



REVIEW ARTICLE

DIGITAL MEDIA LITERACY IN TERTIARY EDUCATION: A SYSTEMATIC LITERATURE REVIEW OF CONCEPTUALIZATIONS, PEDAGOGICAL APPROACHES, AND LEARNING OUTCOMES (2015–2025)

Jiang Xinjue¹, Liu Yuansheng^{2*}

¹ Department of Language and Literacy Education, Faculty of Education, Universiti Malaya, WP Kuala Lumpur, 50603, Malaysia

² Department of Communication, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400, Selangor, Malaysia

ARTICLE INFO	ABSTRACT
Submission Feb. 26, 2026 Acceptance May 05, 2026 Keywords Media literacy; Higher education; Tertiary education; Systematic review; Digital literacy Corresponding Author 218480@student.upm.edu.my	The rapid expansion of digital platforms and algorithm-driven information environments has made media literacy an increasingly critical competency for college and university students. Yet, despite growing scholarly interest, research on media literacy education in tertiary settings remains fragmented across conceptual frameworks, pedagogical approaches, and outcome domains. This systematic review synthesizes empirical studies on digital media literacy interventions in higher education published between 2015 and 2025. Following PRISMA 2020 guidelines, 20 studies were identified through systematic database searching and screened against predefined inclusion criteria. Findings reveal that both short targeted trainings and semester-long curricula consistently produce short-term cognitive gains. However, effects on attitudes remain inconsistent, and evidence of real-world behavioral change is limited. Interventions that emphasize concrete verification routines, such as lateral reading, demonstrated the clearest immediate benefits. From a computing and intelligent education perspective, the review further identifies four technically operational dimensions: cross-platform verification, algorithmic recommendation awareness, generative AI content identification (AIGC literacy), and deepfake detection. These dimensions are unevenly addressed in current curricula. The review also highlights the underutilisation of platform-based training

environments, behavioral log analysis, and human-AI collaborative verification tools in both intervention design and outcome evaluation.

1. INTRODUCTION

The proliferation of digital platforms and algorithm-driven content delivery has transformed the information environment facing college and university students.

Search engines, social media feeds, and AI-generated news relentlessly filter and personalize what users see, often without their awareness (Frau-Meigs, 2024).

UNESCO (2025) notes that this “connected world” requires citizens to critically interpret media messages and use digital tools responsibly. Nowadays, media literacy is not just about knowledge or competencies, but as a set of skills: the ability to access, analyze, evaluate, create, and act on information in any form (Polanco-Levícan & Salvo-Garrido, 2022)). In this sense, media literacy extends beyond operating digital devices to include ethical reasoning about sources and motives, as well as reflective “epistemic judgment” in distinguishing credible information from noise.

Despite broad agreement on its importance (e.g., Martens & Hobbs, 2015; Share & McBride, 2022; Wei et al., 2023), media literacy remains a multifaceted and evolving concept. Scholars often distinguish media literacy from related ideas such as digital literacy, which typically emphasizes technical and functional skills (Pangrazio, 2016)

Nevertheless, academic research on media literacy in tertiary settings has been fragmented. Some studies frame media literacy through the lens of critical pedagogy and power (Smith, 2024; Albardía et al., 2025), others align it with digital competence frameworks (Spante et al., 2018; Georgopoulou et al., 2025), and still others treat it as a facet of civic education and disinformation resilience (McDougall, 2019; Anstead et al., 2025).

From a computer science and intelligent education perspective, digital media literacy can be decomposed into at least four technically operational dimensions that current curricula address unevenly. First, cross-platform verification refers to the competence to corroborate claims across heterogeneous digital environments, including search engines, encyclopaedias, official databases, and social media, through the use of systematic source interrogation techniques such as lateral reading and reverse image search (Brodsky et al., 2021; Breakstone et al., 2021; Guess et al., 2020). Second, algorithmic recommendation awareness denotes an understanding of how personalisation algorithms shape users’ information exposure: the mechanics of collaborative filtering, engagement-optimised ranking, and the resulting filter-bubble and echo-chamber effects that systematically narrow the informational diet of platform users (Frau-Meigs, 2024; Albardía et al., 2025). Third, generative AI content identification (AIGC literacy) captures the emerging competence to recognise, critically interrogate, and appropriately attribute content produced by large language models, image-synthesis systems, and other generative AI pipelines. This dimension was largely absent from pre-2023 media literacy frameworks but has become increasingly salient due to the rapid proliferation of AI-generated text, images, and video (Kong et al., 2021). Fourth, deepfake detection encompasses the perceptual and tool-assisted skills

required to identify synthetic or manipulated audiovisual media, including face-swapped video, voice-cloning artefacts, and AI-edited imagery (Georgopoulou et al., 2025). These four dimensions are not mutually exclusive, and effective digital media literacy education in tertiary settings increasingly requires curricula to address all of them rather than focusing solely on traditional source credibility judgments. Yet, as the synthesis below reveals, the reviewed literature addresses these dimensions unevenly, with cross-platform verification receiving the most empirical attention and AIGC literacy the least.

To clarify the state of the field, this systematic review synthesizes empirical studies on digital media literacy in higher education. In particular, we focus on how media literacy is conceptualized, how it is taught, and how learning outcomes are assessed in university settings. We address three guiding questions:

- (1) How are media literacy interventions pedagogically structured within tertiary education contexts?
- (2) What patterns of reported outcomes emerge across cognitive, attitudinal, and behavioral domains in media literacy interventions in higher education?
- (3) What methodological characteristics shape the effectiveness and limitations of the current empirical evidence on media literacy interventions in higher education?

