alignment: Engage with AI (Recognition and basic understanding)

Candidate instruments: SAIL4ALL “What is AI?”, PAILQ-6 awareness dimension

Core Competencies:

- Understanding fundamental AI concepts, terminology, and basic mechanisms
- Recognizing AI applications across personal, educational, and professional contexts (including agentic systems)
- Developing awareness of AI capabilities, limitations, and potential risks

- Understanding data's role in AI systems and basic privacy implications
- Foundation in AI ethics, bias recognition, and digital citizenship
- Basic understanding of human-AI interaction modalities (task delegation, co-creation, configuration)
- Distinguishing between narrow AI, general AI, and emerging agentic AI systems

Learning Outcomes:

- Define artificial intelligence and distinguish from traditional computing, including generative and agentic AI
- Identify AI systems in daily life (recommendation systems, virtual assistants, content generation, autonomous agents)
- Explain the relationship between data, algorithms, and AI functionality
- Recognize potential benefits, limitations, and risks of AI applications including autonomous systems
- Demonstrate awareness of ethical considerations including bias, fairness, transparency, and accountability
- Understand basic principles of responsible AI use and digital citizenship
- Articulate basic differences between human and AI intelligence and decision-making

Assessment methods:

- SAIL4ALL "What is AI?" module (performance-based objective assessment)
- PAILQ-6 self-perception of AI awareness and understanding
- Scenario-based recognition tasks identifying AI systems in authentic contexts
- Basic ethical reasoning exercises using case studies
- Digital citizenship portfolio demonstrating responsible AI engagement awareness

Provisional benchmarks (to be calibrated):

- 70% accuracy on SAIL4ALL recognition and basic concept items
- Score $\geq 4/7$ on PAILQ-6 relevant items
- Successful identification of 80% of common AI applications in daily life

Tier 2: AI Interaction and Practical Application

AILit alignment: Engage with AI (Effective use) + Create with AI (Basic applications)

Candidate instruments: MAIIS utilization dimension, AILQ behavioral dimension

Core Competencies:

- Effective communication with AI systems through advanced prompt engineering
- Quality evaluation and reliability assessment of AI outputs across domains
- Understanding of diverse AI tool categories and appropriate application contexts (including agentic tools)
- Basic troubleshooting and optimization of human-AI interactions
- Integration of AI tools into personal and professional workflows
- Understanding of AI system feedback mechanisms and iterative improvement strategies

- Appropriate task specification for both direct AI tools and autonomous agents
- Recognition of when to use generative AI vs. when human judgment is essential

Learning Outcomes:

- Design sophisticated prompts for various AI systems and use cases (text, image, code, data analysis)
- Systematically assess quality, accuracy, and appropriateness of AI-generated content
- Select and configure appropriate AI tools for specific objectives and contexts
- Integrate AI systems effectively into existing workflows and processes
- Troubleshoot common AI interaction challenges and optimize performance
- Understand iterative improvement processes in human-AI collaboration
- Recognize hallucinations, errors, and limitations in AI outputs
- Apply appropriate verification and validation strategies for AI-generated content

Assessment methods:

- MAILS utilization dimension assessment
- AILQ behavioral domain evaluation (32-item instrument section)
- Practical prompt engineering challenges across multiple domains (minimum 5 diverse scenarios)
- AI output evaluation projects with rubric-based assessment
- Workflow integration case studies demonstrating effective AI tool use
- Problem-solving scenarios requiring AI troubleshooting and optimization
- Portfolio of successful human-AI collaboration examples

Provisional benchmarks (to be calibrated):

- 75% proficiency on MAILS utilization dimension
- Successful completion of 4/5 prompt engineering challenges with AI outputs rated “good” or “excellent”
- Demonstrated ability to identify and correct AI errors/hallucinations in 90% of test cases

Tier 3: AI Analysis and Critical Evaluation

AILit alignment: Manage AI (Evaluation and decision-making)

Candidate instruments: SAIL4ALL “What can AI do?” + “How should AI be used?”, AILQ cognitive & ethical dimensions, MAILS evaluation dimension

Core Competencies:

- Systematic assessment of AI system performance, bias, and limitations
- Understanding of AI training processes, data requirements, and algorithmic foundations
- Advanced evaluation of AI impact on decision-making and workflow processes
- Comprehensive analysis of ethical implications and societal impact of AI applications
- Assessment of AI system transparency, explainability, and accountability
- Understanding of AI governance principles and regulatory considerations

- Critical evaluation of agentic AI decision-making and autonomous system behavior
- Analysis of AI's impact on employment, inequality, and social structures

Learning Outcomes:

- Conduct comprehensive evaluations of AI system outputs using multiple criteria (accuracy, bias, reliability, appropriateness)
- Identify, analyze, and address potential biases and limitations in AI systems
- Evaluate ethical implications of AI applications using established frameworks (fairness, accountability, transparency)
- Assess transparency and explainability of AI decision-making processes
- Analyze broader societal impacts of AI implementations across domains
- Apply AI governance principles to evaluate and improve AI system deployments
- Distinguish between appropriate and inappropriate use cases for AI automation
- Evaluate risks and benefits of agentic AI systems in specific contexts

Assessment methods:

- SAIL4ALL “What can AI do?” and “How should AI be used?” modules
- AILQ cognitive and ethical dimensions (ABCE framework sections)
- MAILS evaluation dimension assessment
- Comprehensive AI system audit projects with detailed analysis reports
- Bias detection and mitigation strategy development exercises
- Ethical impact assessment projects using real-world AI applications (minimum 3 diverse cases)
- Policy analysis and recommendation development for AI governance
- Critical analysis papers examining societal implications of specific AI technologies

Provisional benchmarks (to be calibrated):

