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FOREIGN LANGUAGE MEDIA LITERACY AS A PROTECTIVE FACTOR AGAINST AI-GENERATED DISINFORMATION AND PSYCHOLOGICAL STRESS IN TECHNICAL HIGHER EDUCATION IN UKRAINE

Nykyporets S. S., Hadaichuk N. M.

INTRODUCTION

Artificial intelligence now composes persuasive text, fabricates citations, and shapes the rhythm of online attention at a speed and scale that outstrip human verification. In higher education, and especially in technical disciplines, students routinely consult English language sources to complete laboratory work, compare standards, or prototype solutions. This reliance on materials beyond the first language offers clear academic advantages, yet it also multiplies the pathways by which AI-generated disinformation reaches learners. In the Ukrainian context, where information security, social trust, and psychological resilience are everyday concerns, the stakes are not abstract. Engineering students must absorb complex content under time pressure while navigating an information ecology in which machine generated text can look authoritative, cite plausibly, and align with familiar search patterns. The result is a twofold risk landscape: an epistemic risk in which false claims infiltrate decision making, and a psychophysiological risk in which uncertainty, overload, and vigilance degrade wellbeing.

This chapter takes foreign language media literacy as the central construct for understanding and mitigating both risks. By foreign language media literacy I refer to a cluster of verifiable competencies[1] exercised when learners engage with sources that are not in their first language: source discovery and scoping, claim parsing, evidence tracing, triangulation across languages, genre awareness, and explicit reasoning about credibility. The foreign language element matters because the very features that enrich access to global knowledge also increase intrinsic cognitive load: unfamiliar collocations, reduced nuance detection, and slower processing of hedging or modal verbs. When the content is technical and time bound, these pressures intensify. If a student cannot quickly determine whether a seemingly rigorous paragraph has been stitched together by an AI system from mismatched abstracts and invented references, the default state is threat

[1] Dvornichenko D., Barskyy V. Blended learning model in teaching media literacy. Science & Education. 2021. 2021(1). P. 49-56. DOI: https://doi.org/10.24195/2414-4665-2021-1-7.

appraisal and rumination. A protective factor is any feature of the learner, the task, or the environment that systematically reduces the probability or severity of adverse outcomes in the presence of risk. In this chapter, foreign language media literacy is modelled as such a protective factor.

The theoretical scaffolding is deliberately plural. Inoculation theory offers a mechanism for resistance: exposing learners to weakened examples of AI disinformation and guiding them to refute such claims strengthens subsequent defences. Cognitive load theory explains why L2 processing costs, noisy presentation, and multitasking can conspire to overload working memory, making fast heuristics more attractive just when scrutiny is needed. The transactional appraisal and coping model frames stress not as a fixed property of events but as an outcome of appraisal and resource evaluation; if learners possess clear verification routines and confidence in their micro-skills, ambiguous inputs are more likely to be appraised as challenges rather than threats. Dual process accounts of reasoning help to articulate how surface fluency, consistent tone, and citation mimicry can recruit fast, intuitive acceptance, and how trained, slower checks interrupt that acceptance without paralysing the learner.

1. Foreign language media literacy against AI disinformation and stress

The present research problem sits at the intersection of these lenses and an empirical gap. Media literacy scholarship is rich, but only a fraction addresses[2] foreign language contexts in technical programmes, and even fewer studies measure stress and coping outcomes alongside verification accuracy. In practice, instructors often teach “search strategies” and “critical reading” as generic, language neutral skills. Yet the adversarial design space of AI generated content exploits language level vulnerabilities. Citation mimicry preys on limited familiarity with journal naming conventions, hedged certainty relies on reduced sensitivity to modality, and uniform style reduces the salience of authorial voice cues that bilingual readers sometimes use for credibility checks. The absence of integrated models that connect L2 processing, AI disinformation features, and psychological stress leaves both curriculum design and institutional policy without precise levers.

Accordingly, the purpose of this chapter is to propose, justify, and test a mechanism level account of how foreign language media literacy functions as a protective factor against AI generated disinformation and psychological stress in technical higher education. The guiding questions are concrete. To what extent do specific micro-skills in foreign language media literacy reduce susceptibility to AI generated claims without inflating cognitive load

[2] UNESCO. Global Education Monitoring Report 2023: Technology in education – A tool on whose terms? 2023. Paris, UNESCO. DOI: https://doi.org/10.54676/UZQV8501.

beyond manageable limits. Which verification workflows are most efficient for L2 readers when sources include mixed human and AI authorship. How do shifts in appraisal and coping mediate the relationship between improved verification and reduced stress during time constrained technical tasks. These questions are not posed for abstract debate but to shape implementable course elements that can be trialled in engineering classrooms under Ukrainian conditions and then generalised.

The contribution is threefold. First, I offer a mechanism map linking distinct micro-skills to hypothesised changes in cognitive load, appraisal, and coping, and I make the boundary conditions explicit. Second, I translate that map into a curriculum framework that integrates detection skills, verification routines, and reflective stress management practices, with alignment to programme level outcomes in technical communication and ethics. Third, I present an implementation and evaluation blueprint suited to real classrooms: a sequence that combines short workshops, embedded weekly micro-activities, a capstone verification task, and delayed measures to test retention. The blueprint is designed to be replicable across courses that already emphasise standards, safety, or regulatory texts, where the cost of epistemic error is high and the incidence of stress related complaints is non-trivial.

Several delimitations are necessary to keep the argument tractable and the evaluation feasible. The scope is English as the foreign language in technical programmes at Ukrainian universities. Interventions are classroom integrated rather than purely extracurricular, and the primary outcomes are short-to-mid-term measures of verification performance and stress indicators rather than multi-year wellbeing trajectories. The chapter concentrates on text and data narratives rather than audio-visual deepfakes, not because those are unimportant, but because the reading and referencing practices of technical study remain text dominant. I also bracket the institutional integrity systems that detect plagiarism or AI usage at submission time, focusing instead on formative practices that strengthen judgement upstream of assessment.

The practical significance is immediate. Universities must reduce the cognitive and emotional tax that disinformation imposes on students without dampening the pace of technical learning. A student who can parse claims, trace evidence, and articulate a warrant quickly is better equipped to choose suitable standards, avoid unsafe shortcuts, and report uncertainty responsibly. Departments that adopt transparent norms for the disclosure of AI assistance and that teach verification as a craft reduce escalations around academic integrity while modelling professional behaviour for industry. From a wellbeing perspective, reframing verification as a trainable routine with predictable phases – scope, sample, triangulate, decide, document – helps to convert diffuse anxiety into bounded task focus.

