

## **Effects of a Structured Media Literacy Intervention on Digital Misinformation Susceptibility Among Undergraduate Students: A Quasi-Experimental Study**

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### **Abstract**

Digital misinformation poses a significant and growing challenge to university students. They are among the most active consumers of online information, yet frequently struggle to distinguish credible content from fabrications. Despite widespread digital fluency, approximately 38% of students incorrectly evaluate the veracity of news headlines under controlled conditions. This study examined the prevalence of misinformation susceptibility among university students and evaluated the effectiveness of a structured, inoculation-grounded media literacy intervention. Using a quasi-experimental mixed-methods design, 200 undergraduate students were assigned through quota sampling to an intervention group (n = 100) and a waitlist control group (n = 100). No random assignment was employed; groups were matched on key demographic variables. Instruments included the Critical Media Literacy Self-Perception Instrument (CMLSPI; Neira et al., 2024) and the Misinformation Susceptibility Test (MIST-16; Maertens et al., 2024), both adapted into Bahasa Indonesia via forward-backward translation. Cronbach's alpha was .86 (CMLSPI) and .79 (MIST-16). Quantitative results demonstrated statistically significant gains in fake news detection accuracy (30% improvement; Cohen's  $d = 1.44$ , 95% CI [1.18, 1.70],  $p < .001$ ) and self-perceived media literacy ( $\eta^2 = .18$ ,  $p < .001$ ) relative to the control group. Qualitative thematic analysis identified four themes: increased

metacognitive awareness, adoption of verification strategies, recognition of cognitive and emotional manipulation, and structural barriers to sustained practice. These findings support the integration of inoculation-based prebunking with MIL competency training as an effective and theoretically grounded approach to building digital resilience among undergraduate students in Indonesia.

*Keywords:* Digital Misinformation; Media Literacy; Fake News; Undergraduate Students; Inoculation Theory.

## 1. Introduction

Digital misinformation has become one of the most urgent information challenges of the twenty-first century. It erodes public trust, distorts political discourse, and destabilizes social cohesion across societies (Lazer et al., 2018; Vosoughi et al., 2018). University students occupy a particularly consequential position in this landscape. They are simultaneously among the heaviest consumers of online information and among those with the greatest potential to either amplify or counter misinformation within their academic and civic roles. Empirical evidence shows that nearly 40% of news items evaluated by university students are incorrectly classified (Leeder, 2019; Wineburg & McGrew, 2017), and more than 60% report having shared false information online, often without awareness (Leeder, 2019). For higher education, this carries direct consequences: students who cannot reliably evaluate sources compromise the quality of their scholarly work and their capacity for informed democratic participation.

The scale of the broader problem reinforces this urgency. During the COVID-19 pandemic, 47% of U.S. adults encountered fabricated health information online (Sumsb, 2024). Advances in generative AI have enabled approximately 500,000 deepfake videos to be shared on social media in 2023 alone (Regula, 2024). For Indonesian undergraduates, who operate within a rapidly digitizing information environment with limited formal media literacy education, the risks are amplified. Equipping students with skills to identify, evaluate, and resist misinformation is therefore not merely an academic concern but a civic and societal imperative.

Understanding students' susceptibility requires a clear account of the cognitive mechanisms involved. Dual-process theory (Kahneman, 2011) offers the foundational framework: misinformation exploits fast, intuitive System 1 processing rather than deliberate analytical reasoning. Within this framework, confirmation bias leads individuals to accept information that aligns with pre-existing beliefs (Pennycook & Rand, 2018). The illusory truth effect increases the perceived credibility of

content through repeated exposure (Fazio et al., 2015). Emotional contagion causes fear- or outrage-inducing content to spread faster and receive less critical evaluation (Vosoughi et al., 2018). Social identity dynamics further shape credibility judgments, as individuals favor information aligned with their ingroup (Del Vicario et al., 2016).

Two complementary theoretical frameworks provide the principled basis for the intervention designed in this study. The UNESCO Media and Information Literacy (MIL) framework (2013) defines media literacy as the ability to access, analyze, evaluate, create, and act upon media messages, emphasizing critical thinking, source verification, and civic responsibility (Livingstone, 2004). Inoculation theory (McGuire, 1964; van der Linden et al., 2017) complements MIL by providing a preventive mechanism: pre-exposing individuals to weakened examples of manipulative misinformation alongside explicit refutational reasoning builds cognitive resistance to future deception. The integration of these frameworks shapes the study's core hypothesis: combining MIL competency development with inoculation-based prebunking produces effects that are larger and more durable than either framework alone would achieve.

Empirical support for media literacy interventions is substantial. Jeong et al. (2012), in a meta-analysis of 51 studies, reported a mean effect size of  $d = 0.37$  across knowledge, attitude, and behavioral outcomes. Multi-session, experiential approaches yield the strongest effects (Vraga & Tully, 2016), and benefits persist when media literacy is embedded within broader educational structures (Kahne & Bowyer, 2017). However, most existing interventions focus on either attitudinal inoculation or skills-based training in isolation.