By organizing findings along these dimensions, we aim to reveal common themes and gaps, contributing to a clearer conceptual foundation and evidence base for curriculum and policy development.

2. METHODS

This review was conducted following the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. PRISMA provides a framework for transparent literature searching and selection, including a flow diagram to document each stage (Page et al., 2021). Searches were conducted across multiple databases, including Google Scholar, ERIC, and Scopus, to maximize disciplinary coverage. Google Scholar served as the primary platform given its broad indexing across social sciences and education, while ERIC and Scopus provided additional coverage of peer-reviewed educational and communication research. Although this combination does not fully replace the coverage achievable through a comprehensive multi-database protocol (e.g., PsycINFO, Web of Science), it represents a pragmatic approach aligned with the interdisciplinary scope of the review; this limitation is acknowledged in the Discussion. Search queries combined keywords for media literacy with terms for higher education, using Boolean operators ("media literacy" OR "digital media literacy" OR "critical media literacy" OR "news literacy" OR "information literacy") AND ("higher education" OR "tertiary education" OR university OR "college students" OR undergraduates OR postgraduates). Searches were limited to English-language journal articles published between 2015 and 2025. After running these searches, all results were exported to a reference manager and duplicates were removed.

Titles and abstracts of the remaining records were screened for relevance to our inclusion

criteria. We included studies if they explicitly focused on postsecondary (undergraduate or graduate) students and treated media literacy (or a closely related construct) as a central subject. Eligible studies reported empirical data (quantitative, qualitative, or mixed methods) and involved some instructional intervention or measurable learning outcomes. We excluded purely conceptual or theoretical papers, K–12 focused work, conference proceedings, and book chapters. Figure 1 (PRISMA flow diagram) summarizes the study selection process. Ultimately, 20 studies met all inclusion criteria and were included in the synthesis.

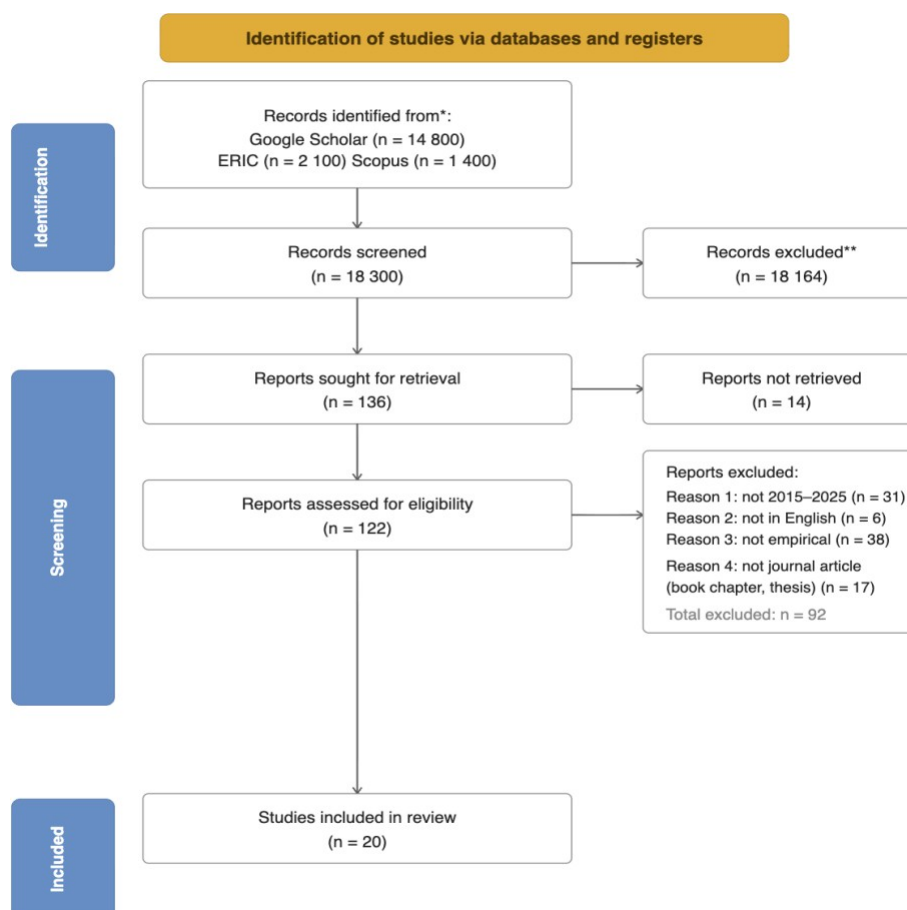


Figure 1. PRISMA Flowchart (Adapted from (Page et al., 2021))

For each included study, data were extracted into a standardized template.

Extraction fields covered bibliographic details (author, year, country), theoretical framework or definition of media literacy, research design, participant sample, description of the pedagogical intervention or curriculum, and the measures used to assess media literacy outcomes. We also noted the main findings reported by each study. This approach follows recommended practice for systematic reviews (Dagher & Khan, 2025), ensuring that key variables (publication year, study context, interventions, outcome measures, etc.) are consistently recorded.