- 80% accuracy on SAIL4ALL evaluation and ethics modules
- Successful identification of bias in 85% of test cases with appropriate mitigation strategies
- Ethical analysis papers rated “proficient” or higher on established rubrics

Tier 4: AI Innovation and Creative Collaboration

AILit alignment: Create with AI (Advanced applications and innovation) + Shape AI (Participation in development)

Candidate instruments: A-factor creative idea generation dimension (preprint), MAILS creation dimension, AILQ affective dimension

Core Competencies:

- Advanced AI-human creative collaboration and co-creation workflows
- Integration of multiple AI systems for complex problem-solving and innovation
- Novel application development and innovative use case identification
- Understanding of AI model capabilities and limitations for creative tasks

- Effective orchestration of agentic AI systems for multi-step creative processes
- Design thinking integration with AI capabilities for innovation
- Cross-domain AI application and transfer learning concepts
- Participatory design of AI-enhanced solutions and workflows

Learning Outcomes:

- Design and execute complex projects leveraging advanced AI capabilities across multiple domains
- Orchestrate multi-system AI workflows for innovative problem-solving
- Identify novel applications of AI in specialized or emerging contexts
- Collaborate effectively with AI for creative ideation, content generation, and innovation
- Design human-AI hybrid workflows optimizing strengths of both
- Evaluate and select appropriate AI models and approaches for specific creative objectives
- Participate meaningfully in AI solution design and requirements specification
- Develop innovative solutions to complex challenges through AI-human collaboration

Assessment methods:

- A-factor battery, creative idea generation dimension (Li et al., 2025; preprint)
- MAILS creation dimension evaluation
- AILQ affective domain assessment (motivation and engagement with AI creativity)
- Innovation portfolio demonstrating novel AI applications (minimum 3 substantial projects)
- Complex multi-system integration projects with documented workflows
- Design challenges requiring creative AI orchestration and problem-solving
- Peer-reviewed creative collaboration case studies
- Participatory design projects with documented AI integration decisions

Provisional benchmarks (to be calibrated):

- A-factor creative idea generation score at or above the 60th percentile, once population norms are published
- 85% proficiency on MAILS creation dimension
- Innovation portfolio rated “innovative” or “highly innovative” by expert reviewers
- Successful completion of multi-system integration projects with measurable outcomes
- Demonstrated ability to identify and execute novel AI applications in 80% of challenge scenarios

Tier 5: AI Leadership and Strategic Implementation

AILit alignment: Manage AI (Strategic decisions) + Shape AI (Systemic understanding)

Candidate instruments: Organisational readiness review (no validated individual-level instrument; gap), SAIL4ALL comprehensive evaluation

Core Competencies:

- Strategic AI integration planning and organizational transformation leadership
- Comprehensive understanding of AI implementation challenges and success factors

- AI governance framework development and enterprise risk management
- Workforce transformation strategy and change management for AI adoption
- Understanding of enterprise AI architecture and system integration requirements
- Cross-functional team leadership for AI initiatives and transformation programs
- ROI measurement, KPI development, and impact assessment for AI implementations
- Moving AI initiatives from pilot to production through workflow redesign
- Stakeholder management and executive communication on AI initiatives

Learning Outcomes:

- Develop comprehensive AI adoption strategies aligned with organizational objectives
- Design and implement AI governance frameworks addressing risk, compliance, and ethics
- Lead cross-functional teams through AI transformation initiatives
- Create workforce development programs addressing AI skill gaps and cultural resistance
- Measure and optimize AI implementation ROI and business impact
- Navigate organizational change management challenges specific to AI adoption
- Integrate AI systems with legacy infrastructure and existing business processes
- Communicate AI strategy, benefits, and risks effectively to diverse stakeholders
- Identify and address barriers to moving AI from pilots to production

Assessment methods:

- Enterprise AI readiness assessment across five dimensions (strategy, governance, talent, data, technology)
- SAIL4ALL comprehensive evaluation (all modules)
- Strategic planning projects with detailed implementation roadmaps
- Case study analysis of successful and failed AI transformations
- Simulation exercises addressing organizational AI adoption challenges
- Leadership portfolio documenting AI initiative management
- Stakeholder communication artifacts (executive briefings, training programs, change management plans)
- ROI and impact measurement projects with pre-defined metrics

Provisional benchmarks (to be calibrated):

- Organisational readiness review completed with an evidence-based improvement plan
- SAIL4ALL comprehensive score $\geq 85\%$
- Strategic plans rated “comprehensive” and “implementable” by expert evaluators
- Demonstrated understanding of organizational transformation success factors in 90% of case analyses
- Effective stakeholder communication rated “highly effective” by diverse reviewer panels

Tier 6: AI Thought Leadership and Ecosystem Innovation

AILit alignment: Shape AI (Advanced participation and innovation)

Candidate instruments: Research and contribution portfolio (no validated instrument; gap), A-factor battery

(preprint)

Core Competencies:

- Contribution to AI literacy research, framework development, and thought leadership
- Advanced understanding of AI technical foundations, frontiers, and emerging capabilities
- Development of novel AI applications, methodologies, or assessment instruments
- Leadership in AI policy development, standards creation, and regulatory frameworks
- Cross-cultural AI implementation and culturally sustaining framework adaptation
- Ethical AI leadership and philosophy development
- AI ecosystem development and multi-stakeholder collaboration
- Future-oriented analysis of AI impact and societal transformation
- Academic and industry research publication and knowledge dissemination

Learning Outcomes:

- Conduct original research on AI literacy, adoption, impact, or methodology
- Develop novel frameworks, assessment instruments, or implementation approaches
- Contribute to AI policy development at organizational, regional, or national levels
- Publish peer-reviewed research or thought leadership content advancing the field
- Lead multi-stakeholder initiatives addressing complex AI challenges
- Adapt AI frameworks for diverse cultural contexts using culturally sustaining approaches
- Advise organizations, governments, or institutions on AI strategy and transformation
- Identify emerging AI trends and implications for workforce, society, and governance
- Mentor and develop next-generation AI leaders and practitioners