Despite the growing body of intervention literature, three important gaps remain. First, existing studies rarely combine inoculation-based prebunking with experiential MIL pedagogy in a single, theoretically integrated curriculum. Second, validated psychometric instruments have seldom been deployed alongside qualitative methods to assess both the scope of susceptibility and the mechanisms of change. Third, empirical work on structured media literacy intervention remains sparse in the Indonesian undergraduate context, where prior studies have been limited in scope, lacked rigorous pre-post designs, or relied on unvalidated tools. These three gaps converge to create a practical and theoretical problem: educators and policymakers lack evidence-based, replicable intervention models suited to the Indonesian higher education context.

This study addresses these gaps by examining the prevalence of digital misinformation susceptibility among Indonesian undergraduates

and evaluating the effectiveness of a structured, inoculation-grounded media literacy intervention. Specifically, it asks: (1) To what degree are undergraduate students susceptible to digital misinformation as measured by validated instruments? And (2) Does participation in the intervention significantly improve misinformation detection accuracy, self-perceived media literacy, and verification behavioral intentions relative to a waitlist control group, and are these gains sustained at four-week follow-up?

## **2. Method**

### ***2.1. Research Design***

A quasi-experimental, mixed-methods design was employed. No random assignment was used; groups were formed through quota sampling, and the design is classified as quasi-experimental. The study comprised three sequential phases: (1) baseline assessment; (2) implementation of a four-session intervention; and (3) post-intervention quantitative evaluation and qualitative exploration. Qualitative data served an explanatory and elaborative function within the mixed-methods design. Quantitative outcomes identified what changed, while thematic analysis of focus group transcripts explained how and why those changes occurred (Hobbs & Coiro, 2019; Jeong et al., 2012).

### ***2.2. Participants and Sampling***

Participants were undergraduate students enrolled at a large public university in Indonesia. Quota sampling ensured proportional representation across years of study (first through fourth year), academic discipline (social sciences, natural sciences, engineering, and humanities), and gender. Quota sampling is appropriate when probability sampling is logistically impractical (Qu & Chen, 2022). However, students who volunteered may systematically differ from non-volunteers in baseline media engagement or critical thinking disposition. This self-selection bias cannot be fully controlled and constrains the generalizability of findings. Sample size was determined a priori via power analysis for a medium effect size (Cohen's  $d = 0.5$ ,  $\alpha = .05$ ,  $\text{power} = .80$ ), yielding a minimum of 100 participants per group. Of 220 initially recruited, 20 were excluded for incomplete baseline data, yielding 200 participants ( $n = 100$  intervention;  $n = 100$  control). The mean age was 20.4 years ( $SD = 1.7$ ); 52% identified as female and 48% as male. No significant between-group differences were observed on baseline demographic variables (all  $p > .05$ ).

### ***2.3. Instruments***

#### ***2.3.1. Quantitative Measures***

Both instruments were adapted for the Indonesian context via forward-backward translation. Each instrument was first translated into Bahasa Indonesia by a bilingual communication scholar, then back-

translated into English by a second independent bilingual scholar. Discrepancies were resolved through discussion. A pilot test with  $n = 20$  undergraduate students confirmed item clarity and identified no substantive ambiguities. Critical Media Literacy Self-Perception Instrument (CMLSPI; Neira et al., 2024) is a 28-item Likert-scale questionnaire measuring self-assessed competencies across three dimensions: situating discourse within sociocultural contexts, recognizing and participating in discursive practices, and assessing the impact of media on the community and individual. The instrument demonstrates high internal consistency ( $\alpha = .87$  in the original;  $\alpha = .86$  in the current adapted sample). Misinformation Susceptibility Test (MIST-16; Maertens et al., 2024) presents participants with 16 news headlines (eight genuine, eight fabricated) and asks them to judge the veracity of each. The instrument is psychometrically validated across large, diverse samples ( $\alpha = .79$  in the current adapted sample) and yields scores for veracity discernment and response bias.

### *2.3.2. Qualitative Measures*

Semi-structured focus group interviews were conducted with a purposive subsample of 24 students ( $n = 12$  intervention;  $n = 12$  control). Focus groups of four to six participants each were audio-recorded, transcribed verbatim, and analyzed using reflexive thematic analysis (Braun & Clarke, 2006). Interpretive decisions were documented in a reflexivity journal throughout the analysis.

### *2.4. Intervention*

The media literacy intervention consisted of four weekly 90-minute workshops facilitated by two trained communication scholars. Facilitator fidelity was monitored through observation checklists and session recordings. Module 1 (identifying types of misinformation) addresses MIL's critical analysis dimension (Wardle, 2017; UNESCO, 2013). Module 2 (source credibility and lateral reading) addresses MIL's verification competency (McGrew et al., 2018). Module 3 (cognitive biases and emotional manipulation) directly operationalizes inoculation theory's threat and refutational preemption components (McGuire, 1964; van der Linden et al., 2017). Module 4 (fact-checking and reverse image search) reflects MIL's participatory engagement dimension (Wineburg & McGrew, 2017). The control group received no intervention during the study period.