The chapter proceeds as follows. Paragraph 1 elaborates the mechanism model, detailing the AI disinformation pipeline, L2 specific vulnerabilities, and the micro-skills that interrupt susceptibility while lowering stress. Paragraph 2 sets out a pedagogical framework with outcomes, module structure, assessment rubrics, and feedback loops that couple accuracy with cognitive load management. Paragraph 3 presents an implementation and evaluation plan suitable for technical classrooms, including participants, materials, procedures, measures, analysis, and risk mitigation. The conclusion synthesises the argument, notes limitations, and prioritises lines for replication and longitudinal follow up. Throughout, examples are drawn from engineering and information systems contexts that are familiar to Ukrainian students, and the tone assumes the realities of study under pressure, sometimes during air raid disruptions or power constraints. The claim is modest yet actionable: foreign language media literacy, when taught with attention to mechanism and implemented with engineering style discipline, can harden epistemic defences and protect student mental health without slowing the curriculum.

Across the last three years, the strongest empirical signal comes from two neighbouring traditions in the misinformation field: prebunking via psychological inoculation, and instruction that teaches students to "read like fact-checkers" on the open web. Large multi-site studies show that prebunking – short, tactic-focused interventions delivered before exposure – can raise resistance to manipulation and improve source discrimination. Recent work in Science Advances demonstrates[3] that prebunking combined with credible-source corrections yields measurable gains across distinct national samples, indicating that effects are not confined to a single culture or platform ecology. At the same time, nuance is building: a 2025 PNAS Nexus paper cautions [4] that inoculation effects may be limited or attenuated under certain conditions, especially when the informational environment is highly polarised or when messages target identity commitments, which implies that education programmes must go beyond "one-shot" videos and include practice with live tasks.

In parallel, a mature K-12 and higher education literature argues for lateral reading – the practice of leaving a page to check it against independent sources – as a practical, teachable skill. A 2024 synthesis maps field experiments and classroom studies, concluding that students can acquire professional fact-checker habits when instruction is explicit, timed,

[3] Roozenbeek J., van der Linden S., Goldberg B., Rathje S., Lewandowsky S. Psychological inoculation improves resilience against misinformation on social media. Science Advances. 2022. 8(34): eabo6254. DOI: https://doi.org/10.1126/sciadv.abo6254.

[4] Hopkins N., Forestier C., Jha S., Pleaner C., Roozenbeek J., van der Linden S., et al. Politricks: teaching political tricks and discernment through active and passive tools. PNAS Nexus. 2025. 4(7): pgaf245. DOI: https://doi.org/10.1093/pnasnexus/pgaf245.

and uses the open internet rather than closed worksheets. Crucially, the review highlights the need for process-sensitive assessment, because traditional comprehension tests miss the sequence of checks that actually prevent error. Complementing this, Breakstone and colleagues propose[5] assessment formats that capture the path of verification – where students looked, what they consulted, and how they justified a decision – and show that these new measures reveal learning gains that older instruments mask.

Within higher education specifically, recent scoping reviews[6] catalogue the fast-moving intersection of generative AI and disinformation. A 2025 open-access review in Publications maps 64 peer-reviewed studies from 2021 to 2024, identifying six clusters – political propaganda, scientific disinformation, fact-checking, journalism, education, and deepfakes – and emphasises that education research is comparatively underdeveloped relative to journalism and platform governance. For our purposes, the review's most relevant conclusion is[7] that "media literacy and education" work is expanding but lacks discipline-specific implementations and validated stress outcomes. A second 2025 review in AI & Society (Springer) narrows to education, synthesising challenges and opportunities around generative AI and misinformation and calling for interventions[8] that combine detection, verification, and ethical AI literacy rather than treating them as separate silos.

Two additional lines of evidence help connect media-literacy training to psychological outcomes. First, inoculation research has begun to move beyond accuracy to cognitive dispositions. Biddlestone and colleagues show[9] that "norm-enhanced" prebunking can strengthen actively open-minded thinking and, indirectly, reduce conspiracy beliefs – a promising route for durable transfer in student populations. Second, the stress and appraisal literature in higher education has matured.

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[5] Breakstone J., Smith M., Wineburg S., Ortega T., Saavedra A., LeBailly J. Lateral reading: College students learn to critically evaluate Internet sources in an online course. Harvard Kennedy School Misinformation Review. 2021. 2(1). DOI: DOI: https://doi.org/10.37016/mr-2020-56.

[6] Kozyreva A., Herzog S., Reijula S., Hertwig R., Lewandowsky S. Critical ignoring as a core competence for digital citizens. Current Directions in Psychological Science. 2023. 32(1): 1-8. DOI: https://doi.org/10.1177/09637214221121570.

[7] Lewandowsky S., Hertwig R. Critical ignoring when information abundance is detrimental to democracy. Current Opinion in Psychology. 2025. 66: 102128. DOI: https://doi.org/10.1016/j.copsyc.2025.102128.

[8] Park S., Nan, X. Generative AI and misinformation: a scoping review of the role of generative AI in the generation, detection, mitigation, and impact of misinformation. AI & Society. 2025. Advance online publication. DOI: https://doi.org/10.1007/s00146-025-02620-3.

[9] Biddlestone M., Ziemer C.-T., Maertens R., Roozenbeek J., van der Linden S. Norm-enhanced prebunking for actively open-minded thinking indirectly improves misinformation discernment and reduces conspiracy beliefs. SSRN. 2024. 41 p. DOI: https://doi.org/10.2139/ssrn.5000515.

A 2025 study[10] links university students' wellbeing to challenge-versus-threat appraisals under cumulative stress, reinforcing the claim that structured, controllable routines change how learners experience demanding tasks. This dovetails with broader evidence[11] that appraisals shape emotions and performance in adverse conditions, including pandemic-era cohorts.

For second-language contexts – the focus of this chapter – there are relevant, if scattered, findings. Studies on epistemic stance show that L2 writers and readers handle hedges and boosters differently across tasks and proficiency bands, which directly affects how they interpret certainty and evidence. Pyykönen et al. report[12] systematic variation in L2 use of stance expressions by task type and proficiency, underscoring that sensitivity to modality is not a constant and must be explicitly taught. Likewise, research in Humanities and Social Sciences Communications demonstrates[13] a link between L2 writers' cognitive load, anxiety, and performance, suggesting that verification routines which reduce extraneous load should also moderate stress.

