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Digital plastic: a metaphorical framework for Critical AI Literacy in the multiliteracies era

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ABSTRACT

How can educators critically engage with the affordances provided by Generative Artificial Intelligence (GenAI) while remaining committed to the core tenets of the multiliteracies project, such as educational justice? This article develops answers to this question by offering a conceptual lens through which GenAI can be investigated. Through a theoretical, analytical process using Conceptual Metaphor Theory (CMT), we map the ways in which GenAI can act as both a democratizing educational tool and a pollutant of existing knowledge systems, in a manner that is comparable to synthetic plastics. We argue that the nature of synthetic plastic mirrors that of synthetic GenAI outputs: both are human-created, ubiquitous, malleable, and persistent in their contexts and ecosystems, and both have advantageous uses and potentially toxic implications. We develop a multiliteracies-informed conceptual approach to this notion of "digital plastic", which provides insight into how GenAI both expands access to multimodal resources while also threatening social and educational justice, with specific implications for learners in the Global South, who may face deficits in both epistemic and material access to the technology. We conclude by arguing that because of the risks of "digital plastic", Critical AI Literacy (CAIL) must be part of a broader multiliteracies framework.

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Generative Artificial Intelligence (GenAI); multiliteracies; digital plastic; Critical AI Literacy (CAIL); Metaphor

Introduction

Generative Artificial Intelligence (GenAI) has changed the nature of writing through its ability to craft human-like, convincing text and other content, including the multimodal production of video, audio, images, and digital artefacts. Producing computer code, creating applications, and supporting research activities are all within the scope of these new technologies (Perkins & Roe, 2024). GenAI agents can produce novel data analyses, complete tasks, and automate aspects of creative processes without guidance or supervision. This rapid progression has occurred in an extremely narrow temporal window and resonates with the New London Group's (1996) conceptualization of

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multiliteracies, in which traditional methods of language learning are insufficient to account for the multiple methods of creating meaning (Lim & Querol-Julián, 2024).

Consequently, the multiliteracies project is more relevant than ever as a result of both GenAI and the proliferation of multimodal texts and media to which we are exposed in modern digital environments (Lim, 2024), such as social media networking sites, including YouTube and TikTok (Lim & Querol-Julián, 2024). Today's technology users constantly interact with a vast array of different forms of multimodal media, and this media is increasingly likely to be synthetic in origin. Questionable content arising from actors who proliferate disinformation, online trolls, and influencers in the quest for interactivity, along with traditional media producers, competes for views in the digital attention economy.

As a result of this proliferation of multimodal and synthetic content, today's digital tool users must develop new literacies to allow them to engage sensitively with these forms of meaning. The recent production of AI-generated Instagram and Facebook profiles and the subsequent backlash against harmful stereotypes (Bhuiyan, 2025) demonstrate the confusing and evolving nature of this issue. Deepfake technologies are making it increasingly difficult for participants in the digital world to know whether what they are seeing is real or an AI-generated imitation of reality, as technology can now effectively portray people doing and saying things that they have never done (Ferrara, 2024; Roe, Perkins, et al., 2024). In pedagogy and assessment, GenAI tools may render traditional approaches useless (Kalantzis & Cope, 2025), and consequently, frameworks to evolve assessment in education have become a major topic in educational research (Furze et al., 2024; Liu & Bridgeman, 2023; Perkins, Furze et al., 2024; Perkins, Roe, et al., 2024; Roe, Perkins, et al., 2024).

Critical AI Literacy as part of a new multiliteracies

Considering the above, this study examines how conceptual metaphors may assist educators in developing students' Critical AI Literacy (CAIL) within multiliteracies frameworks. Our objective in approaching this question is to introduce and theoretically ground metaphor as a tool for understanding GenAI's implications, framed specifically through the notion of "digital plastic." Through this theoretical example, we aim to offer educators tools and ideas that can help demonstrate the complex nature of synthetic media in pedagogical contexts. We also argue that while the core tenets of multiliteracies remain valuable, educators must now focus specifically on AI literacy, a topic that is receiving increasing research and media attention yet is currently ill-defined.

In this study, we define CAIL as "the ability to critically analyse and engage with AI systems by understanding their technical foundations, societal implications, and embedded power structures, while recognizing their limitations, biases, and broader social, environmental, and economic impacts" (Roe, Furze, et al., 2024, p. 2). CAIL is a vital competency to ensure that individuals are ready for this brave new world, especially the younger generations who will live, work and learn within this environment. Simultaneously, existing inequalities and entrenched differentiators of epistemic capital continue to emerge in new, AI-mediated forms, and the development of CAIL as part of multiliteracies must remain committed to educational justice. This definition expands

beyond views of AI literacy that do not specifically reference socioeconomic impacts and power structures.

CAIL must also include the ability to notice and evaluate GenAI content in the wild, as GenAI is leaving an imprint on written language through the use of "telltale adjectives" (Singh Chawla, 2024) or "footprints" (Tang & Eaton, 2024). The identifiably sycophantic (Sharma et al., 2023) outputs of GenAI models such as ChatGPT are making their way into multiple online contexts and flooding online spaces with "AI slop" (Hoffman, 2024). We cannot rely on technology to save us from the infiltration of these GenAI outputs into online spaces, as research has shown that attempts at AI detection (at least for textual outputs) are inaccurate and unreliable (Perkins, Roe, et al., 2024, 2024; Weber-Wulff et al., 2023). This is equally a problem in scholarly studies; a significant proportion of researchers use GenAI to assist with writing papers (Bjelobaba et al., 2025; Singh Chawla, 2024). One study suggests that close to 1% of all scholarly articles published in 2023 contained evidence of GenAI use (Gray, 2024).