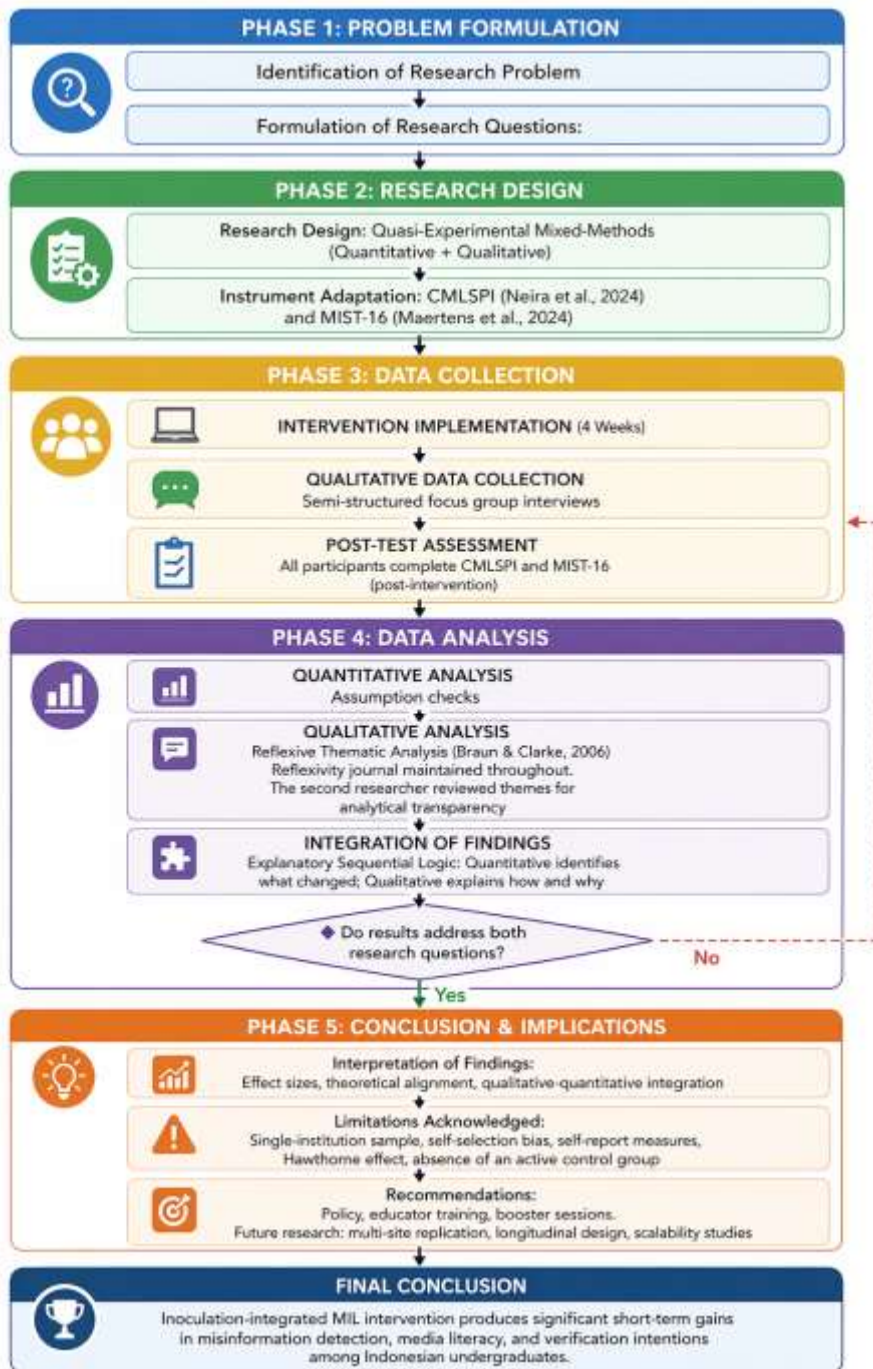


Figure 1. Research Flowchart: From Problem Formulation to Conclusion

## **2.5. Data Analysis**

Quantitative data were analyzed using IBM SPSS Statistics (Version 28). Prior to inferential testing, the following assumptions were formally verified: normality of outcome variable residuals (Shapiro-Wilk test), homogeneity of variance (Levene's test), and homogeneity of regression slopes. All assumptions were satisfied (all  $p > .05$ ). ANCOVA with baseline scores as covariates was the primary analytical model for all between-group post-test comparisons. Cohen's  $d$  was calculated from ANCOVA-adjusted means with 95% confidence intervals. Repeated-measures ANOVA examined the within-group trajectory ( $\eta^2$  reported). All tests used a two-tailed  $\alpha = .05$ . Qualitative transcripts were analyzed using reflexive thematic analysis (Braun & Clarke, 2006). Interpretive decisions were documented in a reflexivity journal; a second researcher reviewed theme definitions and representative excerpts for analytical transparency. Integration of qualitative and quantitative findings followed an explanatory sequential logic: quantitative results established patterns of change, and qualitative themes provided a mechanistic explanation.