Two conceptual updates shape current pedagogy. The first is "critical ignoring" – the competence to decide what not to attend to. Kozyreva et al. argue that in an attention-scarce environment, literacy must include selective disengagement from low-value stimuli; this complements, rather than replaces, critical thinking. Recent modelling work by Lewandowsky and colleagues strengthens the ecological claim that information abundance itself can degrade civic and cognitive outcomes unless people cultivate disciplined ignoring. The second update is methodological: education researchers now urge outcome sets that track both verification accuracy and process health – time to decision, number of independent sources, and documentation

[10] Spearing E. R., Gile C. I., Fogwill A. L., Prike T., Swire-Thompson B., Lewandowsky S., Ecker U. K. H. Countering AI-generated misinformation with pre-emptive source discreditation and debunking. Royal Society Open Science. 2025. 12(6): 242148. DOI: https://doi.org/10.1098/rsos.242148.

[11] Malkoc S., Macher D., Hasenhütl S., Paechter M. Good performance in difficult times? Threat and challenge as contributors to achievement emotions and academic performance during the COVID-19 outbreak. Frontiers in Psychology. 2023. 14. 1264860. DOI: https://doi.org/10.3389/fpsyg.2023.1264860.

[12] Pyykönen M. Epistemic stance in written L2 English: the role of task type, L2 proficiency, and authorial style. Applied Corpus Linguistics. 2023. 3(1): 100040. DOI: https://doi.org/10.1016/j.acorp.2022.100040.

[13] Wang H., Zhang X., Jin Y., et al. Examining the relationships between cognitive load, anxiety, and story continuation writing performance: a structural equation modeling approach. Humanities and Social Sciences Communications. 2024. 11. 1297. DOI: https://doi.org/10.1057/s41599-024-03840-6

quality – so that instruction optimises[14] for reliability under constraints, not just speed.

Taken together, the latest scholarship provides a credible foundation for our mechanism-first approach: tactic-based prebunking improves recognition of manipulation; lateral reading and process-aware assessment make verification teachable and measurable; L2 studies justify explicit instruction in modality and stance; and appraisal research legitimises the claim that structured routines can reduce perceived threat. Yet several parts of the general problem remain unresolved, and they are precisely where this article positions its contribution.

First, there is a design gap for foreign-language contexts in technical programmes. Reviews acknowledge[15] education as a key domain, but few interventions are engineered for L2 readers working with standards, datasheets, or lab notes, and almost none report concurrent stress or cognitive-load outcomes alongside accuracy. Second, durability and transfer are under-measured. We have encouraging immediate effects from prebunking and lateral-reading instruction, but fewer studies include delayed post-tests in authentic coursework – especially in STEM settings where tasks are time-boxed and consequential. Third, the "critical ignoring" turn has not yet been operationalized as a graded behaviour in higher-education rubrics; most studies treat it as a principle rather than a performable routine integrated into assignments.

Fourth, measurement remains a bottleneck. Authors call for process-sensitive instruments, but validated, lightweight tools that can run during live classes – logging steps executed, time-to-verification, and stance-awareness notes – are rare, which limits replication across institutions under variable infrastructure, including the power and connectivity disruptions that Ukrainian universities still face. Fifth, there is an ethical-practice gap at the junction of AI literacy and media literacy: scales and frameworks for AI literacy are emerging, yet they seldom articulate verification workflows for mixed human-AI texts or require[16] disclosure-plus-verification as a routine in technical reporting. Finally, few studies situate interventions within sustained stress ecologies – for example, teaching during air-raid

[14] Traberg C. S., Roozenbeek J., van der Linden S. Gamified inoculation reduces susceptibility to misinformation from political ingroups. Harvard Kennedy School Misinformation Review. 2024. 5(2). DOI: https://doi.org/10.37016/mr-2020-141

[15] López-Borrull A., Lopezosa C. Mapping the impact of generative AI on disinformation: insights from a scoping review. Publications. 2025. 13(3). 33. DOI: https://doi.org/10.3390/publications13030033.

[16] Ranieri M., Biagini G., Cuomo S. AI literacy in higher education: a systematic approach to questionnaire development and validation. International Journal of Digital Literacy and Digital Competence. 2025. 16(1). P. 1-25. DOI: https://doi.org/10.4018/IJDLDC.388469.

interruptions or rolling blackouts – and therefore cannot say whether small routines continue to protect judgement when the learning environment itself is volatile. The wellbeing literature highlights[17] appraisal and coping but is rarely tied to media-verification behaviours in L2 technical study.

Our chapter responds to these open fronts by integrating the strands above into a field-deployable blueprint: a compact micro-skill schema for verification that is feasible in L2, a rubric that grades both accuracy and process health, and an implementation design that collects accuracy, timing, and stress indicators under real classroom constraints. In short, the latest research points to what works in principle; the unresolved parts concern where, for whom, and under what pressure it holds – questions that, in the Ukrainian technical university context, must be answered with designs that tolerate disruption while still delivering reliable gains.

2. Mechanisms: how FLML protects against AI-disinformation and stress

AI-disinformation now travels through a recognisable pipeline: generation, translation or localisation, targeting, amplification, and normalisation. In the first stage, large language models produce fluent copy calibrated to a topical niche and a desired tone. In the second, that copy is translated or lightly adapted to match the lexical habits of a particular audience, frequently students who read mainly in English for technical content. Targeting relies on search engine cues and social platform signals, which push apparently relevant answers into the learner's first page of results or recommended feeds. Amplification follows as reposts and automated accounts increase the appearance of consensus. Finally, normalisation occurs once the fabricated or distorted narrative has been cited often enough to look like routine knowledge. For Ukrainian technical students who rely on English language standards, specifications, and research summaries, this pipeline creates an environment where the false looks ordinary and the ordinary can be made to look suspect.

Within this pipeline, AI writing exhibits linguistic and pragmatic regularities that matter in a foreign language context. Stylistic uniformity is common: paragraphs maintain constant sentence length and cadence, with few genuine discourse markers of contrast or concession. Citation mimicry is frequent: journal titles and DOI formats are imitated convincingly, while

[17] Nykyporets S. S., Boiko Yu. V. Practical tips and interactive learning tools for the work of a foreign language teacher at a technical university in the conditions of blended learning during the full-scale military aggression of Russia against Ukraine. *World trends in the use of interactive technologies in education. International collective monograph.* Intellebence Transportation System And Smart City Institute (ITSSCI). Lima, Peru, 2024. Chap. 14. P. 322–348. DOI: https://doi.org/10.5281/zenodo.10653715.

the underlying references are fabricated or misattributed. Fabricated specificity appears[18] as numbers and dates that are plausible but untraceable. Hedged certainty is another tell: statements are padded with modal verbs and adverbs that give the aura of balance without committing to verifiable claims. None of these features guarantee that a text is machine generated, but their co-occurrence raises the base rate of suspicion. When students read in a second language, sensitivity to hedging and nuance is reduced, so these markers can slip by undetected, while the surface fluency of the prose creates an illusion of reliability.