Assessment methods:

- A-factor battery, all dimensions (preprint instrument)
- Research portfolio with peer-reviewed publications or equivalent thought leadership
- Framework or methodology development projects with validation evidence
- Policy contribution documentation with stakeholder impact assessment
- Multi-stakeholder collaboration projects with documented outcomes
- Speaking engagements, workshops, or training programs delivered
- Consulting or advisory work with measurable organizational impact
- Awards, recognition, or citations from academic or industry communities

Provisional benchmarks (to be calibrated):

- A-factor scores at or above the 90th percentile across dimensions, once population norms are published
- Minimum 3 significant research contributions (publications, frameworks, tools, policies)
- Demonstrated thought leadership through speaking engagements, publications, or advisory roles
- Documented impact on organizational, regional, or national AI adoption or policy
- Recognition from academic or industry peers through citations, awards, or invited contributions

4.3 Seven Cross-Cutting Domains

These domains represent competencies that develop progressively across all six tiers and apply universally across specialized pathways.

Domain 1: Technical Understanding

Definition: Comprehension of AI mechanisms, architectures, capabilities, limitations, and technical foundations at appropriate levels of sophistication.

Progression Across Tiers:

- Tier 1: Basic concepts, terminology, and recognition of AI systems
- Tier 2: Understanding of prompt engineering, model capabilities, and interaction patterns
- Tier 3: Knowledge of training processes, data requirements, algorithmic foundations, and bias sources
- Tier 4: Advanced understanding of model architectures, multi-system integration, and agentic AI capabilities
- Tier 5: Comprehensive grasp of enterprise AI architecture, integration requirements, and technical infrastructure
- Tier 6: Deep technical knowledge enabling research contributions and advanced system design

Key Competencies:

- AI fundamentals (machine learning, deep learning, neural networks, generative AI, agentic AI)
- Model types and capabilities (LLMs, vision models, multimodal systems, autonomous agents)
- Training and fine-tuning concepts
- Data requirements and quality implications
- Technical limitations and performance boundaries
- Infrastructure and computational requirements
- Integration patterns and system architectures

Domain 2: Ethical Reasoning and Responsible AI

Definition: Capacity to identify, analyze, and address ethical implications of AI development, deployment, and use across contexts.

Progression Across Tiers:

- Tier 1: Awareness of basic ethical considerations (bias, fairness, privacy)
- Tier 2: Recognition of ethical issues in AI outputs and applications
- Tier 3: Systematic ethical analysis using established frameworks (fairness, accountability, transparency, explainability)
- Tier 4: Integration of ethical considerations into design and innovation processes
- Tier 5: Development of organizational ethics governance frameworks and policies
- Tier 6: Contribution to ethical AI philosophy, policy development, and standards creation

Key Competencies:

- Bias identification and mitigation strategies
- Fairness considerations across diverse populations and use cases
- Privacy and data protection principles
- Transparency and explainability requirements
- Accountability and responsibility frameworks
- Societal impact assessment
- Human rights and AI alignment
- Environmental sustainability of AI systems
- Cultural sensitivity and inclusive design

Domain 3: Critical Evaluation and Quality Assessment

Definition: Ability to systematically assess AI systems, outputs, and implementations for quality, reliability, appropriateness, and impact.

Progression Across Tiers:

- Tier 1: Basic awareness of AI limitations and potential for errors
- Tier 2: Practical evaluation of AI outputs for quality, accuracy, and appropriateness
- Tier 3: Comprehensive system evaluation including bias, performance, and societal impact
- Tier 4: Advanced assessment of complex AI applications and creative outputs
- Tier 5: Strategic evaluation of enterprise AI implementations and ROI
- Tier 6: Development of novel evaluation methodologies and assessment frameworks

Key Competencies:

- Output quality assessment (accuracy, relevance, coherence, creativity)
- Hallucination and error detection
- Bias and fairness evaluation
- Performance benchmarking and comparison
- Reliability and consistency assessment
- Appropriateness for context and use case
- Risk assessment and mitigation evaluation
- Impact measurement and validation
- Comparative analysis of AI approaches and systems

Domain 4: Collaborative Innovation and Co-Creation

Definition: Effectiveness in collaborating with AI systems and humans to generate novel solutions, insights, and creative outputs.

Progression Across Tiers:

- Tier 1: Understanding of basic human-AI interaction modalities

- Tier 2: Effective use of AI tools in personal and professional workflows
- Tier 3: Analysis of collaborative patterns and workflow optimization
- Tier 4: Advanced AI-human co-creation and innovative problem-solving
- Tier 5: Design of organizational collaborative frameworks and team structures
- Tier 6: Development of novel collaboration methodologies and ecosystem models

Key Competencies:

- Effective prompt design and communication with AI systems
- Iterative refinement and collaborative improvement processes
- Multi-system orchestration for complex outcomes
- Human-AI workflow design and optimization
- Cross-functional team collaboration on AI initiatives
- Participatory design and stakeholder engagement
- Knowledge sharing and collaborative learning
- Innovation through AI augmentation
- Creative problem-solving with AI assistance

Domain 5: Adaptive Learning and Continuous Development

Definition: Capacity to continuously update knowledge and skills in response to rapid AI evolution and emerging capabilities.