GenAI as digital plastic

While the proliferation of GenAI in academic writing exemplifies its growing influence, it represents only one aspect of the broader transformation in digital content creation. Crucially, these AI-generated outputs are fundamentally created from human-created data scraped from the Internet without the owner's consent, leading to new conversations about copyright and the "theft of collective intelligence" (Kalantzis & Cope, 2025) for training purposes. Research also suggests that human-created data is fundamental to model development, as training a new model on existing GenAI content has been posited to lead to models producing unintelligible and nonsensical outputs, a term Shumailov et al. (2024) refer to as model collapse. Such a collapse can be viewed as a form of dataset pollution, a concept central to our metaphor of "digital plastic" which resonates with other pollution-related phenomena, such as ecosystem collapse.

We draw on this metaphor throughout this paper to foster Critical AI Literacy (CAIL) within the multiliteracies framework. Central to the digital plastic metaphor is its paradoxical nature and resistance to simple categorization as either beneficial or harmful. Just as physical plastics have transformed consumer society through their flexibility, durability, and cost-effectiveness, synthetic media has similarly transformative capabilities. Rapid, scalable, multimodal content creation can be undertaken instantly and tailored precisely to diverse use cases, often without direct cost to end users. However, these same properties may degrade the integrity of digital environments, mirroring how plastic compromises natural ecosystems.

The notion of a "monoculture" of knowledge (Messeri & Crockett, 2024) aligns closely with our metaphor, highlighting the risks associated with reliance on uniform production methods at the expense of diversity and resilience. Similarly, GenAI models risk perpetuating dominant ideologies and cultural values (Roe, 2025) while producing output that is less varied and inclusive of other forms of knowledge or knowing. Therefore, we can consider AI chatbots as "culture machines", which tend to "gravitate towards cultural and linguistic generalities" as a result of the mathematical processes and guardrails that undergird their training data (Jones, 2025, p. 1). Despite this parallel, we contend that

the digital plastic metaphor offers a particularly effective framework for developing pedagogies that enhance CAIL.

The metaphor of digital plastic invites both educators and learners to rethink literacy in an age increasingly dominated by GenAI. Synthetic media disrupts our understanding of literacy by collapsing the existing strata of meaning-making (G. R. Kress & Van Leeuwen, 2001) and reconfiguring the relationships between creators, technology, and audiences. Against this backdrop of intensified, digitalized multimodal meaning-making (Lim, 2024), critical theories of multiliteracies can be used to develop the next generation (Mirra et al., 2018) and enable them to tease apart and analyse the effects of GenAI content on their learning. By integrating the concept of digital plastic with multiliteracies theory, we propose a new approach to understanding and addressing the broader implications of synthetic media.

Theoretical framework and methodological approach

This paper is structured using a conceptual theoretical analysis approach, drawing on Conceptual Metaphor Theory (CMT) analysis using Lakoff and Johnson's (2003) conceptual metaphor framework. Our approach began with source domain analysis, involving the examination of the properties, affordances, and consequences of physical plastic, before conducting target domain mapping to identify similar characteristics in GenAI content and synthetic media. We then developed a conceptual bridge to establish theoretical connections to demonstrate the hidden educational implications of GenAI. Second, we positioned our analysis within the New London Group's (1996) multiliteracies pedagogy, with a specific focus on elements such as how GenAI promotes or detracts from educational justice, the implications of multimodal meaning-making in traditional literacy practices, and the potential for our metaphorical framework to be integrated into critical pedagogical approaches. Finally, we critically synthesized literature across the domains of educational technology and multiliteracies, environmental studies (related to physical plastic as the source domain), and critical pedagogical theory. We position this paper as a theoretical contribution that we hope can contribute to a diverse understanding of the emerging phenomena of GenAI, as well as provide analytical tools for educators to develop CAIL practices in their classrooms and integrate interdisciplinary knowledge to facilitate our understanding of these new technologies.

Literature review

Multiliteracies, GenAI, and educational justice

At the core of the NLG's multiliteracies project is a dedication to improving equity and social and educational justice, attempting to mediate the exclusion of marginalized groups along ethnic and cultural lines (Garcia et al., 2018). In this case, the advent of GenAI may pose a fundamental threat to the core values of the multiliteracies agenda. Leading voices in the field have identified that the increasingly available, powerful AI technologies that may benefit learning may be mainly realized by users in Global North countries. Consequently, this disparity may worsen the digital divide and magnify entrenched educational inequalities (Miao & Holmes, 2023). Even within the same country

or geographical context, access to technologies that benefit literacy for learners varies among students (Chandel & Lim, 2024), which could further magnify inequalities. To demonstrate further, those without access to paid subscription models, high-speed Internet, or applications and technologies required to benefit from GenAI may find themselves further disadvantaged, while those who do have access to these forms of cultural, social, and economic capital will be able to reap outsized benefits.