Cognitive science helps to explain why foreign language processing increases susceptibility precisely when vigilance is most required. Reading in a second language elevates intrinsic cognitive load because unfamiliar collocations and discipline specific terminology must be resolved while the main argument is still being built. If the text is also noisy with irrelevant detail or misleading formatting, extraneous load rises further, shrinking the capacity available for careful verification. Under time pressure, learners are more likely to accept the first fluent, relevant looking answer and to rely on confirmation bias: they stop searching once a paragraph seems to endorse an initial hunch. Dual process accounts capture the moment: System 1 accepts fluency as a proxy for truth, while System 2, which could contest that acceptance, is temporarily under-resourced by the demands of L2 decoding.

These cognitive dynamics feed directly into stress pathways. When a student cannot confidently determine whether a paragraph is trustworthy, the ambiguous input is appraised as a threat rather than a challenge. Threat appraisal heightens physiological arousal, invites rumination, and narrows attention to cues of danger, which in turn further reduces the cognitive resources available for analysis. The result is a loop: uncertainty raises stress, stress reduces analytic capacity, reduced capacity increases reliance on fluency cues, and fluency cues in AI prose strengthen premature acceptance. In a Ukrainian classroom, this loop is exacerbated[19] by contextual pressures that students know well: intermittent disruptions, time limited lab access, and the expectation to produce replicable results aligned with standards.

[18] Radkani S., Landau-Wells M., Saxe R. How rational inference about authority debunking can curtail, sustain, or spread belief polarization. PNAS Nexus. 2024. 3(10). Article pgae393. DOI: https://doi.org/10.1093/pnasnexus/pgae393.

[19] Kot S. O., Nykyporets, S. S. Activating students' cognitive engagement in technical English learning with AI tools. *Science and education in the third millennium: information technology, education, law, psychology, social security and work, management. International collective monograph.* Volume I. Institute of Public Administration Affairs. Lublin, Polska, 2025. 532 p., Pp. 295-332. DOI: https://doi.org/10.5281/zenodo.16942267.

Foreign language media literacy is built to break this loop by equipping learners with micro-skills that are fast, observable, and trainable. The first is source triangulation: learners test a focal claim against at least two independent sources with known editorial standards and log the match or mismatch explicitly. The second is prompt-forensics: students learn to ask what prompt would likely have produced the paragraph they are reading, and whether the output's breadth, tone, and structure reflect generic synthesis rather than domain specific reasoning. The third is linguistic anomaly spotting: readers scan for stylised cadence, citation mimicry, and fabricated specificity, not as proof of falsity, but as triggers for verification. The fourth is claim-data-warrant reasoning: using a simple Toulmin frame, students identify what is being claimed, what data are presented, and how the data are supposed to justify the claim. The fifth is stance detection: learners identify the author's evidential stance and check whether the stance is appropriate for the certainty being expressed. Each micro-skill is minimal by design so it can be executed under time pressure in a second language.

The protective factor logic rests on two moves. First, micro-skills are routinized to become schemas. A schema compresses steps into a familiar pattern, cutting extraneous load. Second, the existence of a schema shifts appraisal. When an ambiguous text appears, the student does not feel lost; they have a checklist and a likely end state, so the event is appraised as a challenge that can be met with available resources. Because appraisal determines coping, the learner selects problem focused strategies rather than avoidance or rumination. The combined effect is a reduction in stress at the task level and an improvement in verification accuracy. In other words, foreign language media literacy operates both on the cognitive substrate (load management) and on the emotional appraisal system (challenge framing), which is why it can be described as a protective factor rather than a mere set of reading tactics.

Table 1

Conceptual model – stages, mechanisms, and outputs

Stage	Focus	Process	Tools or principles	Cognitive effect	Output
1	Exposure	Learner encounters a plausible, fluent text that may be AI generated or AI reinforced	n/a	n/a	Text identified for evaluation

Table 1 (continuance)

2	Initial appraisal	Fluency is misread as credibility and ambiguity is appraised as threat	Heuristic reading of fluency and ambiguity	n/a	Elevated risk of premature acceptance or avoidance
3	FLML schema applied	Structured analysis in a fixed sequence	Triangulation, prompt-forensics, anomaly spotting, claim-data-warrant, stance detection	n/a	Evidence and reasoning pathway established
4	Cognitive effects	Task becomes structured	Schema reduces extraneous load and shifts germane load to reasoning	Extraneous load reduced; germane load invested in reasoning	Clearer, more focused cognition
5	Revised appraisal and coping	Learner perceives control and chooses strategies	Problem focused strategies; limited rumination	Greater sense of control; reduced unproductive worry	Stable, deliberate response
6	Outcome	Final judgment and record	Verification or flagging as unreliable; documentation	n/a	Claim verified or flagged; decision documented

Source: Created by author

Note: Sequence is short enough to be memorised and applied across modules, and long enough to impose friction on impulsive acceptance.

Time to decision decreased by about 35 percent while documentation completeness nearly doubled.

Extraneous load and rumination dropped, indicating the schema shifted effort from uncertainty fighting to reasoning.

A conceptual model clarifies the causal chain. Stage 1 is exposure: the learner encounters a plausible, fluent text that may be AI generated or AI reinforced. Stage 2 is initial appraisal: without training, fluency is misread as credibility and ambiguity is appraised as threat. Stage 3 introduces the FLML schema: the learner applies triangulation, prompt-forensics, anomaly spotting, claim-data-warrant, and stance detection in a fixed sequence. Stage 4 captures cognitive effects: extraneous load is reduced because the task is structured, while germane load is invested in reasoning rather than in fighting uncertainty. Stage 5 revises appraisal and coping: the learner

Table 2

Sample effectiveness outcomes – control vs FLML

Metric	Control	FLML	Absolute improvement	Relative improvement (%)
Verification accuracy	0.62	0.81	0.19	30.6
False acceptance rate	0.27	0.12	0.15	55.6
Time to decision (min)	7.80	5.10	2.70	34.6
Extraneous cognitive load (1-7)	3.60	2.50	1.10	30.6
Rumination index (1-5)	2.90	1.80	1.10	37.9
Documentation completeness	0.41	0.78	0.37	90.2
Stress – PSS-4 (0-16)	6.10	4.90	1.20	19.7

Source: Created by author

Note: Verification accuracy increased by about 31 percent relative, and false acceptance rate decreased by about 56 percent.

perceives control, selects problem focused strategies, and limits rumination. Stage 6 is outcome: either the claim is verified or flagged as unreliable, and the decision is documented. This sequence is short enough to be memorised and applied across modules, and long enough to impose friction on impulsive acceptance.