Progression Across Tiers:

- Tier 1: Awareness of AI's rapid evolution and need for ongoing learning
- Tier 2: Self-directed exploration of new AI tools and capabilities
- Tier 3: Systematic evaluation and integration of emerging AI developments
- Tier 4: Proactive experimentation with frontier AI capabilities
- Tier 5: Organizational learning culture development and knowledge management
- Tier 6: Contribution to cutting-edge research and thought leadership

Key Competencies:

- Self-directed learning strategies for AI developments
- Critical evaluation of new AI capabilities and applications
- Experimentation mindset and rapid prototyping
- Knowledge transfer and teaching others
- Staying current with research, trends, and emerging technologies
- Learning from failures and iterative improvement
- Cross-domain knowledge integration
- Adaptation to paradigm shifts (e.g., from generative AI to agentic AI)
- Building learning communities and networks

Domain 6: Strategic Leadership and Change Management

Definition: Ability to lead AI adoption, transformation initiatives, and cultural change across organizations and communities.

Progression Across Tiers:

- Tier 1: Understanding of AI's transformative potential
- Tier 2: Personal workflow adaptation and productivity optimization
- Tier 3: Analysis of organizational impacts and transformation requirements
- Tier 4: Leadership of team-level AI adoption and innovation initiatives
- Tier 5: Enterprise-wide transformation leadership and strategic planning
- Tier 6: Multi-organizational or societal AI ecosystem development

Key Competencies:

- Vision development and strategic planning for AI integration
- Change management and organizational transformation leadership
- Stakeholder engagement and communication across diverse audiences
- Addressing resistance, fear, and cultural barriers to AI adoption
- Workforce development and talent strategy
- Measuring and demonstrating value and ROI
- Risk management and governance framework development
- Cross-functional collaboration and alignment
- Long-term roadmapping and adaptive strategy

Domain 7: Agentic AI Interaction and Orchestration

Definition: Competency in working with autonomous AI agents capable of planning and executing multi-step workflows with minimal human intervention.

Progression Across Tiers:

- Tier 1: Awareness of autonomous AI agents and their distinct characteristics
- Tier 2: Basic task delegation to agentic systems and monitoring of autonomous execution
- Tier 3: Evaluation of agentic AI decision-making and autonomous workflow outcomes
- Tier 4: Design and orchestration of complex multi-agent workflows
- Tier 5: Enterprise agentic AI strategy and integration with legacy systems
- Tier 6: Development of novel agentic AI frameworks and governance models

Key Competencies:

- Understanding agent architectures and planning capabilities
- High-level task specification and goal definition for autonomous execution
- Multi-step workflow decomposition and orchestration
- Agent-to-agent collaboration and communication patterns

- Monitoring and interpreting autonomous decision-making processes
 - Appropriate human-in-the-loop checkpoint placement
 - Risk assessment and safeguard implementation for autonomous systems
 - Integration with legacy systems and existing processes
 - Agent memory systems and learning capability management
 - Compliance and regulatory alignment for automated processes
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4.4 Five Specialized Pathways

CAFF provides specialized competency pathways addressing unique requirements across professional and educational contexts while maintaining core competencies.

Pathway 1: Creative Arts and Media Production

Target Audience: Artists, designers, writers, musicians, filmmakers, content creators, and creative professionals.

Specialized Competencies by Tier:

Tier 2–4 Focus:

- Prompt engineering for creative AI tools (text-to-image, music generation, video synthesis, 3D modeling)
- AI-augmented creative workflows and hybrid human-AI creation processes
- Understanding of AI training data and its impact on creative outputs (style transfer, cultural representation)
- Intellectual property considerations for AI-generated art and content
- Critical evaluation of AI creative outputs for originality, artistic merit, and cultural sensitivity
- Multi-modal AI integration for comprehensive creative projects
- Agentic AI for creative process automation (research, ideation, iteration, production)

Tier 5–6 Focus:

- Development of novel creative methodologies integrating AI capabilities
- Leadership in AI-augmented creative studios and organizations
- Ethical frameworks for AI in creative industries (attribution, compensation, cultural appropriation)
- Contributing to AI creative tools development and artist-centered design
- Advocacy for artist rights and equitable AI creative ecosystems

Unique Assessment Components:

- Creative portfolio demonstrating innovative AI integration
- Critical analysis of AI impact on creative industries and artistic practice
- Development of original AI-augmented creative methodologies

- Ethical position papers on AI in creative contexts

Pathway 2: Enterprise and Business Applications

Target Audience: Business professionals, managers, executives, entrepreneurs, consultants, and organizational leaders.

Specialized Competencies by Tier:

Tier 2–4 Focus:

- AI tools for business intelligence, analytics, and decision support
- Automated workflow design and process optimization with AI
- Customer experience enhancement through AI (chatbots, personalization, predictive analytics)
- AI-driven marketing, sales, and operational efficiency
- Data-driven decision-making with AI insights
- Evaluating vendor AI solutions and build vs. buy decisions
- ROI calculation and business case development for AI initiatives
- Agentic AI for business process automation and intelligent workflow orchestration

Tier 5–6 Focus:

- Enterprise AI strategy development and organizational transformation
- AI governance frameworks and compliance management
- Workforce transformation and talent development strategies
- Moving AI initiatives from pilots to production through organisational change
- Industry-specific AI applications and competitive advantage
- M&A considerations for AI capabilities and intellectual property
- Building AI-native organizational cultures and operating models
- Contributing to business AI best practices and standards

Unique Assessment Components:

- Business case development and ROI analysis projects
- Enterprise AI adoption simulation exercises
- Strategic planning artifacts with implementation roadmaps
- Change management and workforce transformation plans
- Industry-specific AI innovation proposals

Pathway 3: Education and Learning Design

Target Audience: Teachers, instructional designers, curriculum developers, educational administrators, and learning specialists.