## **2.6. Ethical Considerations**

The study was reviewed and approved by the university's Institutional Review Board. All participants provided written informed consent and were informed of their right to withdraw. Data were anonymized and stored on encrypted institutional servers. No deception was employed. The research protocol adhered to the ethical guidelines of the American Psychological Association and the Declaration of Helsinki.

## **3. Results**

### **3.1. Participant Demographics and Attrition**

Of 220 initially recruited students, 20 were excluded for incomplete baseline data, yielding 200 participants ( $n = 100$  intervention;  $n = 100$  control) at post-test. At four-week follow-up, 186 participants were retained (93% retention). Attrition was primarily due to academic scheduling conflicts and did not differ significantly between groups ( $\chi^2(1) = 0.21, p = .65$ ). Baseline scores of completers and dropouts did not differ significantly on any outcome variable (all  $p > .10$ ), indicating no systematic attrition bias. The sample was balanced by gender (52% female; 48% male) and distributed across year of study and academic discipline. No significant between-group differences were observed on any baseline variable (all  $p > .05$ ).

### **3.2. Baseline Media Literacy and Misinformation Susceptibility**

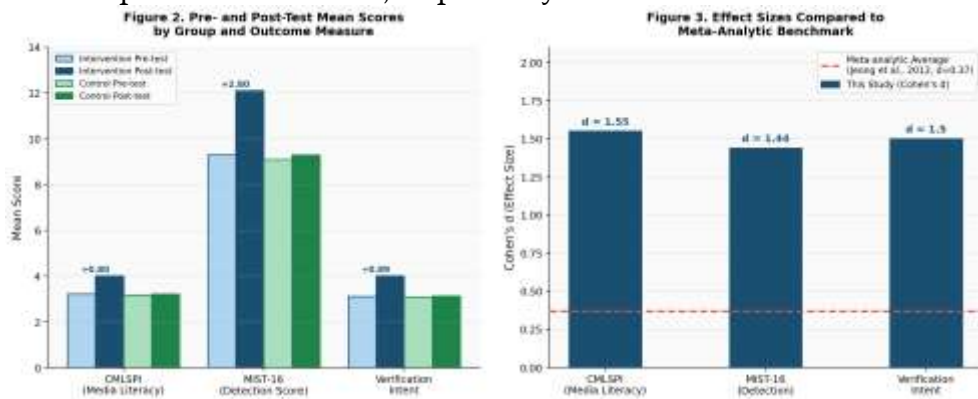
At baseline, both groups demonstrated moderate self-perceived media literacy. Mean CMLSPI scores were 3.21 ( $SD = 0.54$ ) for the

intervention group and 3.18 (SD = 0.57) for the control group ( $t(198) = 0.41, p = .68, d = 0.06$ ). On the MIST-16, participants correctly identified a mean of 9.2 out of 16 headlines (SD = 2.1), with no significant between-group difference ( $t(198) = 0.37, p = .71, d = 0.05$ ). Notably, 38% of participants overestimated their detection ability relative to their actual MIST-16 performance ( $t(199) = 6.82, p < .001$ ). This pattern is consistent with findings reported by Leeder (2019) and McGrew et al. (2018), who found similar calibration errors among U.S. college students, suggesting that overconfidence in media literacy may be a cross-cultural phenomenon rather than specific to the Indonesian context.

### 3.3. Effects of the Media Literacy Intervention

#### 3.3.1. Quantitative Outcomes

All ANCOVA comparisons used baseline scores as covariates. Cohen's  $d$  values reflect ANCOVA-adjusted between-group post-test differences with 95% confidence intervals. Significant effects are indicated where  $p < .05$ . Figure 2 and Figure 3 below illustrate the pre-post changes and comparative effect sizes, respectively.



**Figure 2 (left).** Pre- and Post-Test Mean Scores by Group and Outcome Measure. **Figure 3 (right).** Effect Sizes Compared to the Meta-Analytic Benchmark (Jeong et al., 2012).

**Self-Perceived Media Literacy.** The intervention group's mean CMLSPI score increased from 3.21 (SD = 0.54) to 4.01 (SD = 0.48). The control group showed a negligible change (3.18 to 3.22). ANCOVA: Group x Time interaction  $F(1, 198) = 42.7, p < .001, \eta^2 = .18$ ; post-test comparison Cohen's  $d = 1.55$  (95% CI [1.28, 1.82]).

**Fake News Detection (MIST-16).** The intervention group's mean correct responses increased from 9.3 (SD = 2.0) to 12.1 (SD = 1.7), a 30% improvement. The control group showed no meaningful change (9.1 to 9.3). ANCOVA:  $F(1,197) = 104.1, p < .001$ , Cohen's  $d = 1.44$  (95% CI [1.18, 1.70]).