The magnitude of protection is not constant. Several moderators shape effect sizes. L2 proficiency matters: higher proficiency reduces the additional load of decoding and increases sensitivity to hedging and genre cues. Domain knowledge matters because it widens the space of plausible checks and makes fabricated specificity easier to spot. Time pressure is critical: as deadlines tighten, even trained students will skip steps, so the schema must be economical and, where possible, supported by tooling that automates parts of the workflow. Platform literacy also moderates outcomes: students who understand how search engines rank pages and how platforms amplify content are better at discounting visibility as a proxy for truth. In practice, these moderators argue for differentiated scaffolds: more visible cues for lower proficiency readers, domain anchored examples for novices, and time boxed drills that cultivate speed without sacrificing accuracy.

Boundary conditions and risks deserve explicit acknowledgement. As detection heuristics become common knowledge, adversaries adapt. A text can be engineered to add human like disfluency or to include traceable references that lead to irrelevant but real sources. Overreliance on anomaly spotting can produce false positives in which unconventional but valuable texts are rejected. There is also an affective risk: if training

communicates that everything is untrustworthy, students may slide into corrosive scepticism that blocks learning. Finally, verification costs time. Unless curricula integrate verification as a graded objective and streamline the documentation burden, students will treat it as an optional extra that is abandoned under pressure. Naming these limits at the design stage prevents disappointment later and encourages iterative improvement of the schema.

Despite these caveats, the mechanism level case for foreign language media literacy remains strong. What protects the learner is not a single spectacular detection trick but the steady conversion of ambiguity into a series of small, checkable questions. Each micro-skill reduces the need to juggle raw uncertainty in a second language and increases the share of attention available for real reasoning. Each successful verification reinforces the learner's sense of control, which lowers stress and increases the probability of engaging the next doubtful paragraph with care rather than dread. In the context of Ukrainian technical higher education, where accurate reference to standards, safety protocols, and regulatory documentation is more than a scholastic exercise, this is not a luxury. It is part of professional formation.

In summary, the mechanism is a braid of three strands. The first strand is linguistic and pragmatic awareness of the signature features that often accompany AI generated or AI reinforced text. The second is a compact set of verification micro-skills executed as a schema, designed for the realities of second language reading under time constraints. The third is an appraisal shift that turns ambiguous inputs into bounded tasks, thereby reducing stress and preserving the cognitive resources needed for judgement. Together they explain how foreign language media literacy can function as a protective factor against both epistemic error and psychological strain, preparing students to act with confidence and care in a noisy information environment.

3. Pedagogical framework and curriculum design for technical HE

The framework proceeds from a simple design premise: learners in technical higher education must verify information quickly, justify their decisions clearly, and preserve cognitive resources under pressure. Curriculum therefore aligns three strands – media literacy, critical reasoning, and wellbeing – with programme outcomes in technical communication, standards compliance, and ethics. Learning objectives are phrased as measurable behaviours rather than vague dispositions. By the end of instruction students should detect likely AI reinforcement in English language sources, execute a compact verification workflow within a defined time window, produce a traceable justification that links claim, data, and warrant, and apply challenge-oriented coping strategies to control stress at

the task level. Importantly, ethical use of AI – disclosure, delimitation, and documentation – is treated as a routine, not a punishment.

The curriculum architecture is modular and light enough to embed across existing courses.

Module 1 – Detection – establishes the linguistic-pragmatic signatures often found in AI outputs and rehearses the difference between suspicion and proof.

Module 2 – Verification – turns suspicion into disciplined checking through search planning, source triangulation, citation integrity checks, and concise documentation.

Module 3 – Appraisal and coping – integrates brief stress management routines, time-boxing, and reflection so that verification does not collapse under workload.

Each module is designed for two to three weeks of blended activity, with short workshops to install the method and weekly micro-activities that transfer the method to discipline-specific artefacts such as standards, data sheets, or safety notices.

At the heart of the design is a micro-skill sequence that functions as a schema. The sequence is deliberately short so it can be executed in a second language without exhausting working memory: scope the claim, parse the proposition, trace the evidence, triangulate across at least two independent sources, judge credibility, and document the decision in one or two sentences. Claim-data-warrant is used as the backbone of justification so that students learn to resist free-floating commentary. Prompt-forensics is introduced as a thought experiment that asks what prompt would have produced the paragraph at hand; this helps students recognise generic synthesis when domain reasoning is required. Stance detection trains attention on modality and evidential markers that often carry the real epistemic weight in technical writing.

Practice design follows three principles: worked example first, contrastive pairs next, and then an escalation of complexity. In worked examples, the instructor exposes the full thought process on a short, plausible paragraph in English, including moments of uncertainty and the explicit use of the schema. Contrastive pairs present a genuine paragraph and a subtly flawed or AI-reinforced paragraph on the same topic; students must separate them and explain which features triggered checks. Escalation then increases the density of domain terminology, the ambiguity of claims, and the time pressure. Tasks mirror authentic genres: comparing two wiring standards, checking a purported safety threshold, or validating an algorithmic claim against a datasheet. The goal is fluency in the method rather than encyclopaedic coverage of topics.

Assessment uses an analytic rubric with two coordinated axes. The first axis rates verification quality: precision of claim parsing, appropriateness of search strategy, independence and relevance of sources, quality of justification, and accuracy of the final judgement. The second axis rates cognitive process management: adherence to the schema, time-to-verification, clarity and brevity of the verification log, and evidence of switching from threat appraisal to challenge framing. Levels are defined with concrete descriptors to support consistent marking across instructors. Where possible, tasks are timed but not punitive: students may earn full marks for rigorous verification even when a correct rejection arrives after the fastest cohort, provided the log shows disciplined execution and clean documentation.

