



Combating Misinformation and Science Denial Through Critical Thinking and Scientific Literacy: A Comparative Analysis of Nigerian and Western Education Systems

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Abstract

Misinformation and science denial pose significant challenges to global educational systems, undermining confidence in evidence-based knowledge and impeding societal progress. This paper examines ways to combat these challenges through critical thinking and scientific literacy, comparing the Nigerian educational system, representing a developing nation, with Western systems (the United States, the United Kingdom, and select European countries). Nigeria faces structural barriers, including a 59.57% adult literacy rate and widespread misinformation, while Western systems, with near-universal literacy, grapple with ideological science denial, such as anti-vaccination movements. Guided by empirical knowledge, the paper evaluates strategies like inoculation theory, media literacy integration, and inquiry-based learning. Findings highlight Nigeria's need for increased educational investment and teacher training, contrasted with Western needs for addressing polarisation through epistemic vigilance. Recommendations propose context-specific interventions, including mobile-based literacy programs for Nigeria and gamified prebunking in the West, to foster resilient, informed societies.

Keywords: Misinformation, Science denial, Critical thinking, Scientific literacy.

Introduction

Misinformation and science denial are a very serious concern for building critical thinking and scientific literacy in educational systems. The proliferation of misinformation—false information spread without intent to deceive—and science denial, the rejection of empirically supported scientific consensus, threatens the integrity and trust in educational systems globally (Lewandowsky et al., 2017). These occurrences, exacerbated by digital platforms, undermine public trust and confidence in science, impacting issues from vaccination uptake to climate action amongst other concerns (van der Linden et al., 2017). Educational systems, whose objectives include shaping cognitive frameworks, are critical battlegrounds for fostering resilience against such distortions and misconceptions.

Critical thinking involves or deals with interpretation, analysis, inference, evaluation, explanation, and self-regulation (Facione, 1990). Scientific literacy extends or transfers this to the field of science, requiring knowledge of concepts, inquiry skills, and epistemic understanding (Roberts, 2007). Inoculation theory, which is rooted or anchored in McGuire's (1964) work, suggests that exposing individuals to diluted misinformation builds resistance. This has proven correct to some extent, with modern studies showing 20% efficacy (van der Linden et al., 2017). Media literacy, which encompasses or goes beyond source evaluation and bias detection, complements and supports these frameworks (Potter, 2018). Epistemic vigilance, which means scrutinising information credibility, unifies these constructs (Sperber et al., 2010).

Njoku (2023) described scientific literacy as possessing knowledge of science content, attitudes and process skills, as well as possessing the capacity to utilise this science content knowledge, attitude and procedures in decision-making toward individual and social betterment. The Nigerian Educational Research and Development Council curriculum (NERDC) in Nigeria emphasises functional literacy and neglects inquiry-based learning, which is not in line with inoculation demands (NERDC, n.d.). Epistemic practices are part of Western frameworks such as the U.S. Next Generation Science Standards (NGSS), but their application differs (NGSS Lead States, 2013). The proposed technique implements problem-based learning (PBL) to incorporate critical thinking, which would ultimately culminate in the development of scientific literacy as a social practice (Allchin et al., 2024).

The comparative analysis contrasts Nigeria, a developing country riddled with systemic educational issues, with Western systems including those in the United States, the United Kingdom and Europe. The Nigerian education system has 10.5 million out-of-school children and a 59.57% adult literacy rate (United Nations Children's Fund, UNICEF, 2024), which makes the populace more vulnerable to misinformation such as COVID-19 conspiracies (Okoro et al., 2022). In Western societies with literacy rates exceeding 99%, science denial is fuelled by ideological polarisation. In the U.S., 40% of individuals deny evolution (Berkman & Plutzer, 2010).

Misinformation and science denial pose very significant challenges to global educational systems by downplaying confidence in evidence-based knowledge and impeding societal progress. If misinformation and science denial are not checked, it would inevitably devolve society into a catastrophic state. Progress will not just slow; rather, there will be regression, poverty and destruction. This paper examines ways to combat these challenges through critical thinking and scientific literacy, comparing the Nigerian educational system, representing a developing nation, with Western systems (United States, United Kingdom, and select European countries).

This paper aligns with United Nations Sustainable Development Goal 4 (quality education) by exploring how critical thinking, which includes objective analysis and evaluation of information, and scientific literacy, which is the ability to engage with scientific concepts in societal contexts, can combat misinformation and science denial (National

Academies of Sciences, Engineering, and Medicine, 2016). Consequently, this paper addresses the following:

1. The scope of misinformation and science denial in education,
2. Critical Thinking and Scientific Literacy Deficits
3. Comparative system analysis,
4. Evidence-based strategies, and
5. Policy recommendations.