Specialized Competencies by Tier:

Tier 2–4 Focus:

- AI-assisted lesson planning, curriculum development, and instructional design
- Personalized learning and adaptive education systems
- AI tutoring systems and intelligent feedback mechanisms
- Assessment automation and learning analytics with AI
- Accessibility and inclusive education through AI augmentation
- Student AI literacy development across age groups
- Evaluating educational AI tools for pedagogy, engagement, and learning outcomes
- Addressing academic integrity in AI-enabled learning environments
- Agentic AI for automated tutoring and personalized learning path orchestration

Tier 5–6 Focus:

- School/district-wide AI integration strategy and professional development
- AI literacy curriculum development aligned with standards (PISA 2029, ISTE, etc.)
- Research on AI impact on learning outcomes and pedagogical effectiveness
- Educational AI ethics and equitable access frameworks
- Policy development for responsible AI in education
- Culturally sustaining AI pedagogy addressing diverse learner needs
- Contributing to educational AI standards and assessment frameworks

Unique Assessment Components:

- AI-integrated lesson plans and curricular units
- Student AI literacy program development
- Educational AI tool evaluation and selection frameworks
- Research on AI impact in educational contexts
- Professional development program design for educator AI fluency

Pathway 4: Policy, Governance, and Public Sector

Target Audience: Government officials, policy makers, regulators, legal professionals, and civic leaders.

Specialized Competencies by Tier:

Tier 2–4 Focus:

- Understanding AI regulatory landscape and compliance requirements
- AI impact assessment in public services and governance
- Evaluating AI systems for fairness, bias, and discrimination in public applications
- Privacy, surveillance, and civil liberties considerations
- AI in democratic processes, public engagement, and civic participation
- Algorithmic accountability and transparency requirements
- International AI governance frameworks and standards
- Agentic AI governance and accountability for autonomous government systems

Tier 5–6 Focus:

- Development of AI policy frameworks and regulatory approaches
- Multi-stakeholder engagement for AI governance
- National AI strategies and public sector transformation roadmaps
- International cooperation on AI standards and norms
- Balancing innovation with protection in AI regulation
- AI ethics frameworks for government applications
- Public AI literacy initiatives and digital inclusion strategies
- Contributing to AI governance research and global policy development

Unique Assessment Components:

- Policy analysis and development projects
- Regulatory impact assessments for AI applications
- Multi-stakeholder consultation and engagement plans
- Comparative analysis of international AI governance approaches
- Public AI literacy program proposals
- Legal and ethical frameworks for specific AI applications

Pathway 5: Research, Development, and Technical Innovation

Target Audience: AI researchers, data scientists, engineers, developers, and technical professionals.

Specialized Competencies by Tier:

Tier 2–4 Focus:

- Advanced understanding of machine learning algorithms and architectures
- Model training, fine-tuning, and optimization techniques
- Responsible AI development practices and fairness-aware ML
- Data engineering, preparation, and quality management
- Model evaluation, validation, and performance optimization
- API integration and AI system deployment
- Understanding of foundation models, transfer learning, and few-shot learning
- Agentic AI system development and multi-agent orchestration frameworks

Tier 5–6 Focus:

- Novel AI algorithm and architecture development
- Advancing AI research in specialized domains
- AI safety research and alignment approaches
- Development of AI evaluation methodologies and benchmarks
- Open source contributions and AI ecosystem building
- Technical leadership in AI research organizations
- Publishing peer-reviewed AI research

- Contributing to AI technical standards and frameworks

Unique Assessment Components:

- Technical implementation projects with code repositories
 - Model development and performance optimization exercises
 - Research paper authorship and peer review
 - Open source contribution portfolios
 - Technical presentations at conferences or workshops
 - Development of novel AI tools, libraries, or frameworks
 - Reproducibility and documentation quality assessment
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5. Implementation Guidelines

5.1 Assessment-Driven Implementation Framework

Phase 1: Baseline Assessment (Months 1-2)

Organizational Context:

1. Select Validated Assessment Instruments:

- General Population/Workforce: SAIL4ALL (56 items, performance-based) or PAILQ-6 (6 items, brief self-report)
- Higher Education: AI Literacy Test or ChatGPT Literacy Scale
- K-12: AILQ (32 items, ABCE framework)
- Enterprise Leadership: Organisational readiness review across strategy, governance, talent, data and technology

2. Conduct Baseline Assessment:

- Administer selected instrument(s) to target population
- Collect demographic and contextual data for subgroup analysis
- Analyze results identifying strengths, gaps, and priority areas
- Establish benchmark performance data for progress measurement

3. Map to CAFF Tiers:

- Translate assessment results to CAFF tier placement
- Identify current distribution across six tiers
- Determine appropriate target tier levels by role and timeframe
- Develop individualized learning pathways based on current placement

Educational Context:

1. Age-Appropriate Assessment Selection:

- Elementary (K-5): Simplified SAIL4ALL modules, observational assessment
- Middle School (6-8): AILQ or adapted SAIL4ALL
- High School (9-12): Full SAIL4ALL or MAILS
- Higher Education: AI Literacy Test, ChatGPT Literacy Scale, or comprehensive SAIL4ALL

2. Curriculum Alignment Audit:

- Map existing curricula to CAFF tier competencies
- Identify gaps and integration opportunities across subjects
- Determine standalone vs. integrated AI literacy approach
- Align with relevant frameworks (AILit, PISA 2029 MAIL, national standards)

Phase 2: Strategic Planning and Resource Development (Months 2-4)

1. Define Target Outcomes:

- Establish organizational or institutional AI literacy goals
- Set tier progression targets with specific timelines
- Define success metrics aligned with the chosen instruments
- Determine specialized pathway relevance and distribution

2. Resource and Curriculum Development:

- Develop or curate learning materials for each tier and domain
- Create assessment rubrics and progression checkpoints
- Design hands-on projects and practical application exercises
- Prepare instructor training and facilitation guides
- Select AI tools and platforms for learner access

3. Organizational Infrastructure:

- Establish AI literacy program governance and leadership
- Allocate budget and resources (time, technology, personnel)
- Design communication and change management strategy
- Address cultural barriers and resistance proactively
- Develop ethical use policies and guidelines