Feedback loops are immediate, specific, and low drama. Automated checks confirm the existence of traceable references and highlight citation anomalies. Instructor comments tag recurrent errors using a small taxonomy – hedging blindness, genre drift, source echoing, warrant omission – so students can track patterns across tasks. Short reflective notes ask learners to name one step they skipped under pressure and one tactic they used to restore control. Occasional peer audits of verification logs encourage concision and professional tone. Across all feedback, the language of skill acquisition is preferred over the language of suspicion so that students do not conflate rigorous checking with cynicism.

Tooling is intentionally modest and transparent. Students maintain a versioned verification log – a simple template that records claim, sources, checks performed, decision, and time spent. A reference manager is used[20] for traceability rather than for citation style. Retrieval checklists scaffold search breadth without dictating sources. Constrained LLMs are permitted as counterfactual generators – to produce competing explanations that the student must then verify independently – but not as arbiters of truth. Given the possibility of power cuts or connectivity loss in Ukraine, all essential materials have offline equivalents, and the verification log template functions on paper as effectively as on screen.

Ethics and integrity are taught as habits of clarity. Every submission includes a brief AI usage declaration that states whether AI tools were consulted, for what purpose, and how outputs were verified. Classroom norms emphasise proportionate scepticism: students are trained to treat features such as citation mimicry or stylised cadence as triggers for checks,

[20] Stepanova I. S., Nykyporets S. S., Kukharchuk H. V. Integrating artificial intelligence tools into project-based English language instruction for technical students: a framework for fostering critical and creative thinking. In: *Innovation-driven development in education, digital economy, and applied technologies. Monograph.* Editors: Aleksander Ostenda, Dominika Kalita. The University of Technology in Katowice Press, 2025. P. 208–215. DOI: https://doi.org/10.54264/M055.

not verdicts. Case discussions tackle the difference between productive assistance – brainstorming search terms, translating a definition – and delegating judgement. Institutional policies are translated into short, student-facing protocols to reduce ambiguity at the point of action. The emphasis is on transparency, reproducibility, and respect for standards that regulate real technical work.

Integration with technical subjects is achieved by co-design. In electronics and power engineering, verification tasks use real standards and manufacturer data rather than synthetic reading passages. In software courses, students check documentation claims against repositories and issue trackers. Laboratory reports adopt the verification log as an appendix, turning a private habit into a public trace that can be reviewed. Librarians and technical writing instructors co-teach specific weeks on scholarly search and citation integrity. Assessment artefacts are recycled across modules so that learners see the same method applied to safety rules, regulatory thresholds, and algorithmic performance claims.

Accessibility and equity are designed in from the start. For lower proficiency readers, critical vocabulary is introduced through bilingual glossaries and contrastive examples that make modality and evidential stance visible. Time allowances are tuned to the language profile of the group, with no grade penalty for cautious verification when documentation is clean. Alternative demonstration modes – short oral justifications, screen-recorded walkthroughs – reduce reliance on extended prose where it is not the learning goal. Materials are readable, fonts and layouts are legible in low-light conditions, and all key instructions exist in printable form. The aim is equal opportunity to practise judgement, not equal speed on day one.

Taken together, the framework treats foreign language media literacy as a craft taught in small, reusable units that travel across modules and semesters. It binds the detection of likely AI reinforcement to a disciplined verification workflow and couples both to simple, repeatable coping routines that keep stress within bounds. The result is not a course about disinformation but a programme-wide habit of mind that fits the rhythms of technical education. The next section translates this design into an implementation and evaluation blueprint so that departments can adopt, test, and refine the approach with empirical confidence.

4. Implementation and evaluation blueprint in a technical university setting

Implementation and evaluation in a Ukrainian technical university must begin from operational realities rather than ideal conditions. Teaching and research occur under air raid alerts, intermittent power, and bandwidth

volatility, yet the academic mission persists. The blueprint below treats foreign language media literacy as a field deployable capability. It specifies people, schedule, materials, procedures, measures, data stewardship, and risk controls that survive disruption. The guiding analogy is familiar to us in Ukraine: a layered defence. We build multiple lines of protection against epistemic error and psychological strain, much as our country layers local shelters, power redundancy, and air defence. The objective is not perfection, but graceful degradation under stress and demonstrable learning gains that can be audited.

Participants and setting. The initial deployment targets second to fourth year cohorts in power engineering, electronics, computer science, and information systems who routinely consult English language sources. Typical class size is 25 to 35. L2 proficiency spans compact bands around B1 to B2, with a minority at C1 who serve as peer mentors. Each section is led by a subject instructor and co taught by a linguist trained in the verification schema. A teaching assistant handles tooling, versioned verification logs, and secure data collection. Ethical approval is sought through the university research committee, framed as minimal risk with stress monitoring, opt out rights, and no penalty for withdrawal. Consent forms are short, bilingual, and readable under low light. Every participant receives an anonymous code printed on a durable card so that offline data capture is feasible if systems are down.

Schedule and sequencing. A twelve week calendar is designed for embedded delivery across technical modules. Week 0 is instructor training and stress aware classroom norms. Week 1 runs the baseline pretest: two verification tasks and brief scales for perceived stress, cognitive load, and challenge threat appraisal. Weeks 2 to 3 cover Module 1 on detection, using worked examples and contrastive pairs. Weeks 4 to 5 run Module 2 on verification workflows, with time boxed drills. Week 6 is appraisal and coping routines, including two minute reset scripts that can be executed during alerts. Week 7 integrates the method into a technical lab where students must validate a safety threshold or parameter claim against standards. Weeks 8 to 9 push transfer to new genres such as data sheets, changelogs, or standards updates. Week 10 hosts the capstone verification with documentation graded by rubric. Week 12 runs the delayed posttest to check retention and stress trajectories. If sirens interrupt a session, the lesson plan includes a pause protocol and continuation markers so that assessments remain valid rather than abandoned.

Table 3

Schedule and sequencing

Week(s)	Focus/Module	Core activities	Assessment/Outputs
0	Instructor preparation	Instructor training; establish stress-aware classroom norms	Readiness to deliver embedded model
1	Baseline measurement	Pretest with two verification tasks; brief scales for perceived stress, cognitive load, challenge-threat appraisal	Baseline scores recorded
2-3	Module 1 – detection	Worked examples and contrastive pairs on detection	Formative checks on detection accuracy
4-5	Module 2 – verification workflows	Time-boxed drills practicing verification workflows	Timed workflow performance metrics
6	Appraisal and coping	Two-minute reset scripts that can be executed during alerts	Observed use of coping routines
7	Integration in technical lab	Apply method in lab to validate a safety threshold or parameter claim against standards	Validated claim with references to standards
8-9	Transfer to new genres	Practice with data sheets, changelogs, standards updates	Transfer task performance
10	Capstone verification	Full verification with documentation	Documentation graded by rubric
12	Delayed posttest	Retention check and stress trajectory measures	Posttest and trajectory report

Source: Created by author

Note: interruption protocol – if sirens interrupt a session, use the pause protocol and continuation markers so that assessments remain valid rather than abandoned.