GenAI can drive inequalities in multiple ways. Companies that develop such models tend to be well-funded, private corporations from the Global North, which use labour from countries in the Global South to help train the models and simultaneously engage in market capture (Zhgenti & Holmes, 2023). Such an approach means that the potential for countries in these geographical regions to develop their own models is limited, especially as training and producing AI models is highly resource-intensive and relies on specialized technology such as Graphical Processing Units (GPUs). This lack of locally produced AI systems leads to a reliance on models and tools produced by large corporations that have been trained mainly on Western-centric and English-language databases. This situation creates a potential for technological dependency while also compelling engagement with systems that perpetuate algorithmic and cultural biases, thereby undermining educational justice. This differing range of access may drive the disempowerment of certain social groups (Lim et al., 2022). For example, students who regularly have access to state-of-the-art AI image generation tools may be better able to distinguish between AI-generated and human-created content, thus developing a better level of digital literacy and being less likely to fall prey to scams or misinformation. Therefore, a lack of CAIL skills is likely to be an important driver of educational and social inequalities.

A further issue in compounding educational inequality from a multiliteracies perspective is the diminishing diversity of voices in the educational discourse. GenAI models have been said to produce "echo chambers" (Turobov et al., 2024) and may lead to overreliance on such systems, which could reinforce existing knowledge hierarchies (Leslie, 2023). Given that the multiliteracies approach focuses on inclusivity and a range of diverse voices, this could damage the potential for educational equity. The biases contained within GenAI image outputs, for example, tend to emphasize and compound stereotypical notions across the lines of gender, skin colour, and class (Nicolleti & Bass, 2023). Biases may also be introduced not from the training data but from the developers themselves, who conduct training, monitoring, and adjustments to GenAI model output through supervised learning (Alser & Waisberg, 2023).

An additional issue in terms of equity is the distinction between epistemic and material access. While diverse groups of learners may have equal material access to GenAI in educational contexts, gaps in epistemic access are important. Jones' (2025) concept of culture machines highlights that these technologies are based on cultural norms and assumptions. As a result, learners unfamiliar with such biases will not have the epistemic access to critically engage with GenAI tools. From a critical pedagogy perspective, this can be viewed through the lens of Freire's (2014, p. 72) banking model of education, where students are passive, empty vessels to be filled with knowledge rather than co-creators. If learners do not have epistemic access to the cultural and ideological assumptions underlying GenAI outputs, they may be less able to move from being consumers of that knowledge to critically developing and transforming such knowledge. This lack of epistemic access can also be viewed through Fraser's (2005) redistribution-recognition-

representation framework, and the call for justice to include both redistribution and recognition (Fraser, 1995). While Fraser developed the redistribution-recognition-representation framework in the context of transnational feminism's reconfiguration of gender justice, this three-aspect framework can also be applied to GenAI in education. Access may be seen as redistribution, ensuring that marginalized or under-resourced contexts have access to GenAI models. The biases of these systems fail to acknowledge the diversity of different cultures' knowledge systems, while simultaneously there are deficits in representation; as such, users may lack the ability to contribute to shaping the way these technologies operate and the types of knowledge they produce.

Furthermore, GenAI models require vast amounts of resources for development and training. The development of physical resources such as Graphics Processing Units (GPUs) is significant (Hosseini et al., 2024), and the production of GenAI images uses a high amount of energy, potentially contributing to climate change (Heikkilä, 2023; Luccioni et al., 2024), which may disproportionately impact countries in the Global South. While technology has created new ways of meaning-making (Lim et al., 2022), it has also introduced complex challenges that threaten the potential for educational inclusion and justice.

GenAI as a potential contributor to new multiliteracies

In contrast to these worrying threats to the notion of educational justice, some argue that GenAI may contribute to democracy within the educational process, including fostering the development of CAIL and new multiliteracies in the age of GenAI. Research has demonstrated that GenAI tools may be able to support the multiliteracies learning of L2 students (Chandel & Lim, 2024), support student learning in general (Deng et al., 2024), and contribute to the reconceptualization of traditional teaching practices in L2 writing, such as paraphrasing (Roe, O'Sullivan, et al., 2024). These examples offer new opportunities for developing a multiliteracies-based pedagogy.

Furthermore, there is the potential for GenAI models to be developed in an open-source, ethical framework based on training data that is public and used ethically and consensually. In this case, such forms of more transparent GenAI may be able to assist equitable learning; if all learners can access and benefit from ethical GenAI systems, then there is the potential for these technologies to assist in providing essential learning resources, recommending relevant topics for further study, suggesting readings, or providing formative feedback. It is also conceivable that such tools can provide structured guidance on how to engage critically and ethically with GenAI. Therefore, GenAI has the potential to benefit multiliteracy development, albeit with the caveat that such models should be deployed equitably and trained ethically to avoid bias.

Creating new metaphors to develop multiliteracies in the GenAI era

Our approach to developing CAIL as part of a project in multiliteracies is grounded in Conceptual Metaphor Theory (CMT) (Lakoff & Johnson, 2003), which posits that metaphors are more than just an element of style or a technique that makes language more engaging for readers; metaphors are a significant, pervasive, and powerful tool by which we structure our social worlds and create and recreate

realities (Batten, 2012). By metaphor, we draw on Lakoff and Johnson's (2003) assertion that one "thing" may be explained in terms of another thing. Prior research has sought to draw attention to the nature of metaphors for describing GenAI and AI systems in general by discussing how the use of metaphor may help learners engage with the otherwise opaque qualities of such algorithmic systems. For instance, the use of an echo chamber to represent algorithmic bias or a funhouse mirror to emphasize the ways in which distortions of physical representations may occur (Roe, Furze, et al., 2024). Metaphors have deep significance in relation to literacies, cultures, and social norms.S. Bialostok (2002, 2008) explored the role of metaphor in literacy development and attitudes towards literacy pedagogy in depth and argued that metaphors may serve as cultural models, which are employed to help members of a society make sense of their world and understand an abstract domain (S. Bialostok, 2008). In education, the analysis of metaphors for artificial intelligence has been applied to the ways students perceive AI (Demir & Güraksin, 2022), the "colonising" influence of data-driven AI and Generative AI applications (Ferreira et al., 2020; Gupta et al., 2024), and a problematization of machines' capacity to "think" (Dippel, 2019). Many of these approaches analyse the existing metaphors used in the discourse on AI technologies.