Quality appraisal and risk-of-bias assessment were conducted for each included study using criteria adapted from the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018), which accommodates the heterogeneous designs present in this review (quantitative, qualitative, mixed-methods, and quasi-experimental). Each study was evaluated on five dimensions: (1) clarity of

research questions and objectives; (2) appropriateness of the study design for the stated aims; (3) adequacy of sampling strategy and sample size; (4) reliability and validity of outcome measurement; and (5) potential for selection bias, attrition, or confounding. Studies were rated as low, moderate, or high risk of bias on each dimension. Overall, the majority of included studies ($n = 13$) exhibited a moderate risk of bias, primarily due to the absence of control groups, reliance on self-report measures, and short follow-up periods. A smaller subset ($n = 4$) demonstrated low risk of bias through experimental or quasi-experimental designs with active control conditions (Guess et al., 2020; Adjin-Tettey, 2022; Geers et al., 2020; Brodsky et al., 2021). Three studies were rated high risk of bias owing to the absence of pre-measures, very small samples, or purely descriptive designs without clear inferential intent. These appraisal judgments are integrated throughout the Results and Discussion sections to contextualize the strength of evidence underlying each finding.

Table 1. Quality appraisal and risk-of-bias summary — Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018)

Study (author, year)	Design type	D1 RQ clarity	D2 Design fit	D3 Sampling	D4 Measures	D5 Bias risk	Overall RoB
Guess et al. (2020)	RCT	L	L	L	L	L	Low
Adjin-Tettey (2022)	Experimental	L	L	M	L	L	Low
Geers et al. (2020)	Quasi-experimental	L	L	M	L	M	Low
Brodsky et al. (2021)	Quasi-experimental	L	L	M	L	M	Low
Breakstone et al. (2021)	Pre/post (no ctrl)	L	M	H	L	M	Moderate
Al Zou'bi (2022)	One-group pre/post	L	M	M	M	H	Moderate
Higdon (2021)	Qualitative pilot	L	L	H	M	M	Moderate
Kong et al. (2021)	Pre/post survey	L	M	M	M	M	Moderate
Klaassen et al. (2024)	Action research	L	M	H	M	M	Moderate
Tully & Vraga (2018)	Mixed methods	L	L	M	M	M	Moderate
Ashley et al. (2017)	Correlational	L	M	M	M	M	Moderate
Okela (2024)	SEM cross-sectional	L	M	M	M	M	Moderate
Tran-Duong (2023)	SEM cross-sectional	L	M	M	M	M	Moderate
Zhou et al. (2025)	SEM cross-sectional	L	M	M	M	M	Moderate
Dann et al. (2022)	Pre/post survey	L	M	L	M	M	Moderate
Fang & Nie (2025)	Correlational	L	M	M	M	M	Moderate
Georgopoulou et al. (2025)	Descriptive	L	M	M	H	H	High
Albardia et al. (2025)	Mixed methods	L	M	M	M	M	Moderate
Oroka (2024)	Quasi-experimental	L	M	M	M	H	High
Fleming (2015)	Qualitative case	L	M	H	H	H	High

Dimension key: D1 = Clarity of research questions and objectives; D2 = Appropriateness of study design for stated aims; D3 = Adequacy of sampling strategy and sample size; D4 = Reliability and validity of outcome measurement; D5 = Potential for selection bias, attrition, or confounding. **Rating key:** L = Low risk; M = Moderate risk; H = High risk. **Overall RoB** reflects the highest dimension rating observed, weighted by centrality to the study's main claims. Studies assigned Low overall RoB used experimental or quasi-experimental designs with active controls (Guess et al., 2020; Adjin-Tettey, 2022; Geers et al., 2020; Brodsky et al., 2021). High overall RoB reflects absence of baseline measures, very small or purely purposive samples, or descriptive designs without inferential intent (Georgopoulou et al., 2025; Oroka, 2024; Fleming, 2015). All other studies rated Moderate, primarily due to absence of control conditions, reliance on self-report measures, and/or short or absent follow-up. RoB = risk of bias. Adapted from Hong et al. (2018). *Education for Information*, 34(2), 133–146.

Data synthesis proceeded thematically. Given the heterogeneity of study designs and measures, we did not perform a meta-analysis. Instead, we coded the extracted information inductively to identify recurring patterns and themes. These thematic groupings help reveal common strands across the literature and highlight variations in how media literacy is operationalized in higher education.

3. RESULTS

This review synthesized evidence ($n=20$, see Appendix for details) examining media, information, and digital literacy in postsecondary and adjacent learning contexts. The 20 studies varied substantially in design and evidential strength. Nine studies employed experimental or quasi-experimental designs involving an instructional intervention with pre- and post-measurement (Brodsky et al., 2021; Breakstone et al., 2021; Klaassen et al., 2024; Al Zou'bi, 2022), and are referred to throughout as intervention studies. The remaining eleven studies used observational designs, including cross-sectional surveys, correlational analyses, and descriptive

case studies that measured existing competencies or associations between literacy and outcomes without introducing an intervention; these are referred to as observational studies. Where findings from these two evidence types are synthesized, their different levels of evidential strength are explicitly noted, as causal claims are only warranted by the former.

The 20 included studies were unevenly distributed geographically. North America accounted for the largest share ($n = 7$; 35.0%), followed by Asia ($n = 5$; 25.0%), Europe ($n = 4$; 20.0%), Africa ($n = 3$; 15.0%), and Oceania ($n = 1$; 5.0%); no studies were drawn from South America. Using World Bank income categories as a proxy for development status, 13 studies (65.0%) were conducted in high-income (developed) economies, while 7 studies (35.0%) were from developing (upper- or lower-middle or low-income) economies. These patterns indicate a concentration of tertiary media-literacy intervention research in North America and other high-income settings, with comparatively fewer studies from low- and middle-income regions.