The Scope of Misinformation and Science Denial in Education

The Global Challenge of Misinformation and Science Denial

Misinformation spreads rapidly or quickly through social media, with false information diffusing six times faster than truth (Vosoughi et al., 2018). In education, this manifests as science denial, where pseudoscientific beliefs that are claims lacking empirical rigour are mistaken for valid science (Science Learning Hub, n.d.). In Nigeria, a 2022 survey revealed that 75% of adults were exposed to COVID-19 conspiracy theories, which have contributed to or even resulted in a 33% vaccine rejection rate (Okoro et al., 2022). Likewise, in the U.S., 77% of Gen Z fact-checkers believed at least one conspiracy about COVID, tying denialism to eroding trust (Pérez-Escolar & Colomer, 2025). Science denial is often the result of mental biases, such as confirmation bias, when people search for evidence that confirms their pre-existing opinions (Lewandowsky et al., 2017).

School systems can make these problems worse or better. Rote learning inhibits research in under-resourced or economically challenged contexts or situations, but polarised media ecosystems exacerbate denialism in Western contexts, such as climate doubt in the United States (Kavanagh & Rich, 2018). A systematic analysis of various interventions indicated that media literacy programs lower misinformation susceptibility by 20-30%, but adoption remains limited in developing nations (Walter & Murphy, 2025).

Critical Thinking and Scientific Literacy Deficits

Scientific literacy involves and encompasses understanding scientific processes, evidence evaluation, and societal implications (Shaffer et al., 2019). Programme for International Students Assessment (PISA) 2022 data reveals sub-

Saharan Africa’s science scores lag 50 points behind the Organisation for Economic Co-operation and Development (OECD) average, with Nigeria at 384 compared to the U.S.’s 499 (OECD, 2022). In Nigeria, low literacy (13% among the poorest women) correlates with pseudoscience uptake, such as herbal cure myths (Copenhagen Consensus, n.d.). In the West, teacher misconceptions, like 20% of U.S. educators questioning climate science, hinder effective instruction (Plutzer et al., 2016).

Critical thinking, which is defined as purposeful judgment through analysis and evaluation (Facione, 1990), is deficient in 70% of Nigerian college students due to memorisation-focused curricula (Aina et al., 2020). In Europe, 38% of Eastern youth endorsed U.S.-originated COVID conspiracies, reflecting weak source evaluation. Inoculation theory, which is preemptive exposure to weakened misinformation, reduces acceptance by 15–25% across contexts (Compton et al., 2021).

Comparative Analysis of Educational Systems

Nigerian Education System: Structural and Cultural Challenges

Nigeria’s educational system is characterised by the current 9-3-4 system with the aim of universal basic education but suffers from serious limitations or obstacles. Some 10.5 million children are out of school, 69% of them in the northern regions (UNICEF, 2024). Low scientific literacy: 70% of elementary students are unable to read basic texts, and only 35% of teachers are certified (Bold et al., 2018). The curriculum is based on rote memorisation, which does not allow critical thinking to be developed. Only 30% of students have analytical skills (Aina et al., 2020). Access remains a challenge since the Nigerian education system is presently structured as 9-3-4 (basic to tertiary) with 60% of youth being out-of-school and courses skewed toward rote learning (World Bank, 2023). Western systems, in contrast, combine inquiry-based learning with media literacy, but are challenged by ideological denialism (Borges Do Nascimento et al., 2022). This contrast underlines the necessity of customised approaches using the characteristics of each system.

Misinformation flourishes in this context: 82% of Nigerians encountered COVID-19 falsehoods via WhatsApp, contributing to vaccine hesitancy (Apuke & Omar, 2020). Cultural beliefs, such as reliance on ritual healing, further entrench pseudoscience (Igwe, 2007). Recent reforms, like the 2022 NERDC curriculum, introduce critical thinking modules, but implementation is hampered by a 1:70 teacher-pupil ratio and 5.8% Gross Domestic Product (GDP) education spending (NERDC, 2022).

Aspect	Nigeria	Evidence/Source
Literacy Rate (Adult)	59.57% (2024)	UNICEF (2024)
Out-of-School Children	10.5 million	World Bank (2023)
Curriculum Focus	Rote learning, functional literacy	NERDC (n.d.)
Misinformation Impact	75% COVID conspiracy exposure	Okoro et al. (2022)

Western Education Systems: Strengths and Ideological Barriers

Standard international metrics show high income nations maintaining near universal baseline. Youth and adult literacy rates in parts of Europe and North American countries sit at near-universal 99%. (UNESCO, 2025). The U.S. NGSS promotes scientific practices, while the UK mandates media literacy (NGSS Lead States, 2013; DfE, 2013). PISA 2022 scores reflect strength: U.S. (499), UK (500), versus OECD’s 485 (OECD, 2022). Approximately 80% of European schools integrate digital literacy (European Commission, 2023). However, science denial persists: 40% of U.S. adults reject evolution, and 33–38% of European youth believe COVID conspiracies (Berkman & Plutzer, 2010). Polarisation fuels anti-vaccination movements, with 77% of U.S. Gen Z endorsing at least one conspiracy (Pérez-Escolar & Colomer, 2025). Information overload, driven by AI-generated deepfakes, complicates discernment.