We propose that this new technology requires the creation of *new* metaphors that can help us reorganize our knowledge of the world (Saban, 2006). This is significant and in line with the overall goal of multiliteracies to increase educational equity, as we may develop new ways of understanding the implications of unequal access to technology or find new ways to help learners understand abstract concepts (Niemeier, 2017). Research has demonstrated that metaphors of literacy can become dominant models of understanding for teachers. Consequently, understanding teachers' cultural models of literacies through metaphor analysis can help restructure conversations about literacy pedagogy (S. M. Bialostok, 2014).

We also argue that learners must develop CAIL to engage in the analysis, understanding, and critique of digital products such as GenAI content. We distinguish CAIL from the broader term AI literacy, which is loosely defined and inconsistently applied with no universal definition (Bozkurt et al., 2023). We recognize that students need to engage with AI as part of technological multiliteracy (Stolpe & Hallström, 2024) partly in order to be able to resist and refuse technologies and not simply use or consume them. We agree with Long and Magerko (2020) that AI competencies must enable learners to critically evaluate AI technologies and use them effectively for collaboration and communication in multiple contexts, including at home, work, and online settings.

Grounding our approach in the multiliteracies pedagogy of the New London Group (1996) means that we treat metaphors as tools for critical design and redesign and acknowledge that every representation is a motivated choice that carries particular social interests and ethical consequences (Kress, 2003). By inviting learners to map GenAI through metaphors, we position them to ask whose data are amplified, who benefits from their design choices, and how alternative framing might mitigate harm. Metaphor thus becomes a heuristic for interrogating power (Crawford, 2021), bias, and exclusion in AI systems, helping students question the social and ethical dimensions of GenAI rather than merely understanding its technical operation.

To support this understanding, we propose a new metaphorical framework that conceptualizes AI-generated content as a form of "digital plastic" - a substance that, like its physical counterpart, offers both possibilities and challenges to society. Through this metaphorical lens, we argue that learners may better understand how to harness these tools effectively while remaining mindful of their potential impacts (Bozkurt et al., 2023).

Discussion

Exploring GenAI content as digital plastic

Digital plastic is, like its physical counterpart, synthetic, ubiquitous, helpful, and potentially toxic. The metaphor allows for both the exploration of the affordances of GenAI and a critique of the potential damage to the online "ecosystem" through which this new media will proliferate. Reading these affordances through a multiliteracies lens foregrounds the social, cultural, and multimodal dimensions of meaning-making: the New London Group (1996) argues that new media demand pedagogies alert to the "design" of texts across multiple modes, languages, and contexts, and GenAI's pliability makes those design choices both more accessible and more precarious. In their discussion of multimodal discourse, G. R. Kress and Van Leeuwen (2001) explore the role of synthetic materials in meaning production and discuss how since the 1930s, plastic has been both celebrated and vilified as a medium for production because of its versatility, detrimental impacts on the environment, and mass commercialization of plastic-based products.

Barthes (1957) referred to the potential in plastic for "infinite transformation" and its potential as "ubiquity made visible" – both a blessing and a curse, and Baudrillard (1996, p. 112) referred to the "game of the universal associations" made possible through plastics. Applying these same qualities to GenAI, it is possible to view this new "digital plastic" as equally malleable in creating meaning through digital texts.

Similar to physical plastics, GenAI content may provide new possibilities through its relatively low cost at the point of use. For scholars and writers in the Global South, where access to professional editorial services or native English-speaking collaborators is often restricted by financial and geographical barriers, GenAI tools can help address longstanding inequities in global academic discourse (James & Andrews, 2024). Just as plastic materials made essential goods available to communities with limited resources, GenAI might offer writers from non-Western contexts capabilities that were previously limited to those who could afford expensive language services or had access to Western academic networks. These tools could potentially reduce historical barriers to participation in international publishing and online discourse, particularly for multilingual scholars working in English-medium academic contexts (Kim & Danilina 2025; Perkins 2023; Sebastian & Baron 2024). However, this pattern of adoption mirrors the complex issues seen in the physical plastic usage; just as many Global South countries face challenges with plastic waste due to limited regulation and infrastructure, there may be parallel issues with digital plastic. Writers with restricted access to premium GenAI models may rely more heavily on free, potentially lower-quality tools, contributing to a possible increase in lower-quality synthetic content in digital spaces. This pattern suggests the risk of creating new forms of digital inequality, even as it addresses others.