3.1. Evaluation of Online Information and Misinformation Discernment

Across intervention studies, a consistent pattern is that targeted instruction can improve learners' ability to evaluate online information, particularly when instruction explicitly teaches verification strategies (e.g., lateral reading) and makes those strategies visible through worked examples and repeated practice (Brodsky et al., 2021; Breakstone et al., 2021). In their studies, the pedagogical mechanism is not merely exposure to “tips” but the cultivation of transferable routines: leaving a focal page, corroborating across sources, and interrogating the provenance of claims and organizations (Brodsky et al., 2021; Breakstone et al., 2021). From a media literacy perspective, these results support an instructional emphasis on process (how to verify) rather than solely content (what is true/false).

At the same time, Guess et al. (2020) show reductions in the perceived accuracy of false news headlines and improvements in the ability to distinguish false headlines from mainstream factual news. Moreover, real-world exposure and attention to the intervention may be substantially lower than in study conditions, which would attenuate impact. This raises the necessity of promoting media literacy training.

Fleming (2015) curriculum-focused study highlights that instructional framing determines whether students practice verifying factual claims, weighing interpretations, or enacting epistemic routines that justify conclusions. This helps explain why interventions that operationalize evaluation as observable routines (e.g., corroboration and provenance checking) yield clearer performance gains than approaches that rely on general discussion of credibility (Brodsky et al., 2021; Breakstone et al., 2021).

Evidence also indicates that media literacy education can reduce susceptibility to false or misleading content (Al Zou'bi, 2022; Adjin-Tettey, 2022), reinforcing that evaluation is malleable, but that effects likely depend on the fit between the skills taught and the misinformation forms encountered (Adjin-Tettey, 2022)). This complements findings showing modest, decaying improvements in discernment (Guess et al., 2020) and suggests that durable change requires more than generic skepticism. Instead, learners need actionable heuristics and practice under realistic task demands. In this context, however, durability and transfer hinge on specificity, credible

instruction, and alignment between learning activities and assessment (Al Zou'bi, 2022). Overall, interventions are most likely to produce sustained improvements when “critical evaluation” is taught and measured as routinized, performance-based practice that is reinforced over time (Brodsky et al., 2021; Breakstone et al., 2021; Guess et al., 2020).

3.2. Media and Information Literacy and Learning-Related Outcomes

Several studies framed media/new media/digital literacy as a contributor to learning outcomes in online and higher-education settings, with findings generally indicating that higher literacy competencies are associated with more positive educational experiences (Dann et al., 2022; Georgopoulou et al., 2025; Okela, 2024; Tran-Duong, 2023; Zhou et al., 2025).

For example, students who can critically navigate, evaluate, and produce digital content may experience online learning as more coherent and manageable, potentially because literacy competencies reduce informational friction and increase perceived control over learning resources (Okela, 2024). Similarly, digital literacy can function as a form of academic and professional capital: the ability to locate, assess, and recombine information may enable students to generate novel ideas and implement them effectively in coursework and projects (Zhou et al., 2025). In the context of adult/vocational education, the relevance of media literacy extends beyond academic outcomes to include broader forms of social and economic participation (Oroka, 2024).

However, these should be interpreted cautiously. First, cross-sectional designs cannot establish whether literacy drives outcomes or whether more engaged, better-resourced, or higher-achieving students develop literacy and report better outcomes. Second, “digital literacy” is operationalized differently across studies, and measures can conflate technical fluency (e.g., operating tools) with critical competence (e.g., evaluating claims and sources), which has implications for what educational interventions should target.

These patterns reinforce a key implication for higher education: generic “one-shot” approaches are unlikely to be sufficient. Instead, instruction should be scaffolded and contextualized within disciplinary epistemologies, assessment norms, and authentic information tasks (Dann et al., 2022; Georgopoulou et al., 2025).

Beyond digital and media literacy narrowly defined, adjacent “future-facing” literacies are also being positioned as consequential for learning. In particular, evaluation of an artificial intelligence (AI) literacy course suggests that students from diverse disciplinary backgrounds can develop AI-related competencies through structured instruction, pointing to the increasing convergence of media literacy concerns with data-, platform-, and AI-mediated information environments (Kong et al., 2021).

3.3. Civic and Political Outcomes

In the civic domain, the literature links news media literacy to political engagement and political efficacy.

Evidence from selected articles indicates that higher levels of news media literacy tend to co-occur with stronger political engagement and efficacy-related orientations (Ashley et al., 2017;

Tully & Vraga, 2018). One plausible interpretation is that literacy competencies help individuals navigate political information with less cynicism and more calibrated trust. Rather than treating all sources as equally unreliable, more literate individuals may be better able to discriminate among sources and claims, supporting a sense of agency.

At the same time, Geers et al.'s (2020) research among lower-educated youth suggests that structured media literacy education can improve news media literacy and, in some contexts, related civic knowledge and efficacy outcomes. Importantly, if media literacy is positioned as a civic competency, then differential access to high-quality instruction may reproduce civic inequalities. Therefore, program design should attend to not only measurable skill gains but also whether interventions narrow (or widen) gaps in who benefits from informational participation (Geers et al., 2020).