Judgment Bias Reduction. The intervention group's combined error rate (false positives and false negatives) declined from 28% to 14%. Control group rates were unchanged (27% to 26%).

Behavioral Verification Intentions. The intervention group showed a significant increase in intentions to verify information before sharing (mean increase: 0.89 points; ANCOVA:  $F(1,197) = 88.4, p < .001$ , Cohen's  $d = 1.50$ , 95% CI [1.24, 1.76]). No significant change was observed in the control group. These gains reflect stated intentions, not observed behavior.

**Table 1.** Pre- and Post-Intervention Outcome Measures for Intervention and Control Groups

Outcome Measure	Group	Pre-test M (SD)	Post-test M (SD)	Change	Cohen's d (95% CI)	p
Self-Perceived Media Literacy (CMLSPI)	Intervention	3.21 (0.54)	4.01 (0.48)	+0.80	1.55 [1.28, 1.82]	< .001*
	Control	3.18 (0.57)	3.22 (0.56)	+0.04	n/a	.71
MIST-16 Correct Responses	Intervention	9.3 (2.0)	12.1 (1.7)	+2.8 (+30%)	1.44 [1.18, 1.70]	< .001*
	Control	9.1 (2.2)	9.3 (2.1)	+0.2	n/a	.71
Judgment Error Rate	Intervention	28%	14%	-14%	N/A	< .001*
	Control	27%	26%	-1%	n/a	.73
Verification Behavioral Intent	Intervention	3.12 (0.61)	4.01 (0.55)	+0.89	1.50 [1.24, 1.76]	< .001*
	Control	3.09 (0.64)	3.13 (0.62)	+0.04	n/a	.68

*Note.* MIST-16 = Misinformation Susceptibility Test (Maertens et al., 2024). CMLSPI = Critical Media Literacy Self-Perception Instrument (Neira et al., 2024). Cohen's d and 95% CIs derived from ANCOVA-adjusted post-test between-group comparisons with baseline as covariate. N/A = not applicable for percentage-based outcomes. \*  $p < .05$  (two-tailed).

### 3.3.2. Qualitative Outcomes

Thematic analysis yielded four themes. Table 2 presents each theme alongside its core finding, linked quantitative outcome, and a representative quotation. Figure 5 (presented in Section 3.4) illustrates the relational structure among themes.

**Table 2.** Summary of Qualitative Themes, Linked Quantitative Outcomes, and Representative Quotations

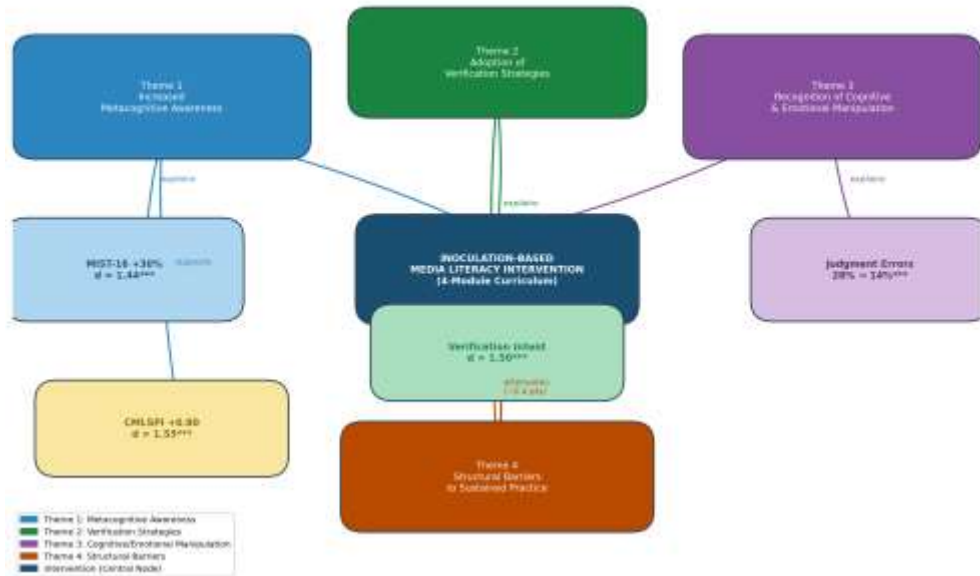
Theme	Core Finding	Linked Quant. Outcome	Representative Quotation
1. Metacognitive Awareness	Shift from passive to evaluative news consumption	MIST-16: +30% accuracy (d=1.44)	'I catch myself asking, am I believing this because I want it to be true?'
2. Verification Strategies	Adoption of lateral reading and fact-checking tools	Verification Intent: d=1.50	'Now I always open other tabs to check who else is reporting the same thing.'
3. Cognitive & Emotional Manipulation	Awareness of how biases and emotional framing are exploited	Judgment Errors: 28% to 14%	'Headlines are designed to make you angry or scared before you think.'
4. Structural Barriers	Time pressure, peer norms, and information overload hinder practice	MIST-16 attenuation: 12.1 to 11.7 at follow-up	'If you stop to fact-check, people think you're being difficult.'