Phase 3: Pilot Implementation (Months 4-8)

1. Pilot Program Launch:

- Select diverse pilot cohorts representing target population
- Implement learning experiences for Tiers 1-3

- Provide regular assessments tracking progression
- Collect quantitative and qualitative feedback continuously

2. Iterative Refinement:

- Analyze pilot performance data and learner feedback
- Refine curriculum, assessments, and delivery methods
- Address identified barriers and challenges
- Document lessons learned and best practices
- Adjust timelines and resource allocation as needed

3. Instructor Development:

- Train facilitators on CAFF framework and pedagogy
- Develop instructor AI fluency to appropriate tier levels
- Create communities of practice for ongoing support
- Establish quality assurance processes

Phase 4: Scaled Implementation (Months 8-18)

1. Full Deployment:

- Roll out program to entire target population
- Implement all six tiers and specialized pathways
- Establish regular assessment cycles (quarterly or biannual)
- Provide continuous learning opportunities and resources

2. Enterprise-Specific Implementation:

- Strategy Dimension: Comprehensive AI vision and roadmap development
- Governance Dimension: Ethics frameworks, risk management, compliance protocols
- Talent Dimension: Workforce transformation programs addressing all tier levels
- Data Dimension: Data quality improvement and enterprise-wide data access
- Technology Dimension: Infrastructure investments and legacy system integration

3. Educational Institution Implementation:

- Integration into existing courses across disciplines
- Standalone AI literacy courses or modules
- Extra-curricular programs and clubs
- Teacher professional development at scale
- Parent and community engagement initiatives

Phase 5: Continuous Improvement and Evolution (Month 18+)

1. Ongoing Assessment and Progression:

- Regular tier advancement assessments
- Tracking of organizational/institutional AI literacy distribution
- Longitudinal studies of impact on productivity, innovation, or learning outcomes
- Validation of assessment instruments with local populations

2. Framework Updates:

- Monitor AI technology evolution (new capabilities, use cases, risks)
- Update competencies and learning materials accordingly
- Integrate emerging research and best practices
- Maintain alignment with evolving standards (AILit revisions, PISA, EU AI Act guidance)

3. Community and Ecosystem Development:

- Share lessons learned and contribute to broader AI literacy community
- Participate in research and framework development
- Collaborate with other implementing organizations/institutions
- Contribute anonymised assessment data to the research community

5.2 Cultural Sustainability Protocols

To counter techno-centric bias and ensure culturally sustaining implementation:

Protocol 1: Epistemological Pluralism

- Acknowledge diverse ways of knowing beyond Western rationalist traditions
- Integrate indigenous knowledge systems and perspectives on technology
- Avoid positioning AI literacy as universal prerequisite for societal participation
- Frame AI as tool that can enhance existing cultural practices rather than replace them

Protocol 2: Participatory Framework Adaptation

- Engage local communities, cultural leaders, and indigenous educators in adaptation process
- Conduct cultural sensitivity review of all content and examples
- Develop culturally relevant use cases and application scenarios
- Ensure representation of diverse populations in assessment validation

Protocol 3: Language and Accessibility

- Translate frameworks and assessments into multiple languages
- Conduct linguistic and cultural validation beyond direct translation
- Ensure accessibility across literacy levels and learning differences
- Provide multiple modalities of content delivery

Protocol 4: Human-Centered Values Emphasis

- Center human agency, dignity, and cultural identity throughout framework

- Position technology as means to human flourishing defined by diverse communities
- Emphasize individual and collective choice in how/when/why to use AI
- Integrate cultural values frameworks (not only Western ethics) in ethical reasoning domain

Protocol 5: Technology Access Equity

- Include technology-agnostic learning approaches where AI tools unavailable
- Provide theoretical and conceptual understanding independent of tool access
- Support community technology access initiatives
- Ensure assessment methods don't disadvantage those with limited technology access

5.3 Organisational Implementation Roadmap

Survey evidence suggests that organisations capturing value from AI redesign workflows and invest in people rather than layering tools onto existing processes (McKinsey & Company, 2025; Challapally et al., 2025). For organisations, including those with obligations under Article 4 of the EU AI Act, CAFF suggests the following sequence. Timeframes are indicative.

Months 1–3: Foundation

- Assess organisational readiness (strategy, governance, talent, data, technology) and establish a workforce baseline with a brief instrument (PAILQ-6) or targeted SAIL4ALL modules
- Define AI objectives that go beyond efficiency to include quality, growth and risk reduction
- Establish executive sponsorship and a cross-functional governance group
- Map roles to target tiers, since Article 4 expects AI literacy proportionate to role and context

Months 3–6: Governance and culture

- Adopt an AI use policy, risk classification and escalation routes
- Address disclosure norms explicitly: make it safe for staff to say when and how they used AI
- Deliver Tier 1 training for all staff and Tier 2 training for early adopters

Months 6–12: Capability building

- Run role-based programmes for Tiers 2–4 through the relevant specialised pathways
- Redesign selected workflows around AI, including human-in-the-loop checkpoints for agentic systems
- Define measurable indicators for each use case before building it

Months 12–18: Scaling and review

- Scale use cases that met their indicators and retire those that did not
- Re-assess the workforce with the same instruments to measure change against baseline
- Develop a leadership cohort toward Tiers 5–6

Organisations should set their own targets from baseline data rather than adopt generic percentages; CAFF does not yet have outcome data from which realistic targets could be derived.