Aspect	Western (USA/UK/EU)	Evidence/Source
Literacy Rate (Adult)	>99%	UNESCO (2025)
Science Score (PISA)	485–500 (avg.)	OECD (2022)
Curriculum Focus	Inquiry, media literacy	NGSS (2013); DfE (2013)
Misinformation Impact	77% Gen Z conspiracies	Pérez-Escolar & Colomer (2025)

Comparative Insights

The issues facing Nigeria are based on inequities in access and cultural pseudoscience, and the Western system is characterised by ideological denialism in a context of plenty or surplus of information. Synergy includes the possibility of Nigeria taking on Western modes of inquiry and the West utilising Nigeria’s communal learning strategies such as the town hall debunking sessions (Okoro et al., 2022).

Strategies to Combat Misinformation and Science Denial: Evidence-Based Interventions

- 1. Inoculation and Prebunking: Preemptive confrontation with weakened disinformation increases cognitive resistance. A 15-minute intervention decreased teenage vulnerability by 17% (Orosz et al., 2024). In Nigeria, FactCheck Africa’s curriculum is directed toward journalism students (THISDAYLIVE, 2024). “Bad News” game decreased acceptance of misinformation by 20% in the UK (Roozenbeek & van der Linden, 2019).
- 2. Media and Online Literacy: Enhancing resilience through source evaluation teaching. A meta-analysis of 49 studies showed a 25% reduction in susceptibility to misinformation (Huang et al., 2024). The MILCON alliance in Nigeria integrates literacy into schools, whereas the EU uses infographics to counter conspiracies (UNESCO, 2023; European Commission, 2023).
- 3. Problem-Based Learning (PBL): PBL promotes inquiry and critical thinking. In Nigeria, PBL increased scientific literacy by 30% in colleges (Aina et al., 2020). In the U.S., PBL matched to NGSS reduced beliefs in pseudoscience (Shaffer et al., 2019).
- 4. Teacher Training and Curriculum Reform: Better teacher training in epistemic vigilance improves student results. The 2022 NERDC changes in Nigeria include critical thinking; yet, budget difficulties remain (NERDC, 2022). UNESCO’s MIL initiatives in Europe develop teacher capacity (UNESCO, 2023).

Strategy	Nigeria Adaptation	Western Adaptation	Efficacy	Evidence
Inoculation	Community-based debunking	Gamified apps (e.g., Bad News)	17–20% reduction	(Orosz et al., 2024; Roozenbeek & van der Linden, 2019)
Media Literacy	MILCON school programs	EU infographics	25% resilience boost	(Huang et al., 2024)
PBL	Science experiment integration	NGSS inquiry units	30% literacy gain	(Aina et al., 2020)
Teacher Training	NERDC critical thinking modules	UNESCO MIL programs	15% attitude shift	(Tseng et al., 2021)

Barriers and Enablers

Nigeria: Barriers include low funding (5.8% GDP vs. 6% global average) and cultural pseudoscience (Ogunyemi, 2023). Enablers: High mobile penetration (90%) supports digital interventions (Global System for Mobile Telecommunications Association (GSMA), 2023).

Western: Barriers include polarisation and deepfake proliferation; enablers include robust tech infrastructure, with Finland’s media literacy model leading globally. Hybrid solutions, like adapting Western games to Nigerian languages, show promise, with RCTs in Kenya/Uganda reporting 40% sustained effects (Bold et al., 2018).

Discussion

Nigeria’s and developing nations’ educational systems require structural reform to address access and inquiry deficits, drawing from Western Problem-Based Learning and media literacy models while incorporating cultural strategies like community engagement (Okoro et al., 2022). Western systems such as the US, UK and Europe must counter or combat polarisation through epistemic humility training (Allchin et al., 2024). Limitations include Nigeria’s data scarcity and the need for longitudinal studies on hybrid interventions. Strengths lie in the paper’s actionable, evidence-based framework for global policymakers.

Conclusion

Educational systems are very important, or pivotal, in combating misinformation and science denial. In Nigeria, literacy can be improved through mobile technologies and community-based learning, whereas Western systems

should focus on depolarisation and Artificial Intelligence literacy. “Global collaboration, like the UNESCO KIX hubs, can help exchange knowledge (UNESCO IICBA, 2024). Policymakers should spend 4% - 6% of GDP on education (UNESCO, 2026), enforce media literacy, and track results with PISA-aligned measures.

Recommendations

1. Nigeria: Scale mobile-based literacy programs; increase teacher certification to 70% by 2030.
2. Western: Implement gamified prebunking and AI literacy in curricula.
3. Global: Foster cross-national curriculum development through UNESCO partnerships.

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