*Note.* Quotations are drawn from focus group interviews with intervention group participants (n=12).

### 3.4. Qualitative-Quantitative Integration and Thematic Structure

Figure 5 illustrates the relational structure among the four qualitative themes and their links to quantitative outcomes. Themes 1, 2, and 3 represent mechanisms through which the intervention produced measurable gains, while Theme 4 explains the partial attenuation observed at follow-up. This thematic map makes explicit a causal logic that quantitative data alone cannot convey: the intervention worked by building metacognitive awareness and equipping students with verification tools, but its long-term effectiveness is constrained by structural features of everyday digital environments.

Figure 5. Thematic Map: Relationships Among Qualitative Themes and Their Links to Quantitative Outcomes



**Figure 5.** Thematic Map: Relationships Among Qualitative Themes and Their Links to Quantitative Outcomes. Arrows indicate explanatory relationships; bold boxes indicate central nodes.

### 3.5. Moderating and Follow-Up Analysis

Subgroup analyses revealed no significant moderation of intervention effects by gender, year of study, or academic discipline (all interaction  $p > .05$ ), indicating broad effectiveness across the sample. Students with higher baseline critical thinking dispositions showed marginally greater gains in MIST-16 performance (Group x Baseline CT interaction:  $F(1,197) = 4.2, p = .04, \eta^2 = .02$ ), consistent with evidence that prior reflective thinking facilitates media literacy learning (Kahne & Bowyer, 2017).

**Figure 4. Outcome Trajectories Across Pre-test, Post-test, and 4-Week Follow-up (Intervention vs. Control Groups)**



**Figure 4.** Outcome Trajectories Across Pre-test, Post-test, and 4-Week Follow-up (Intervention vs. Control Groups). Error bars omitted for clarity. An annotated arrow indicates 3.3% attenuation in MIST-16 at follow-up.

Follow-up assessment was completed by 186 participants (93% retention). Mean MIST-16 score at follow-up was 11.7 (SD = 1.8) for the intervention group, compared to 12.1 at post-test. This represents a modest attenuation of 0.4 points (3.3%) over four weeks. CMLSPI scores showed a similar pattern, declining from 4.01 to 3.93. These patterns are consistent with inoculation theory's prediction that resistance requires periodic reinforcement (van der Linden et al., 2017) and with the broader intervention literature (Guess et al., 2020; Kahne & Bowyer, 2017).

#### 4. Discussion

The results demonstrate that a structured, inoculation-grounded media literacy intervention can produce significant improvements in undergraduate students' misinformation detection accuracy, self-perceived media competencies, and behavioral verification intentions. This section interprets these findings in relation to prior research, examines divergences and convergences, explains the mechanisms underlying observed patterns, and discusses the practical contributions of the study.

##### 4.1. Comparison with Prior Research

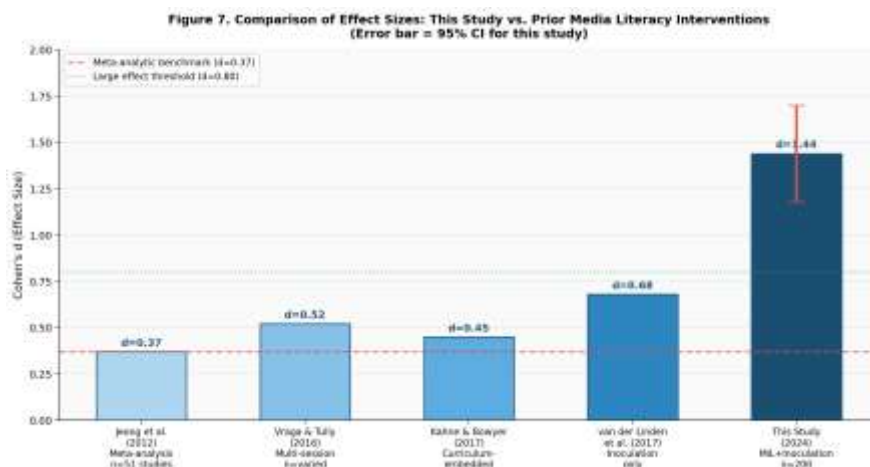
The observed effect sizes substantially exceed the meta-analytic benchmark reported by Jeong et al. (2012), who found a mean effect of  $d = 0.37$  across 51 media literacy intervention studies. In the present study, MIST-16 gains reached  $d = 1.44$  (95% CI [1.18, 1.70]), CMLSPI gains

reached  $d = 1.55$ , and verification intention gains reached  $d = 1.50$ . Table 3 and Figure 7 below situate these findings within the broader literature.