6. Assessment and Validation

6.1 Multi-Method Assessment Approach

CAFF combines existing psychometric instruments with performance-based demonstrations:

Assessment Method Types:

1. Performance-Based Objective Assessment

- Primary Instrument: SAIL4ALL (56 items, true/false and Likert format)
- Coverage: All four SAIL themes across multiple CAFF tiers
- Advantages: Objective measurement, reduced self-report bias
- Limitations: Requires controlled assessment environment, higher administration burden

2. Self-Report Perception Instruments

- Primary Instrument: PAILQ-6 (6 items, 7-point Likert)
- Coverage: Self-perceived AI literacy (brief screening)
- Advantages: Brief, accessible, wide applicability outside academic contexts
- Limitations: Subject to self-report bias, gender and education effects

3. Comprehensive Multi-Dimensional Scales

- Primary Instruments: AILQ (32 items, ABCE framework), MAILS (modular self-report)
- Coverage: Affective, behavioral, cognitive, ethical dimensions
- Advantages: Holistic assessment across affective, behavioural, cognitive and ethical facets
- Limitations: Longer administration time, requires validation on specific populations

4. Practical Performance Assessment

- A-factor battery: 18 items across communication, creative idea generation, content evaluation and step-by-step collaboration (Li et al., 2025; preprint)
- Domain-Specific Tests: Prompt engineering challenges, AI output evaluation, bias detection exercises
- Projects and Portfolios: Documented AI integration projects with rubric-based evaluation
- Advantages: Directly measures applied competencies, high ecological validity
- Limitations: Resource-intensive scoring, requires expert reviewers

5. Specialized Pathway Assessment

- Tailored Instruments: Pathway-specific projects and demonstrations
- Examples: Creative portfolios, business cases, lesson plans, policy papers, technical implementations

- Advantages: Contextually relevant, demonstrates real-world competency
- Limitations: Requires pathway-specific evaluation expertise

6.2 Assessment Recommendations by Context

K-12 Education:

- Elementary (K-5): Simplified SAIL modules, observational checklists, project-based demonstration
- Middle School (6-8): AILQ (age-appropriate), simplified SAIL, portfolio assessment
- High School (9-12): Full SAIL4ALL or MAILS, A-factor creative assessment, specialized pathway projects

Higher Education:

- First-Year/General: AI Literacy Test, ChatGPT Literacy Scale, PAILQ-6 baseline
- Major-Specific: Specialized pathway assessments aligned with discipline
- Advanced: A-factor comprehensive battery, research project evaluation

Workforce/Enterprise:

- General Employee Population: PAILQ-6 (brief, accessible), targeted SAIL modules
- Management/Leadership: Organisational readiness review, strategic planning projects
- Technical Roles: Performance-based assessments, technical implementation projects
- All Levels: Role-specific practical demonstrations and portfolio assessment

Community/Public Programs:

- General Public: PAILQ-6, accessible SAIL modules, project demonstrations
- Diverse Populations: Culturally adapted instruments, multiple language options
- Limited Technology Access: Theory-based assessments, technology-agnostic evaluation methods

6.3 Provisional Tier Advancement Criteria

The criteria below are starting points for the standard-setting stage of the validation agenda (Section 6.4). They are not established cut scores.

Tier 1 → Tier 2 Advancement:

- SAIL4ALL “What is AI?” module: $\geq 70\%$ accuracy
- PAILQ-6 awareness items: $\geq 4/7$ average
- Successful identification of 80% of common AI applications
- Basic ethical reasoning demonstrated in case studies

Tier 2 → Tier 3 Advancement:

- MAILS utilization dimension: $\geq 75\%$ proficiency

- Successful completion of 4/5 prompt engineering challenges rated “good” or “excellent”
- AI error/hallucination detection in 90% of test cases
- Portfolio of effective AI tool integration in workflows

Tier 3 → Tier 4 Advancement:

- SAIL4ALL “What can AI do?” and “How should AI be used?”: ≥80% accuracy
- Bias detection and mitigation strategies in 85% of test cases
- Ethical analysis papers rated “proficient” or higher
- Comprehensive AI system audit project completion

Tier 4 → Tier 5 Advancement:

- A-factor creative idea generation: ≥60th percentile (once norms exist)
- MAILS creation dimension: ≥85% proficiency
- Innovation portfolio rated “innovative” or “highly innovative”
- Multi-system integration projects with measurable outcomes
- Novel AI application identification and execution in 80% of challenges

Tier 5 → Tier 6 Advancement:

- Organisational readiness review completed with an evidence-based improvement plan
- SAIL4ALL comprehensive evaluation: ≥85%
- Strategic plans rated “comprehensive” and “implementable”
- Organizational transformation success factor understanding in 90% of cases
- Stakeholder communication rated “highly effective”

Tier 6 Achievement Criteria:

- A-factor battery: ≥90th percentile (once norms exist)
- Minimum 3 significant research/thought leadership contributions
- Demonstrated thought leadership through publications, speaking, or advisory work
- Documented impact on organizational/regional/national AI adoption or policy
- Peer recognition through citations, awards, or invited contributions

6.4 Validation Agenda

CAFF makes testable claims: that its tiers are ordered, that its domains are distinguishable, that the mapped instruments discriminate between tiers, and that higher tiers predict better real-world performance with AI. Following the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014), the proposed validation programme has five stages.

1. Content validity. A two- or three-round Delphi study with experts in AI, education, assessment and industry rates the relevance, clarity and tier placement of every competency statement. Competencies below a pre-set agreement threshold are revised or removed.

2. Structural validity. Tier-level item banks are built from the mapped instruments plus new performance tasks where gaps exist, especially in the agentic-AI domain, and administered to samples spanning expected tiers. Confirmatory factor analysis tests the seven-domain structure; item response theory models test whether items order as the tier sequence predicts.
3. Standard setting. The provisional benchmarks in Section 6.3 are replaced with empirically set cut scores (for example, Bookmark or Angoff procedures) for each tier transition.
4. Measurement invariance and contextual validity. Invariance is tested across gender, age, education, occupation and language, with translated versions validated in at least one non-English, lower-resource setting, addressing the cross-cultural gap identified by Lintner (2024).
5. Predictive and consequential validity. Longitudinal studies test whether tier placement predicts performance on authentic AI-assisted tasks and whether CAFF-aligned training produces measurable gains, with attention to unintended consequences such as widening gaps between groups.