3.4. Critical Media Literacy and Social Media Behavior

Beyond skills-based instruction, critical media literacy approaches emphasize reflexive engagement with media power, ideology, and platform dynamics. Such pedagogy can influence students' social media behaviors and attitudes (Higdon, 2021), shifting learners from passive consumption toward more intentional participation, including heightened attention to how content is framed, whose voices are amplified, and how engagement metrics can reward sensationalism.

Within social media environments, even small, strategically designed actions can be positioned as media and information literacy tools (Klaassen et al., 2024). A critical interpretation, however, is that microinterventions may have uneven reach and may be constrained by platform governance and algorithmic visibility. Thus, the relationship between individual action and systemic change remains an open empirical question.

At a broader level, instructional outcomes are shaped by the interplay between pedagogical goals and the structural features of contemporary media systems (e.g., platform business models, algorithmic ranking, and datafication) (Albardía et al., 2025). This perspective supports interpreting observed behavioral shifts (Higdon, 2021) and microintervention effects (Klaassen et al., 2024) as contingent, situated achievements rather than purely individual skill gains.

3.5. Equity and Heterogeneity in Outcomes

The literature selected indicates that digital literacy is not uniformly distributed and, critically, that similar levels of "internet use" do not necessarily translate into similar tangible outcomes.

Evidence from Fang and Nie (2025) highlights disparities in how effectively students can convert online participation into educational, social, and economic benefits. This finding is consistent with a broader media literacy argument: literacy is an enabling resource whose value depends on context, including available institutional supports, social networks, language repertoires, and the fit between platform affordances and users' goals. Accordingly, interventions should be evaluated not only on average treatment effects but also on distributional consequences (who benefits, under what conditions, and at what cost).

Across studies, heterogeneity also reflects differences in conceptualization (media literacy vs. information literacy vs. digital literacy), instruments used, and the intensity and duration of instruction, which complicates direct comparison of effect sizes and may help explain apparently inconsistent findings. For instance, studies emphasizing verification and source evaluation typically assess performance on information evaluation tasks (Brodsky et al., 2021; Breakstone et al., 2021), whereas studies framed around online learning outcomes often rely on self-report scales (Okela, 2024; Tran-Duong, 2023). Platform-Based Training, Behavioral Measurement, and Human–AI Collaborative Verification. A technically oriented analysis of the 20 included studies reveals substantive variation in both intervention delivery platforms and the methods used to measure learner behaviour, two dimensions that have not been sufficiently differentiated in most prior reviews.

Regarding delivery, the majority of interventions were conducted in face-to-face or asynchronous online classroom environments, but a meaningful subset used live digital platforms as the site of instruction and assessment. Guess et al. (2020) deployed their “Tips to Spot False News” intervention directly through Facebook, exposing learners to heuristic rules in the same algorithmic environment where misinformation circulates; this ecological validity distinguishes the study from classroom-only designs. Kong et al. (2021) used a structured flipped-classroom model in which learners engaged with AI literacy content through a purpose-built digital platform prior to in-class consolidation, enabling timestamped tracking of access patterns. Klaassen et al. (2024) had journalism students perform microinterventions directly on live social media accounts, making the platform itself both the instructional medium and the site of behavioural measurement. With respect to outcome measurement, most studies relied on self-report surveys or researcher-constructed knowledge quizzes. However, two studies employed behavioural log analysis, an approach that offers considerably higher ecological and construct validity. Brodsky et al. (2021) used screen-capture tracking software to record whether students actually executed lateral reading routines during live information tasks, enabling direct observation of verification behaviour rather than relying on self-reports. Similarly, Breakstone et al. (2021) measured the frequency and accuracy of lateral reading moves from task-completion logs. These approaches represent an important methodological advance: behavioural log data reveal not only whether students know the correct strategy (cognitive outcome) but whether they spontaneously apply it under realistic conditions (behavioural outcome). The gap between self-reported competence and logged behaviour has been documented in adjacent digital-skills literatures and deserves greater attention in future media literacy intervention research. The reviewed studies also begin to gesture toward human–AI collaborative verification, though none systematically evaluated it. Georgopoulou et al. (2025) assessed students’ ability to detect deepfakes using scenario-based tasks, identifying significant variation in students’ perceptual accuracy and revealing that visual inspection alone is insufficient for identifying sophisticated synthetic media, implying a need for tool-assisted verification workflows. Kong et al. (2021) introduced students to AI-generated content through a structured AI literacy module, building awareness of generative systems’ capabilities and limitations. Taken together, these cases suggest a trajectory toward curricula that combine critical human judgment with computational verification tools (e.g., provenance-checking APIs, AI-detection classifiers, reverse-image search engines). This model warrants systematic empirical evaluation in higher education contexts.

4. DISCUSSION

Literature included in this review affirms that media literacy programs in higher education take many forms. Some are short, targeted trainings on specific skills (Guess et al., 2020; Kong et al., 2021; Breakstone et al., 2021; Adjin Tettey, 2022), while others are embedded courses or curricula that integrate media literacy across a semester or program (Fleming, 2015; Higdon, 2021; Brodsky et al., 2021; Al Zoubi, 2022).