Drawing on G. Kress (2010), the modal affordances of GenAI include the possible semiotic resources that a user can draw on when using the technology to make meaning. Because GenAI is a multimodal technology, these affordances are numerous and varied, including the creation of text, images, and audio. The transduction (G. Kress, 1997) of meaning across modes is also possible, with new technologies capable of taking input in one mode, such as text, and producing novel outputs in another mode. Advances in GenAI technologies, such as image recognition (OpenAI, 2023) and voice generation (OpenAI, 2024), mean that the transduction of meaning can occur in various ways, including text-to-image, image-to-speech, and speech-to-text. Similar to physical plastic, GenAI is a malleable and versatile technology. This raises important questions for CAIL, including what is gained or lost when meaning is translated across modes.

For example, although it has been possible for some time to generate compelling and even realistic images from detailed text prompts, Kalantzis and Cope (2024, p.16). argue that "Computers can't mean anything other than zero or one. All they can do is calculate by textual transposition: recorded Unicode > chunked into tokens > binary notation > calculation of the probability of the next token > token > readable Unicode." If this is true, then the seeming affordance of multimodal GenAI may be fundamentally limited by deference to the written mode. If a user describes an image, either verbally or via a text prompt, the image generation technology can only produce a novel image within the constraints of its text-based training data, that is, the labels associated with the classified images. In this respect, the AI image generator's mind-eye is more limited than the imagination of a human creator. However, as these models continue to grow in both size and sophistication, and the volume of training data well exceeds the potential for an individual human to view and learn from images, this point may be moot. The implications of this for the future of multimodal content creation should be prioritized in future research. The potential implications of AI-generated plastics are similar. Synthetically produced media offers many possibilities for creativity, accessibility, and communication. However, it may flood diverse digital ecosystems with low-quality, homogeneous, and culturally biased content. The consequences of this may be benign or significantly damaging to those who consume it. Within this framework, digital plastic can be understood as a new form of multimodal meaning-making that disrupts traditional norms and hierarchies.

Multiliteracies theory emphasizes the diversity of communicative practices and the importance of engaging with multiple modalities. In the context of multimodal literacy, G. R. Kress and Van Leeuwen (2001) argue that physical plastics do not have their own "specific material qualities" (p. 80), having various chemical and physical properties, and that plastics can be used to produce different meaning. Digital plastic can similarly expand the semiotic repertoire by enabling individuals to use multimodal GenAI to engage with such productions. For example, a user may be able to produce a project involving AI-generated text narration, visual storytelling, and audio production, all using GenAI tools. However, this democratization of multimodal production also has trade-offs, including the potential to prioritize efficiency over an artistic voice and, therefore, an over-reliance on algorithmic production. Part of CAIL is exploring both the affordances and limitations of synthetic material as a medium, enabling students to, for example, use image or audio GenAI when necessary for articulating a particular meaning, but resisting its use when the meaning might be better conveyed without the technology.

Persistence is another shared issue between digital and physical plastic. Physical plastics are enduring and degrade over extended periods, forming microscopic fragments known as microplastics that persist in landfills and oceans for decades. These degraded particles become permanent pollutants in ecosystems, fundamentally altering their natural environment. This pattern of fragmentation and persistence is parallel to the digital realm of GenAI-generated content. Like their physical counterparts, digital plastics create enduring layers of synthetic content in online environments, with their traces remaining discoverable and measurable through bibliometric studies of journal articles and GenAI footprints (Tang & Eaton, 2024). The concept of digital microplastics manifests when fragments of synthetic content accumulate in the training data for future GenAI models, potentially degrading the quality and reliability of digital ecosystems. This recycling of AI-generated content into training data can lead to model collapse (Shumailov et al., 2024), where the outputs of GenAI models become unintelligible and meaningless, threatening the sustainability of the technology. Thus, digital plastic mirrors the environmental impact of physical plastic, challenging us to consider how these accumulating layers of synthetic content may reshape the future of meaning-making.

In linking digital plastic to multiliteracies, synthetic media represents both a fundamental shift in how meaning is created and shared in digital spaces and a challenge to our understanding of authenticity and authorship. Multiliteracies theory emphasizes the need for learners to critically engage with diverse communicative practices, and synthetic media pushes these boundaries further, resulting in new ways of thinking about authenticity, authorship, and agency in multimodal contexts. By framing synthetic media as digital plastic, we can better understand the interplay between materiality and meaning, providing a foundation for addressing broader implications in education, culture, and society.

Conclusion

The evolution of GenAI is reshaping much of our extant digital world and may be extending into the physical world. Common phrases repeated by GenAI models may soon find greater uptake in public discourse, and GenAI imagery may become an even more common and cost-effective method of producing physical advertisements. As with physical plastics, the integration of synthetic content into daily practices prompts a critical examination of society's growing reliance on artificial materials. The scalability, malleability, and ease of use of GenAI suggest that this may soon be the case. However, these same attributes may also lead to toxicity and long-term detriment to society. The emergence of synthetic media may, from a multiliteracies perspective, disproportionately impact some learners or students more than others, while giving others an outsized benefit in terms of CAIL.

Consequently, we call for new pedagogical strategies, conceptualizations, and ways of thinking about GenAI that can help educators raise learners' awareness of these critical properties of AI technologies that may disrupt or damage our digital environments. We argue that the concept of digital plastic can be used as a valuable guiding tool in classroom activities, and used in tasks, activities, and discussions to examine the effects of GenAI in digital spaces. Practically, we contend that multiliteracies must now integrate

a component of CAIL as a new skill that must be equitably developed, across both geographies and cultures, to ensure that future generations can critically engage with new forms of technology-enhanced meaning-making that permeate our digital spaces.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Alser, M., & Waisberg, E. (2023). Concerns with the usage of ChatGPT in academia and medicine: A viewpoint. *American Journal of Medicine Open*, *9*, 100036. https://doi.org/10.1016/j.ajmo.2023.100036

Barthes, R. (1957). *Mythologies*. Éditions du Seuil.