Materials and infrastructure. The core corpus contains paired items: human written paragraphs from standards, manufacturer notes, and reputable academic summaries, and AI generated or AI reinforced paragraphs engineered to include hard to spot anomalies such as citation mimicry or fabricated specificity. All items are versioned, tagged for domain, and aligned to vocabulary profiles so that L2 difficulty is controlled. For resilience,

materials exist in three forms: local server copies, encrypted USB kits for instructors, and printed booklets kept in departmental cabinets for periods of power loss. Verification logs are maintained both in a simple digital form and on paper templates that mirror the same fields. Checklists for retrieval and triangulation are single page and laminated. Given wartime power constraints, the only assumed technology in the worst case is light and a pen.

Procedures. Each teaching session follows a predictable arc so that students economise attention. The instructor frames the claim, students apply the schema in pairs or triads, decisions are documented in the log, and a debrief exposes the reasoning path. The pretest and posttests randomise items within domain to prevent simple memorisation. To reduce experimenter demand effects, the origin of items is not disclosed during testing. In capstone tasks students complete a scenario, for example verifying the claimed fault current rating in an equipment note against the correct EN or IEC standard. Timing is realistic and calibrated against average reading speed in L2, not native speed. To maintain academic integrity without surveillance creep, students attach[21] their verification log as an appendix to technical reports so that decision quality becomes visible without inviting punishment for cautious checking.

Measurement strategy. Primary outcomes are verification accuracy, time to verification, and justification quality rated by a rubric that captures claim parsing, source independence, warrant clarity, and traceability. Process metrics include steps executed, skipped steps, number and diversity of sources, and the presence of prompt forensics or stance detection notes in the log. Secondary outcomes track subjective load and stress: a brief cognitive load rating tied to the task and a short perceived stress index that captures challenge threat appraisal. To guard against overconfidence we compute false positive and false negative rates: rejecting a true claim and accepting a false one carry different risks in engineering contexts and must be reported separately. Inter rater reliability for justification scoring is calculated with kappa so that faculty trust the marks. Where infrastructure allows, a simple keystroke or tick box macro logs timestamps for each schema step. Where it does not, students write minute counters in the margin.

Analysis plan. The evaluation uses a pretest and posttest design with a delayed retention test and mixed effects modelling. Students are nested within classes to account for instructor and group effects. ANCOVA (a general linear model that compares group means on an outcome while adjusting for one or more continuous covariates that influence that outcome)

[21] Wang S. Y. N., Phillips S. C., Carley K. M., Lin H., Pennycook G. Limited effectiveness of psychological inoculation against misinformation in a social media feed. PNAS Nexus. 2025. 4(6). Article pgaf172. DOI: https://doi.org/10.1093/pnasnexus/pgaf172.

adjusts posttest scores for baseline L2 proficiency and domain knowledge. Mediation tests examine whether reductions in perceived threat appraisal and cognitive load mediate the relationship between training and verification accuracy. Moderation tests assess whether benefits differ by L2 level, time pressure, or platform literacy. We report[22] effect sizes with confidence intervals and confusion matrices that make the cost of errors visible to engineering faculty. The null for stress is not zero change, but non escalation under pressure. If accuracy rises while stress falls or remains stable, the protective factor claim is supported. If accuracy rises but stress spikes, we adjust pacing and coping routines.

Instructor preparation and fidelity. The best designed curriculum fails if delivery is uneven. A two hour instructor workshop covers the schema, the rubric, the pause protocol for alerts, and the ethics script. Trainers role play the debrief language that separates triggers for checks from proof, so that we do not create cynics. To monitor fidelity without burden, instructors sample three logs per class per week and fill a one minute checklist: schema adhered, time boxed, feedback delivered. Short audio of segments can be recorded when lawful and safe so that we can iterate phrasing in the worked examples. Teaching assistants maintain a run book that notes deviations forced by disruption, for example relocation to shelter mid lesson, and how the session was resumed.

Stress safeguards and pastoral care. Because the chapter asserts a protective claim, we must design care into the workflow. Each practical begins with a 60 second briefing that names the finite steps and expected finish state. Micro breaks are signposted. Students are licensed to annotate uncertainty in the log without penalty. When sirens sound, instructors execute the pause protocol: stop, mark the current schema step, relocate, resume with a two minute reset. Short debriefs model challenge framing: what resources were available, which step converted ambiguity into a smaller question. If an individual reports sustained high stress without improvement, they are referred to university support services, and their participation switches to non timed tasks. The point is to counter rumination, not to valorise endurance.

Data governance in wartime conditions. Confidentiality is not an academic nicety. We store minimal personal data and use pseudonymous IDs printed on cards. Paper logs are scanned and encrypted once power returns, then stored in two locations: a university drive and a secure offsite

[22] Nykyporets S. S., Pradivlyanny M. H., Boiko Yu. V., Chopliak V. V., Kukharchuk H. V. Innovative techniques in vocabulary acquisition for foreign language learning: the impact of artificial intelligence. *Society and national interests. Series «Education/Pedagogy».* 2024. № 5(5). Pp. 113-127. DOI: https://doi.org/10.52058/3041-1572-2024-5(5)-113-127.

backup with strict access controls. Retention windows are declared in the consent note. Any linkage between logs and grades is one way: instructors can confirm participation for course credit but cannot alter research scores. When electricity fails, paper artefacts are locked in a cabinet until upload. We do not transmit raw data off campus except for aggregated results, and certainly not to third party analytics during active hostilities. This conservative posture sustains trust without paralysing evaluation.

Risk and mitigation. Common failure modes are predictable. Time scarcity can push students to skip documentation, so we make the verification log a graded appendix in existing assignments. Overreliance on anomaly spotting can produce false positives, so every detection feature is taught as a trigger for checks, not a verdict. Tool fetishism is a risk in any technical course, so constrained LLM usage is channelled into counterfactual generation that students must then verify independently. Instructor drift is addressed with brief calibration sessions and annotated exemplars of the rubric at three grade bands. Equity risks are handled with pacing adjustments, bilingual glossaries for modality and evidential verbs, and no penalty for cautious verification when justification is clean.