Meanwhile, interventions ranged from discrete workshops such as “Tips to Spot False News” (Guess et al., 2020) and cognitive skills modules such as a flipped classroom (Kong et al., 2021), to long term courses (Higdon, 2021) framed around critical media literacy or news production. Others were action oriented “microinterventions” that prompted students to actively vet or create content on social media (Klaassen et al., 2024). A few studies simply surveyed existing competencies without any intervention (Tran Duong, 2023). These varied interventions reflect different pedagogical framings, but most share an emphasis on giving students concrete evaluation routines such as corroboration and source checking rather than abstract discussions of credibility.

The studies also target different outcome domains. In our review, students often improved on tasks such as distinguishing true versus false headlines, evaluating evidence, or navigating online search strategies after training. This aligns with Potter’s (2004) media literacy theory, in which cognitive outcomes such as knowledge and skills are most commonly assessed.

By contrast, attitudinal outcomes, including beliefs, skepticism, and self efficacy, were less frequently measured in the literature selected. As Polanco Levicán and Salvo Garrido (2022) note, social media literacy encompasses both cognitive competences such as analysis and evaluation and socio emotional competences such as motivation, attitude, and behavior. In practice, however, most college level media literacy curricula emphasize the cognitive dimension, with fewer explicitly aiming to shift beliefs or social norms. A few studies did report attitude related shifts (Ashley et al., 2017; Tully and Vraga, 2018; Al Zoubi, 2022). Crucially, however, many interventions had minimal impact on deeper attitudes (Blair et al., 2024).

Behavioral outcomes, referring to students actual media practices, are the least commonly addressed. A handful of studies attempted to measure behavior change by tracking whether students applied fact checking routines in real time or shared news responsibly (Higdon, 2021). Similarly, Klaassen et al. (2024) report that media activism “microinterventions” can increase resilience to misinformation by having students practice rebuttal tasks. However, these behavior focused findings were exceptions. Most studies relied on cognitive quizzes or self reports. In short, interventions primarily target cognitive skills, only secondarily measure attitudes, and seldom capture real world behavior change.

The methodological rigor of the evidence is mixed, and interpretation of findings must account for differences in evidence type. Intervention studies, defined as those with pretest and posttest measurement and a pedagogical treatment, provide stronger causal evidence than observational studies such as cross sectional surveys and correlational analyses, which can only speak to associations. Among the 20 studies, only a few used strong experimental designs (Guess

et al., 2020; Adjin Tettey, 2022). However, the majority of studies were one group pretest posttest evaluations or correlational surveys (Al Zoubi, 2022; Okela, 2024; Zhou et al., 2025). Measurement also varied. Some programs used established instruments such as New Media Literacy scales, whereas others created ad hoc quizzes. Follow up was rare, meaning few studies assessed whether gains endured over time.

A notable contradiction is that more intensive curricula do not always outperform brief nudges. For instance, Guess et al. (2020) found that heuristic tips can still boost fake news discernment in the short term. This suggests scalability and generalizability, which may be useful for informal short term or urgent trainings in media literacy. Another, and arguably more fundamental, tension concerns the pace of technological change relative to curriculum development. Traditional media literacy courses were largely designed around static source credibility heuristics, including evaluating authorship, publication date, and domain, that are increasingly insufficient in an environment shaped by three rapidly advancing technical phenomena: recommendation algorithms, AI generated content, and automated fact checking tools.

First, platform recommendation algorithms now serve as primary gatekeepers of political and social information for the majority of tertiary students. Collaborative filtering and engagement maximisation systems create personalised information environments that systematically amplify emotionally resonant and partisan content, producing filter bubbles that standard source evaluation curricula do not address (Frau Meigs, 2024; Albardía et al., 2025). The reviewed studies rarely engaged with this structural feature of contemporary information environments. Only Klaassen et al. (2024) and Higdon (2021) positioned platform architecture itself as an object of critical literacy instruction. Future curricula should incorporate explicit instruction on how algorithmic ranking operates, how to audit and disrupt personalised feeds such as through incognito search, cross platform triangulation, and filter bubble visualisation tools, and how to reason about the provenance of algorithmically surfaced content.

Second, the proliferation of AI generated content, including large language model text, synthetic images, voice clones, and deepfake video, introduces verification challenges that go beyond conventional source evaluation. Large language model generated text can mimic expert register, cite plausible sounding but fabricated sources, and produce fluent prose on any topic without traceable institutional authorship. Deepfake audiovisual media can fabricate statements by identifiable public figures with high perceptual plausibility. The reviewed literature addresses AI generated content literacy only marginally. Kong et al. (2021) provided foundational AI literacy instruction, and Georgopoulou et al. (2025) assessed students deepfake detection accuracy. Both studies found significant competence gaps. This represents a critical curricular deficit. AI generated content literacy must be treated as a discrete and teachable sub dimension of digital media literacy, requiring instruction in how generative models work, what artefacts they produce, and how provenance metadata, watermarking standards such as C2PA, and AI detection classifiers can assist human judgement.

Third, automated fact checking tools represent an underexplored resource for human AI collaborative verification in educational settings. Systems such as ClaimBuster, Google Fact

Check Tools, and platform integrated provenance APIs can assist students in rapidly querying whether claims have been previously fact checked, identifying the original source of viral images, and cross referencing statements against structured knowledge bases. None of the 20 reviewed studies systematically integrated or evaluated such tools as pedagogical resources, despite growing evidence from computational journalism and information science that tool assisted verification outperforms unaided human judgement for many claim types. Incorporating automated fact checking tools into media literacy curricula while also teaching their limitations, including coverage gaps, potential biases in training data, and inability to evaluate novel AI generated content, represents a productive direction for future course design. The emerging inclusion of AI literacy (Kong et al., 2021) and media activism tasks (Klaassen et al., 2024) points toward this convergence. Translating it into systematically evaluated instructional models is an important priority for the field.