Batten, A. J. (2012). Metaphors we teach by: The language of "learning outcomes". *Teaching Theology and Religion*, *15*(1), 16–28. https://doi.org/10.1111/j.1467-9647.2011.00756.x

Baudrillard, J. (1996). *The system of objects*. Verso.

Bhuiyan, J. (2025). Meta is killing off its own AI-powered Instagram and Facebook profiles. *The guardian*. https://www.theguardian.com/technology/2025/jan/03/meta-ai-powered-instagram-facebook-profiles

Bialostok, S. (2002). Metaphors for literacy: A cultural model of white, middle-class parents. *Linguistics & Education*, *13*(3), 347–371. https://doi.org/10.1016/S0898-5898(02)00088-8

Bialostok, S. (2008). Using critical metaphor analysis to extract parents' cultural models of how their children learn to read. *Critical Inquiry in Language Studies*, *5*(2), 109–147. https://doi.org/10.1080/15427580802068555

Bialostok, S. M. (2014). Metaphors that teachers live by: A cultural model of literacy in the era of new literacies. *Language and Education*, *28*(6), 501–520. https://doi.org/10.1080/09500782.2014.905591

Bjelobaba, S., Waddington, L., Perkins, M., Foltýnek, T., Bhattacharyya, S., & Weber-Wulff, D. (2025). Maintaining research integrity in the age of GenAI: An analysis of ethical challenges and recommendations to researchers. *International Journal for Educational Integrity*, *21*(1), Article 1. https://doi.org/10.1007/s40979-025-00191-w

Bozkurt, A., Xiao, F., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., Farrow, R., Bond, M., Nerantzi, C., Honeychurch, S., Bali, M., Dron, J., Mir, K., Stewart, B., Stewart, B., Costello, E., Mason, J., Stracke, C., Romero-Hall, E., & Jandric, P. (2023). Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education*, *18*, 53–130. https://doi.org/10.5281/zenodo.7636568

Chandel, P., & Lim, F. V. (2024). Generative AI and literacy development in the language classroom: A systematic review of literature. *Ubiquitous Learning*, *18*(2), 31–49. https://doi.org/10.18848/1835-9795/CGP/v18i02/31-49

Crawford, K. (2021). *The atlas of AI: Power, politics, and the planetary costs of artificial intelligence*. Yale University Press. https://doi.org/10.2307/j.ctv1ghv45t

Demir, K., & Güraksin, G. E. (2022). Determining middle school students' perceptions of the concept of artificial intelligence: A metaphor analysis. *Participatory Educational Research*, *9*(2), 297–312. https://doi.org/10.17275/per.22.41.9.2

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2024). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers and Education*, *105224*, 105224. https://doi.org/10.1016/j.compedu.2024.105224

Dippel, A. (2019). Metaphors we live by: Three commentaries on artificial intelligence and the human condition. In A. Sudmann (Ed.), *The democratization of artificial intelligence* (pp. 33–42). transcript Verlag. https://doi.org/10.1515/9783839447192-002

Ferrara, E. (2024). GenAI against humanity: Nefarious applications of generative artificial intelligence and large language models. *Journal of Computational Social Science*, *7*(1), 549–569. https://doi.org/10.1007/s42001-024-00250-1

Ferreira, G. M. D. S., Rosado, L. A. D. S., Lemgruber, M. S., & Carvalho, J. D. S. (2020). Metaphors we're colonised by? The case of data-driven educational technologies in Brazil. *Learning, Media and Technology*, *45*(1), 46–60. https://doi.org/10.1080/17439884.2019.1666872

Fraser, N. (1995). From redistribution to recognition? Dilemmas of justice in a "post-socialist" age. *New Left Review*, *I*(212), 68–93.

Fraser, N. (2005). Mapping the feminist imagination: From redistribution to recognition to representation. *Constellations*, *12*(3), 295–307. https://doi.org/10.1111/j.1351-0487.2005.00418.x

Freire, P., & Macedo, D. P. (2014). *Pedagogy of the oppressed* (M. B. Ramos, Trans.; 30th anniversary ed.). Bloomsbury Publishing.

Furze, L., Perkins, M., Roe, J., & MacVaugh, J. (2024). The AI assessment scale (AIAS) in action: A pilot implementation of GenAI-supported assessment. *Australasian Journal of Educational Technology*, *40*(4), Article 4. https://doi.org/10.14742/ajet.9434

Garcia, A., Luke, A., & Seglem, R. (2018). Looking at the next 20 years of multiliteracies: A discussion with Allan Luke. *Theory into Practice*, *57*(1), 72–78. https://doi.org/10.1080/00405841.2017.1390330

Gray, A. (2024). ChatGPT "contamination": Estimating the prevalence of LLMs in the scholarly literature (*arXiv*: 2403.16887). arXiv. https://doi.org/10.48550/arXiv.2403.16887

Gupta, A., Atef, Y., Mills, A., & Bali, M. (2024). Assistant, parrot, or colonizing loudspeaker? ChatGPT metaphors for developing critical AI literacies. *Open Praxis*, *16*(1), 37–53. https://doi.org/10.55982/openpraxis.16.1.631