**Table 3.** Comparison of This Study with Key Prior Media Literacy Intervention Studies

Study	n	Design	Duration	Framework	Effect Size (d)	Key Difference from This Study
Jeong et al. (2012)	51 studies	Meta-analysis	Varied	Mixed	0.37 (avg)	No single framework; passive/brief interventions predominate
Vraga & Tully (2016)	~200	Quasi-exp.	Multi-session	MIL only	~0.52	No inoculation; no validated psychometric instruments
Kahne & Bowyer (2017)	~800	Survey	Semester	Civic ed.	~0.45	Survey design; no pre-post experimental comparison
van der Linden et al. (2017)	2,000+	Experiment	Single session	Inoculation only	~0.68	No MIL curriculum; online delivery; no qualitative component
This Study (2024)	200	Quasi-exp. mixed	4 weeks + 4-wk follow-up	MIL + Inoculation	1.44 [1.18-1.70]	Integrated MIL+inoculation; validated instruments; Indonesian context

Note. Effect sizes for prior studies are approximate where original studies reported partial eta<sup>2</sup> or correlation statistics. CI = confidence interval. MIL = Media and Information Literacy.



**Figure 7.** Comparison of Effect Sizes: This Study vs. Prior Media Literacy Interventions.

Several factors may explain why the present study's effects substantially exceed the meta-analytic average and the effect sizes of comparable prior work. First, the theoretical integration of MIL and inoculation theory is likely the primary driver. Vraga and Tully (2016) reported  $d$  values of approximately 0.52 using MIL alone, and van der Linden et al. (2017) reported  $d$  values around 0.68 using inoculation alone. The present study's values of 1.44 to 1.55 are consistent with a multiplicative synergy between these frameworks: MIL provides the skill architecture while inoculation provides the preemptive psychological defense. No prior study in the Indonesian context has combined both frameworks within a single curriculum.

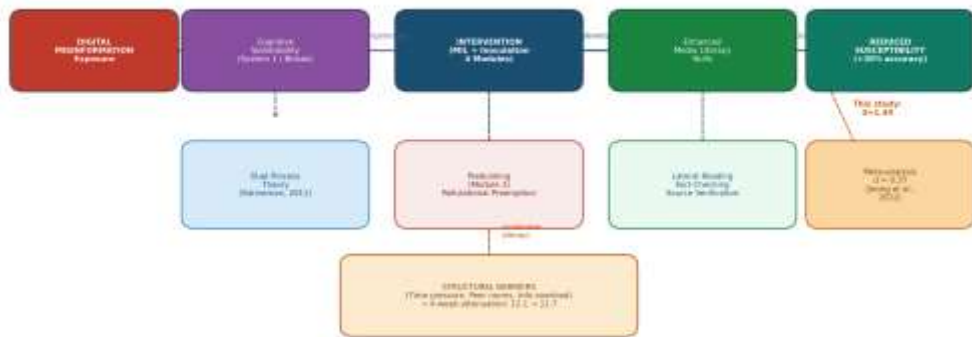
Second, the four-session, 90-minute dosage exceeds most brief interventions reviewed by Jeong et al. (2012). Multi-session, experiential approaches produce the strongest effects (Vraga & Tully, 2016), and the present design fully meets this criterion. Third, the use of validated instruments (MIST-16 and CMLSPI) rather than researcher-constructed scales likely produced more sensitive detection of genuine change. Fourth, the participant pool comprised motivated volunteers at a single institution. This may have contributed to effect size inflation through demand characteristics and the Hawthorne effect, meaning the true intervention effect is likely smaller than the observed  $d$  values indicate.

In contrast to studies conducted in Western contexts (Kahne & Bowyer, 2017; McGrew et al., 2018), the intervention showed no moderation by academic discipline or gender, suggesting the curriculum's effectiveness was not contingent on prior critical thinking training or gender-linked media consumption patterns. This is a finding that diverges from Kahne and Bowyer (2017), who found stronger effects among students with higher civic engagement baseline scores. The divergence likely reflects differences in educational contexts: Indonesian students, regardless of discipline, appear to enter higher education with similarly limited formal training in media literacy, creating a more homogeneous baseline from which intervention effects can emerge uniformly.

#### ***4.2. Mechanisms of Change and Causal Interpretation***

Figure 6 presents the proposed causal mechanism through which the intervention reduces misinformation susceptibility. The integration of qualitative and quantitative findings reveals mechanisms that quantitative data alone cannot capture. The theme of structural barriers to sustained practice directly explains the quantitative attenuation pattern observed at four-week follow-up. Peer norms rewarding rapid information sharing and daily time pressures reduce the frequency with which trained lateral reading and fact-checking skills are exercised, gradually eroding performance gains.

Figure 6. Proposed Causal Mechanism: How the Inoculation-MIL Intervention Reduces Misinformation Susceptibility



**Figure 6.** Proposed Causal Mechanism: How the Inoculation-MIL Intervention Reduces Misinformation Susceptibility. The dashed arrow indicates the moderating/attenuation effect of structural barriers.