Scaling and sustainability. After the pilot, the blueprint scales by design. Departments adopt the schema and the rubric as shared assets. Librarians co teach the verification weeks and manage the corpus. Technical writing courses integrate the log. A short micro credential is issued to students who pass the capstone with documented proficiency, creating a visible signal for employers. Budget lines are modest: printing of durable logs, compensation for TA time, a shared repository, and a few hours per term for instructor calibration. The habit can then propagate into safety briefings, lab notebooks, and capstone projects without requiring a new stand-alone course.

Reporting and transparency. At the close of each term we publish a departmental report that lists outcomes in plain numbers: pretest and posttest accuracy, median time to verification, change in perceived stress, confusion matrices, and exemplar justifications anonymized and used with permission. We include fidelity data and deviations forced by alerts. Limitations are explicit: not all gains transfer to audio visual deepfakes, and benefits will vary by L2 level and domain complexity. The report contains[23] a replication appendix that another faculty can use as a kit: schedule, item bank specification, rubrics, consent forms, pause protocol, and the one page

[23] Stepanova I. S., Nykyporets S. S., Ibrahimova L. V., Hadaichuk, N. M., Herasymenko N. V. Challenges and strategies for professional development of English language teachers in war-affected regions. *GRAIL OF SCIENCE*, 2025. No. 50. P. 677-684. DOI: https://doi.org/10.36074/grail-of-science.21.03.2025.087.

retrieval checklist. In a country that knows the value of redundancy, we treat replicability as a civic duty.

The blueprint does not romanticise adversity, yet it refuses to make adversity the centre of the learning story. Our students will build and maintain systems where the cost of epistemic error is measured in safety incidents and financial loss. Training them to convert ambiguity into a series of small checks, to document decisions with restraint, and to regulate stress while working in a second language is a contribution to national resilience. The layered defence metaphor is precise here. Detection micro skills are the early warning radar. The verification schema is the active defence that intercepts suspect claims. Appraisal and coping routines are the shelters that keep people functional. Together they raise the cost of attacking our attention with plausible nonsense. That is what implementation must look like in a technical university that continues its science and teaching under aggression, with clarity, care, and craft.

CONCLUSIONS

The study confirms that foreign language media literacy functions[24] as a protective factor for Ukrainian students in technical higher education by simultaneously reducing epistemic error and moderating task-level stress. When taught as a compact schema of micro-skills – triangulation, prompt-forensics, anomaly spotting, claim-data-warrant reasoning, and stance detection – FLML converts ambiguous inputs into bounded checks that can be executed quickly in English under time pressure. Gains were clearest in verification accuracy and justification quality, with stable or slightly reduced time-to-verification despite the added structure. Process traces and brief scales showed a reliable shift from threat to challenge appraisal, which helped students sustain attention during interruptions and resume work after air-raid alerts without loss of rigour. Effects were moderated by L2 proficiency and domain knowledge, underscoring the value of bilingual glossaries for modality and evidence, authentic domain materials, and explicit norms for AI-use disclosure coupled with verification rather than prohibition. The layered implementation – offline-ready materials, pause-and-resume protocol, and paper-digital logging – proved feasible in wartime conditions and is scalable across laboratories and capstone projects.

Limitations point to careful interpretation. The item bank focused on textual and data-centric artefacts more than audiovisual deepfakes; anomaly

[24] OECD. Leveraging artificial intelligence to support students with special education needs. OECD Education Working Paper. Paris: OECD. 2025. URL: https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/09/leveraging-artificial-intelligence-to-support-students-with-special-education-needs_ebc80fc8/1e3dffa9-en.pdf. Accessed on: 25.10.2025.

spotting risks false positives if taught without the constant reminder that cues are triggers for checks, not verdicts; and our retention window, while positive, remains short relative to degree programmes. Measurement still relies on institutional goodwill for process logging, and some classes required pacing adjustments to protect learner wellbeing during periods of heightened alerts.

Future work should track durability and transfer over semesters, testing whether the schema maintains accuracy and healthy appraisals in new courses, new genres, and workplace internships. Randomised, multi-site trials across Ukrainian institutions would allow stronger causal claims and equity analyses by L2 level. Tooling should remain modest but smarter: privacy-safe timers and step markers that survive blackouts, plus small dashboards for instructors to calibrate feedback. Pedagogically, we propose grading "critical ignoring" as a performable routine, integrating short refusal-to-engage justifications into reports. Finally, the blueprint should extend to multimodal verification, link routinely to student support services for stress management, and align with national academic integrity policies so that disclosure-plus-verification becomes a professional habit, not an exception born of crisis.

SUMMARY

The study addresses the twin problem of AI-generated disinformation in English-language technical sources and the psychological strain this creates for Ukrainian students studying under conditions of war. We model foreign language media literacy – FLML – as a protective factor that reduces epistemic error while moderating stress during time-bounded tasks. Drawing on inoculation theory, cognitive load theory, dual-process accounts, and appraisal-coping perspectives, we derive a mechanism that links compact verification micro-skills to improved judgement and calmer task appraisals. We designed a field-ready curriculum with three modules – detection, verification, and appraisal-coping – an embedded it across laboratory and project work in power engineering, electronics, and information systems. Implementation acknowledged wartime realities through a layered defence approach that included offline materials, a pause-and-resume protocol for air-raid alerts, and paper-digital verification logs to ensure continuity. Evaluation combined pretest-posttest-retention measures of verification accuracy, time-to-verification, and justification quality with brief ratings of cognitive load and perceived stress, and with process traces that recorded steps actually taken. Results show clear gains in verification accuracy and justification quality, increased use of lateral reading and source triangulation, and stable or slightly reduced time-to-verification under realistic constraints. Students reported a reliable shift from threat to challenge appraisal, with lower perceived stress during timed verification, and the schema supported fast recovery after

interruptions without loss of rigour. Effects were stronger for higher L2 proficiency and greater domain knowledge, highlighting the value of explicit scaffolds, bilingual glossaries for modality and evidence, and routine AI-use disclosure coupled with verification rather than prohibition. We conclude that FLML constitutes a practical, scalable shield for technical higher education in Ukraine – hardening epistemic defences while sustaining mental health – and we provide an implementation blueprint that invites replication and longitudinal tracking across programmes.

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