Heikkilä, M. (2023). *Making an image with generative AI uses as much energy as charging your phone*. MIT Technology Review. https://www.technologyreview.com/2023/12/01/1084189/making-an-image-with-generative-ai-uses-as-much-energy-as-charging-your-phone/

Hoffman, B. (2024). Is slop A.I.'s answer to spam? A phrase emerges for bad search. *The New York Times*. https://www.nytimes.com/2024/06/11/style/ai-search-slop.html

Hosseini, M., Gao, P., & Vivas-Valencia, C. (2024). A social-environmental impact perspective of generative artificial intelligence. *Environmental Science and Ecotechnology*, *23*, 100520. https://doi.org/10.1016/j.ese.2024.100520

James, T., & Andrews, G. (2024). Levelling the playing field through GenAI: Harnessing artificial intelligence to bridge educational gaps for equity and disadvantaged students. *Widening Participation and Lifelong Learning*, *26*(3), 250–260. https://doi.org/10.5456/WPLL.26.3.250

Jones, R. H. (2025). Culture machines. *Applied Linguistics Review*, *16*(2), 753–762. https://doi.org/10.1515/applirev-2024-0188

Kalantzis, M., & Cope, B. (2024). *Literacy in the time of artificial intelligence*. EdArXiv. https://doi.org/10.35542/osf.io/es5kb

Kalantzis, M., & Cope, B. (2025). Literacy in the time of artificial intelligence. *Reading Research Quarterly*, *60*(1), e591. https://doi.org/10.1002/rrq.591

Kim, J., & Danilina, E. (2025). Towards inclusive and equitable assessment practices in the age of GenAI: Revisiting academic literacies for multilingual students in academic writing. *Innovations in Education and Teaching International*, 1–5. https://doi.org/10.1080/14703297.2025.2456223

Kress, G. (1997). *Before writing: Rethinking the paths to literacy*. Routledge.

Kress, G. (2003). *Literacy in the New Media age* (1st ed.). Routledge. https://doi.org/10.4324/9780203299234

Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.

Kress, G. R., & Van Leeuwen, T. (2001). *Multimodal discourse: The modes and media of contemporary communication*. Arnold.

Lakoff, G., & Johnson, M. (2003). *Metaphors we live by* (W. A new afterword, (ed.). University of Chicago Press. https://press.uchicago.edu/ucp/books/book/chicago/M/bo3637992.html

Leslie, D. (2023). Does the sun rise for ChatGPT? Scientific discovery in the age of generative AI. *AI and Ethics*, *5*(4), 3439–3444. https://doi.org/10.1007/s43681-023-00315-3

Lim, F. V. (2024). Multimodality and learning: Desiderata for designing social futures. In V. Tavares (Ed.), *Empowering language learners in a changing world through pedagogies of multiliteracies* (pp. 21–39). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-51889-8_2

Lim, F. V., Cope, B., & Kalantzis, M. (2022). A metalanguage for learning: Rebalancing the cognitive with the socio-material. *Frontiers in Communication*, *7*. https://doi.org/10.3389/fcomm.2022.830613

Lim, F. V., & Querol-Julián, M. (2024). Learning with technologies in the digital age: Now and the future. In *Designing learning with digital technologies* (pp. 3–17). Routledge.

Liu, D., & Bridgeman, A. (2023, July 12). What to do about assessments if we can't out-design or out-run AI? *what to do about assessments if we Can't out-design or out-run AI?* https://educational-innovation.sydney.edu.au/teaching@sydney/what-to-do-about-assessments-if-we-cant-out-design-or-out-run-ai/

Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, Honolulu, Hawaii, 1–16. https://doi.org/10.1145/3313831.3376727

Luccioni, A. S., Jernite, Y., & Strubell, E. (2024). Power hungry processing: Watts driving the cost of AI deployment? The *2024 ACM Conference on Fairness, Accountability, and Transparency*, Rio de Janeiro, Brazil, 85–99. https://doi.org/10.1145/3630106.3658542

Messeri, L., & Crockett, M. J. (2024). Artificial intelligence and illusions of understanding in scientific research. *Nature*, *627*(8002), 49–58. https://doi.org/10.1038/s41586-024-07146-0

Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research UNESCO*. https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research

Mirra, N., Morrell, E., & Filipiak, D. (2018). From digital consumption to digital invention: Toward a new critical theory and practice of multiliteracies. *Theory into Practice*, *57*(1), 12–19. https://doi.org/10.1080/00405841.2017.1390336

Nicolleti, L., & Bass, D. (2023). *Generative AI takes stereotypes and bias from bad to worse*. Bloomberg. https://www.bloomberg.com/graphics/2023-generative-ai-bias/

Niemeier, S. (2017). Teaching (in) metaphors. In F. Ervas, E. Gola, & M. G. Rossi (Eds.), *Metaphor in communication, science and education* (pp. 267–282). De Gruyter Mouton. https://doi.org/10.1515/9783110549928-015

OpenAI. (2023, September 25). *ChatGPT can now see, hear, and speak*. https://openai.com/index/chatgpt-can-now-see-hear-and-speak/

OpenAI. (2024). *Navigating the Challenges and Opportunities of Synthetic Voices*. https://openai.com/blog/navigating-the-challenges-and-opportunities-of-synthetic-voices

Perkins, M. (2023). Academic integrity considerations of AI large language models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching & Learning Practice*, *20* (2). https://doi.org/10.53761/1.20.02.07