The intervention's Module 3 directly operationalized inoculation theory's threat and refutational preemption mechanisms (McGuire, 1964; van der Linden et al., 2017). The observed gains in bias recognition and the significant judgment error reduction (28% to 14%) are consistent with inoculation theory's prediction that preemptive exposure to weakened misinformation builds cognitive resistance. The modest four-week performance attenuation further aligns with inoculation theory's prediction that resistance decays without reinforcement, providing theoretical justification for the recommendation of booster sessions. The finding that students with higher baseline critical thinking dispositions showed marginally greater gains ( $p = .04$ ) suggests that media literacy education yields compounding returns when paired with broader critical thinking pedagogy. Students with weaker analytical foundations may require additional scaffolding. This finding is consistent with Kahne and Bowyer (2017) but diverges in magnitude: the interaction effect in this study ( $\eta^2 = .02$ ) was smaller, which may reflect the more structured and scaffolded nature of the present curriculum, which partially compensates for lower baseline skills.

#### 4.3. Practical Contributions and Implications

Beyond the theoretical contribution, this study offers specific, actionable contributions to practice. For curriculum designers, the four-module protocol developed here provides a replicable template: each module is explicitly mapped to its theoretical basis, enabling direct adaptation to institutional contexts. The facilitator training protocol (standardized two-day training with observation checklists) offers a fidelity

mechanism that prior studies have rarely operationalized, addressing a persistent gap in the implementation literature (Hobbs & Coiro, 2019).

For student outcomes, the 30% improvement in MIST-16 detection accuracy and the reduction of judgment errors from 28% to 14% represent practically meaningful gains in students' ability to navigate real-world information environments. A student who can correctly classify 12.1 rather than 9.3 of 16 headlines is meaningfully less vulnerable to sharing misinformation in academic and civic contexts. This translates directly to improved quality of scholarly work and more informed participation in democratic processes (Leeder, 2019).

For educators and institutions, the lack of significant moderation by gender, discipline, or year of study suggests this curriculum can be implemented as a general education requirement without requiring differentiated versions for different student populations. This simplifies adoption substantially compared to targeted interventions. The recommendation for booster sessions at four-to-six week intervals is grounded both in the follow-up attenuation data and in inoculation theory, and provides a concrete, low-cost implementation mechanism for sustaining gains.

For the Indonesian higher education policy context specifically, this study provides the first rigorous experimental evidence that an integrated inoculation-MIL curriculum produces large, measurable gains in a population with historically limited formal media literacy education. The findings support mandating at minimum two media literacy modules within undergraduate general education requirements in communication, journalism, and social science programs, with pathways for broader integration across disciplines.

#### ***4.4. Limitations***

Several limitations require direct emphasis. The single-university sample is the most consequential constraint on external validity: findings cannot be generalized to institutions with different demographics, resource environments, or media landscapes. The absence of an active control group means that nonspecific effects (Hawthorne effect, general engagement, expectancy) cannot be separated from intervention-specific content. The well-documented intention-behavior gap in psychology means that the significant gains in verified behavioral intentions ( $d = 1.50$ ) cannot be taken as evidence of actual behavior change. Self-selection bias from quota sampling further limits confidence that the observed effects would replicate in a population-representative sample. Finally, the four-week follow-up window is insufficient to characterize the long-term trajectory of skill retention.

## 5. Conclusion

This study makes two specific contributions to the media literacy literature. The first is empirical: using a quasi-experimental design with validated psychometric instruments and complementary qualitative inquiry, the study demonstrates that an intervention integrating inoculation-based prebunking with the UNESCO MIL framework produces large short-term gains in misinformation detection, self-perceived media literacy, and verification behavioral intentions among Indonesian undergraduates, with meaningful retention at four-week follow-up. The second is theoretical: inoculation theory's prebunking mechanism and MIL's competency-based pedagogy are not merely compatible but mutually reinforcing. The former builds cognitive resistance through preemptive refutation; the latter provides the structured skill set within which that resistance is embedded.

For policy, the findings support mandating at a minimum two inoculation-based media literacy modules within undergraduate general education requirements, particularly within communication, journalism, and social science programs. For educator training, the four-module protocol provides a replicable template that institutions can adapt. The modest attenuation at four-week follow-up supports scheduling booster sessions at four-to-six week intervals, consistent with inoculation theory's prescription for periodic reinforcement.

Future research should address this study's limitations through three priorities: multi-site replication across culturally and linguistically diverse populations; longitudinal designs tracking outcomes across a full academic year with booster sessions at defined intervals; and scalability studies comparing facilitator-led delivery with self-paced digital formats. Media literacy is not a fixed skill but a dynamic competency requiring ongoing cultivation. As generative AI, deepfake technology, and platform algorithm dynamics continue to reshape the information environment, the urgency of equipping university students with robust, theoretically grounded media literacy skills has never been greater.

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