Based on the findings of this review, future research should prioritize methodological rigor and outcome breadth to address current limitations in tertiary media literacy interventions. Given that most studies demonstrate short term cognitive gains but provide limited evidence of sustained attitudinal or behavioral change, future work should incorporate longitudinal designs and objective behavioral measures to assess durability and real world transfer. Stronger experimental or quasi experimental designs with appropriate comparison groups are necessary to enhance causal inference. Additionally, greater conceptual and measurement standardization would improve comparability across studies, particularly through validated performance based instruments. As the evidence base of this study is geographically uneven, research should expand to more diverse socio cultural and economic contexts to strengthen external validity.

5. CONCLUSION

In conclusion, this study systematically reviewed 20 empirical articles on media-literacy education in tertiary settings, extracting intervention types, pedagogical features, outcomes, and methodological characteristics to map the current evidence base. Across studies, short, targeted trainings and curricular courses commonly produce reliable short-term cognitive gains (improved source evaluation, fact-checking, lateral reading), with less consistent effects on attitudes and only sporadic evidence of real-world behavior change; interventions emphasizing concrete verification routines showed the clearest immediate benefits.

The review additionally highlights that the field has paid insufficient attention to technically operational sub dimensions of digital media literacy, particularly algorithmic recommendation awareness, AIGC literacy, and deepfake detection, and that evaluation methods have rarely moved beyond self report toward behavioural log analysis or tool assisted verification assessment. Future curricula should integrate explicit instruction on recommendation algorithm mechanics, AI generated content identification, and automated fact checking tools alongside traditional source evaluation routines, and should measure outcomes using ecologically valid behavioural indicators rather than relying solely on self report or researcher constructed knowledge quizzes.

The review has several important limitations. First, although searches were conducted across Google Scholar, ERIC, and Scopus, a fully comprehensive multi database search, including PsycINFO, Web of Science, and Communication Abstracts, may have captured additional relevant

studies. The current search strategy likely introduces some selection bias toward more widely indexed journals. Second, given the heterogeneity in study designs and measures, causal claims should be interpreted with care, particularly where findings are based on observational rather than experimental evidence. Third, the sample is relatively small ($n = 20$) and geographically concentrated, which restricts generalizability. Future work should prioritize pre registered randomized controlled trials or rigorous quasi experimental designs with active control conditions, standardized performance based instruments, objective behavioral indicators, and longer follow up periods, as well as broader equity focused sampling across multiple countries and populations, in order to build a cumulative and generalizable evidence base for media literacy in higher education.

CONFLICT STATEMENT

The authors declare no conflict of interest.

COOPERATION STATEMENT

All authors contributed equally to this work and approved the final manuscript.

REFERENCES

- Al Zou'bi, R. M. (2022). The impact of media and information literacy on students' acquisition of the skills needed to detect fake news. *Journal of Media Literacy Education*, 14(2), 58–71.
- Albardía, M. S., Peña-Fernández, S., & Agirreazkuenaga, I. (2025). Technology, education and critical media literacy: Potential, challenges, and opportunities. *Frontiers in Human Dynamics*, 7, 1608911.
- Anstead, N., Edwards, L., Livingstone, S., & Stoilova, M. (2025). The potential for media literacy to combat misinformation: Results of a rapid evidence assessment. *International Journal of Communication*, 19, 2129–2151.
- Ashley, S., Maksl, A., & Craft, S. (2017). News media literacy and political engagement: What's the connection? *Journal of Media Literacy Education*, 9(1), 79–98.
- Blair, R. A., Gottlieb, J., Nyhan, B., Paler, L., Stainfield, C. J., & Weaver, J. A. (2024). How effective are media literacy interventions at countering misinformation in the Global South? Democratic Erosion Evidence Brief, Democracy Erosion Consortium. <https://democratic-erosion.org/wp-content/uploads/2024/09/HOW-EFFECTIVE-ARE-MEDIA-LITERACY-INTERVENTIONS-AT-COUNTERING-MISINFORMATION-IN-THE-GLOBAL-SOUTH.pdf>
- Breakstone, J., Smith, M., Connors, P., Ortega, T., Kerr, D., & Wineburg, S. (2021). Lateral reading: College students learn to critically evaluate internet sources in an online course. <https://dash.harvard.edu/entities/publication/adbef840-9142-4a9c-8347-acb7962dcd03>
- Brodsky, J. E., Brooks, P. J., Scimeca, D., Todorova, R., Galati, P., Batson, M., Grosso, R., Matthews, M., Miller, V., & Caulfield, M. (2021). Improving college students' fact-checking strategies through lateral reading instruction in a general education civics course. *Cognitive Research: Principles and Implications*, 6(1), 23. <https://doi.org/10.1186/s41235-021-00291-4>
- Dagher, D., & Khan, M. (2025). Writing a systematic review and meta-analysis: A step-by-step guide. *Sports Health*, 17(5), 885–890. <https://doi.org/10.1177/19417381251364686>

- Dame Adjin-Tettey, T. (2022). Combating fake news, disinformation, and misinformation: Experimental evidence for media literacy education. *Cogent Arts & Humanities*, 9(1), 2037229. <https://doi.org/10.1080/23311983.2022.2037229>
- Dann, B. J., Drabble, A., & Martin, J. (2022). Reading between the lines: An examination of first-year university students' perceptions of and confidence with information literacy. *Journal of Information Literacy*, 16(1), 50–69.
- Fang, W., & Nie, C. (2025). Inequalities in digital literacy: Exploring the disparity in tangible outcomes of internet use among college students in China. *Frontiers in Communication*, 10, 1601240.
- Fleming, J. (2015). What do facts have to do with it? Exploring instructional emphasis in the Stony Brook news literacy curriculum. *Journal of Media Literacy Education*, 7(3), 73–92.
- Frau-Meigs, D. (2024). Algorithm literacy as a subset of media and information literacy: Competences and design considerations. *Digital*, 4(2), 512–528.
- Geers, S., Boukes, M., & Moeller, J. (2020). Bridging the gap? The impact of a media literacy educational intervention on news media literacy, political knowledge, political efficacy among lower-educated youth. *Journal of Media Literacy Education*, 12(2), 41–53.
- Georgopoulou, M. S., Troussas, C., Krouska, A., & Sgouropoulou, C. (2025). Digital literacy in higher education: Examining university students' competence in online information practices. *Computers*, 14(12), 528.
- Guess, A. M., Lerner, M., Lyons, B., Montgomery, J. M., Nyhan, B., Reifler, J., & Sircar, N. (2020). A digital media literacy intervention increases discernment between mainstream and false news in the United States and India. *Proceedings of the National Academy of Sciences*, 117(27), 15536–15545. <https://doi.org/10.1073/pnas.1920498117>
- Higdon, N. (2021). The critical effect: Exploring the influence of critical media literacy pedagogy on college students' social media behaviors and attitudes. <https://digitalcommons.uri.edu/jmle-preprints/3/>
- Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., Vedel, I., & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for Information*, 34(2), 133–146. <https://doi.org/10.3233/EFI-180221>
- Integrating media and information literacy into higher education. (2025, March 13). UNESCO. <https://www.unesco.org/en/articles/integrating-media-and-information-literacy-higher-education-unesco-academia-and-higher-education>
- Klaassen, M., Murumaa-Mengel, M., & Himma, M. (2024). Social media microinterventions: Testing information activism as a media and information literacy tool. *Journal of Media Literacy Education*, 16(2), 1–13.
- Kong, S.-C., Cheung, W. M.-Y., & Zhang, G. (2021). Evaluation of an artificial intelligence literacy course for university students with diverse study backgrounds. *Computers and Education: Artificial Intelligence*, 2, 100026.
- Martens, H., & Hobbs, R. (2015). How media literacy supports civic engagement in a digital age. *Atlantic Journal of Communication*, 23(2), 120–137.
- McDougall, J. (2019). Media literacy versus fake news: Critical thinking, resilience and civic engagement. *Media Studies*, 10(19), 29–45.

- Okela, A. H. (2024). The role of new media literacy in shaping online learning satisfaction: Evidence from Egyptian universities. *Journal of Media Literacy Education*, 16(2), 46–60.
- Oroka, O. V. (2024). Effect of media literacy on entrepreneurial development of learners in adult and vocational education. *Journal of Media Literacy Education*. <https://www.academia.edu/download/120677950/Oroka1.pdf>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., & Brennan, S. E. (2021). Declaración PRISMA 2020: Una guía actualizada para la publicación de revisiones sistemáticas. *Revista Española de Cardiología*, 74(9), 790–799.
- Pangrazio, L. (2016). Reconceptualising critical digital literacy. *Discourse: Studies in the Cultural Politics of Education*, 37(2), 163–174. <https://doi.org/10.1080/01596306.2014.942836>
- Polanco-Levican, K., & Salvo-Garrido, S. (2022). Understanding social media literacy: A systematic review of the concept and its competences. *International Journal of Environmental Research and Public Health*, 19(14), 8807.
- Potter, W. J. (2004). *Theory of media literacy: A cognitive approach*. Sage.
- Share, J., & McBride, T. M. (2022). Critical media literacy for civic engagement in the United States. In *Handbook of civic engagement and education* (pp. 162–172). Edward Elgar Publishing. <https://www.elgaronline.com/edcollchap/book/9781800376953/book-part-9781800376953-23.xml>
- Smith, E. E. (2024). Building critical digital literacies for social media through educational development. *Journal of Contemporary Issues in Education*, 19(2), 64–89.
- Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, 5(1), 1519143. <https://doi.org/10.1080/2331186X.2018.1519143>
- Tran-Duong, Q. H. (2023). The effect of media literacy on effective learning outcomes in online learning. *Education and Information Technologies*, 28(3), 3605–3624.
- Tully, M., & Vraga, E. K. (2018). A mixed methods approach to examining the relationship between news media literacy and political efficacy. *International Journal of Communication*, 12, 22–22.
- Wei, L., Gong, J., Xu, J., Abidin, N. E. Z., & Apuke, O. D. (2023). Do social media literacy skills help in combating fake news spread? Modelling the moderating role of social media literacy skills in the relationship between rational choice factors and fake news sharing behaviour. *Telematics and Informatics*, 76, 101910.
- Zhou, X., Sun, K., Zhu, K., Feng, L., Sun, Q., & Zhong, D. (2025). The impact of digital literacy on university students' innovation capability: Evidence from Ningbo, China. *Frontiers in Psychology*, 16, 1548817.