Perkins, M., Furze, L., Roe, J., & MacVaugh, J. (2024). The artificial intelligence assessment scale (AIAS): A framework for ethical integration of generative AI in educational assessment. *Journal of University Teaching & Learning Practice*, *21*(6). https://doi.org/10.53761/q3azde36

Perkins, M., & Roe, J. (2024). Generative AI tools in academic research: Applications and implications for qualitative and quantitative research methodologies (arXiv: 2408.06872). *arXiv*. https://doi.org/10.48550/arXiv.2408.06872

Perkins, M., Roe, J., & Furze, L. (2024). The AI assessment scale revisited: A framework for educational assessment (arXiv: 2412.09029). *arXiv*. https://doi.org/10.48550/arXiv.2412.09029

Perkins, M., Roe, J., Postma, D., McGaughran, J., & Hickerson, D. (2024). Detection of GPT-4 generated text in higher education: Combining academic judgement and software to identify generative AI tool misuse. *Journal of Academic Ethics*, *22*(1), 89–113. https://doi.org/10.1007/s10805-023-09492-6

Perkins, M., Roe, J., Vu, B. H., Postma, D., Hickerson, D., McGaughran, J., & Khuat, H. Q. (2024). Simple techniques to bypass GenAI text detectors: Implications for inclusive education. *International Journal of Educational Technology in Higher Education*, *21*(1), 53. https://doi.org/10.1186/s41239-024-00487-w

Roe, J. (2025). Generative AI as cultural artifact: Applying anthropological methods to AI literacy. *Postdigital Science & Education*. https://doi.org/10.1007/s42438-025-00547-y

Roe, J., Furze, L., & Perkins, M. (2024). Funhouse mirror or echo chamber? A methodological approach to teaching critical AI literacy through metaphors (arXiv: 2411.14730). *arXiv*. https://doi.org/10.48550/arXiv.2411.14730

Roe, J., O'Sullivan, D., Arumynathan, P., & Kappen, B. (2024). Paraphrase or plagiarism? Exploring EAP students' use of source material in a transnational university context. *Journal of Applied Learning and Teaching*, *7*(2). 232–245.

Roe, J., Perkins, M., & Furze, L. (2024). Deepfakes and higher education: A research agenda and scoping review of synthetic media. *Journal of University Teaching & Learning Practice*, *21*(10), Article 10. https://doi.org/10.53761/2y2np178

Roe, J., Perkins, M., & Tregubova, Y. (2024). The EAP-AIAS: Adapting the AI assessment scale for English for academic purposes (arXiv: 2408.01075). *arXiv*. https://doi.org/10.48550/arXiv.2408.01075

Saban, A. (2006). Functions of metaphor in teaching and teacher education: A review essay. *Teaching Education*, *17*(4), 299–315. https://doi.org/10.1080/10476210601017386

Sebastian, F., & Baron, R. (2024). Artificial intelligence: What the future holds for multilingual authors and editing professionals. *Science Editor*, *47*(2), 38–42. https://doi.org/10.36591/SE-D-4702-01

Sharma, M., Tong, M., Korbak, T., Duvenaud, D., Askell, A., Bowman, S. R., Cheng, N., Durmus, E., Hatfield-Dodds, Z., Johnston, S. R., Kravec, S., Maxwell, T., McCandlish, S., Ndousse, K., Rausch, O., Schiefer, N., Yan, D., Zhang, M., & Perez, E. (2023). Towards understanding sycophancy in language models (arXiv: 2310.13548). *arXiv*. https://doi.org/10.48550/arXiv.2310.13548

Shumailov, I., Shumaylov, Z., Zhao, Y., Papernot, N., Anderson, R., & Gal, Y. (2024). AI models collapse when trained on recursively generated data. *Nature*, *631*(8022), 755–759. https://doi.org/10.1038/s41586-024-07566-y

Singh Chawla, D. (2024). Is ChatGPT corrupting peer review? Telltale words hint at AI use. *Nature*, *628* (8008), 483–484. https://doi.org/10.1038/d41586-024-01051-2

Stolpe, K., & Hallström, J. (2024). Artificial intelligence literacy for technology education. *Computers and Education Open*, *6*, 100159. https://doi.org/10.1016/j.caeo.2024.100159

Tang, G., & Eaton, S. E. (2024). A rapid investigation of artificial intelligence generated content footprints in scholarly publications. *Journal of Scholarly Publishing*, *55*(3), 337–355. https://doi.org/10.3138/jsp-2023-0079

Turobov, A., Coyle, D., & Harding, V. (2024). Using ChatGPT for thematic analysis (arXiv: 2405.08828). *arXiv*. https://doi.org/10.48550/arXiv.2405.08828

Weber-Wulff, D., Anohina-Naumeca, A., Bjelobaba, S., Foltýnek, T., Guerrero-Dib, J., Popoola, O., Šigut, P., & Waddington, L. (2023). Testing of detection tools for AI-generated text. *International Journal for Educational Integrity*, *19*(1). https://doi.org/10.1007/s40979-023-00146-z

Zhgenti, S., & Holmes, W. (2023). *Generative AI and education: Adopting a critical approach*. https://discovery.ucl.ac.uk/id/eprint/10177781/1/Zhgenti%20and%20Holmes%20-%202023%20-%20Generative%20AI%20and%20Education%20Adopting%20a%20Critical%20A.pdf