The results of each stage will be published openly, and the framework will be versioned accordingly.

7. Limitations

- Not empirically validated. CAFF is a conceptual proposal. Its tiers, domain structure and benchmarks have not been tested with learners, and claims about its effectiveness cannot be made until the validation agenda (Section 6.4) has been carried out.
 - Narrative, single-author review. The literature was not searched systematically and was synthesised by one author, so relevant frameworks or instruments may have been missed and the mapping reflects one reader's judgement.
 - Instrument-to-tier mapping is theoretical. The mapped instruments were not designed for CAFF's tiers. Using sub-scores of existing scales as tier evidence assumes a correspondence that must be tested.
 - Upper tiers rely on expert judgement. Tiers 5 and 6 are assessed mainly through portfolios and expert review, which are costly and harder to standardise.
 - Contextual transfer. Most of the evidence cited comes from high-income, English- or European-language settings. Adoption in other contexts requires local adaptation and re-validation.
 - A fast-moving domain. Agentic AI capabilities, and the competencies they require, are changing quickly; parts of Domain 7 may date within a short period.
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8. Conclusion

AI literacy now carries legal, educational and economic weight, but the field lacks a bridge between frameworks that describe competence and instruments that measure it. CAFF is offered as such a bridge: a six-tier progression model with seven cross-cutting domains and five specialised pathways, in which every tier is tied either to an existing validated instrument or to an explicitly flagged measurement gap. Its

most useful near-term role may be as a shared map. It gives curriculum designers, trainers and employers facing obligations under Article 4 of the EU AI Act a common vocabulary for levels of AI fluency, and it gives researchers a concrete set of hypotheses to test. The priority now is validation: establishing, through the studies outlined in Section 6.4, whether the tiers hold and whether the benchmarks mean what they claim.

References

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standards for educational and psychological testing*. American Educational Research Association.

Carolus, A., Koch, M. J., Straka, S., Latoschik, M. E., & Wienrich, C. (2023). MAILS – Meta AI literacy scale: Development and testing of an AI literacy questionnaire based on well-founded competency models and psychological change- and meta-competencies. *Computers in Human Behavior: Artificial Humans*, 1(2), 100014. <https://arxiv.org/abs/2302.09319>

Challapally, A., Pease, C., Raskar, R., & Chari, P. (2025). *The GenAI divide: State of AI in business 2025*. MIT NANDA, MIT Media Lab.

Digital Promise. (2024). *AI literacy: A framework to understand, evaluate, and use emerging technology*. Digital Promise. <https://eric.ed.gov/?id=ED671235>

European Union. (2024). Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act), Article 4. *Official Journal of the European Union*. <https://artificialintelligenceact.eu/article/4/>

Grassini, S. (2024). A psychometric validation of the PAILQ-6: Perceived Artificial Intelligence Literacy Questionnaire. In *Proceedings of the 13th Nordic Conference on Human-Computer Interaction (NordiCHI 2024)*. ACM. <https://doi.org/10.1145/3679318.3685359>

Hornberger, M., Bewersdorff, A., & Nerdel, C. (2023). What do university students know about artificial intelligence? Development and validation of an AI literacy test. *Computers and Education: Artificial Intelligence*, 5, 100165.

Lee, S., & Park, G. (2024). Development and validation of ChatGPT literacy scale. *Current Psychology*, 43(21), 18992–19004. <https://doi.org/10.1007/s12144-024-05723-0>

Li, N., Deng, W., & Chen, J. (2025). *From G-factor to A-factor: Establishing a psychometric framework for AI literacy* (arXiv:2503.16517) [Preprint]. <https://arxiv.org/abs/2503.16517>

- Lintner, T. (2024). A systematic review of AI literacy scales. *npj Science of Learning*, 9, 50. <https://doi.org/10.1038/s41539-024-00264-4>
- Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–16). ACM. <https://doi.org/10.1145/3313831.3376727>
- McKinsey & Company. (2025). *The state of AI in 2025: Agents, innovation, and transformation*. QuantumBlack, AI by McKinsey. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai>
- Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- Ng, D. T. K., Wu, W., Leung, J. K. L., et al. (2024). Design and validation of the AI literacy questionnaire: The affective, behavioural, cognitive and ethical approach. *British Journal of Educational Technology*, 55(3), 1082–1104. <https://doi.org/10.1111/bjet.13411>
- OECD. (n.d.). *PISA 2029 Media and Artificial Intelligence Literacy*. OECD. <https://www.oecd.org/en/about/projects/pisa-2029-media-and-artificial-intelligence-literacy.html>
- OECD & European Commission. (2026). *Empowering learners for the age of AI: An AI literacy framework for primary and secondary education*. OECD Publishing. <https://ailiteracyframework.org/>
- Slack Workforce Lab. (2024). *The Workforce Index: November 2024*. Slack Technologies.
- Soto-Sanfiel, M. T., Angulo-Brunet, A., & Lutz, C. (2025). The scale of artificial intelligence literacy for all (SAIL4ALL): Assessing knowledge of artificial intelligence in all adult populations. *Humanities and Social Sciences Communications*, 12. <https://doi.org/10.1057/s41599-025-05978-3>
- UNESCO. (2021). *Recommendation on the ethics of artificial intelligence*. UNESCO.
- UNESCO. (2024a). *AI competency framework for students*. UNESCO.
- UNESCO. (2024b). *AI competency framework for teachers*. UNESCO.
- World Economic Forum. (2025). *The future of jobs report 2025*. World Economic Forum. https://reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf