



Research article

Large Language Model-based Tools in Language Teaching to Develop Critical Thinking and Sustainable Cognitive Structures

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Abstract

Experts assert that Large Language Model (LLM) based tools like ChatGPT are the next generation in the evolution of Artificial Intelligence and will permeate all walks of human life including education. The current narrative is that we need to embed the LLM-based tools into the system taking advantage of their personalised, dynamic, adaptive nature while being mindful of their limitations. One of the greatest limitations so far identified is that these pre-trained transformer-based encoder models fine-tuned on Natural Language Processing (NLP) tasks do not reveal verifiable reasoning ability. As a result, the information generated by these tools is subject to ethical and factual errors that need human oversight. This paper uses the integrative literature review to identify and synthesize Critical Digital Literacy frameworks in language teaching in the light of the essential competencies and learning domains identified by the UNESCO Education for Sustainable Development directives. The Critical AI Literacy framework proposed in this paper would enable language teachers to adopt LLM-based tools to enhance their instructional strategies. The cognitive, affective and conative competencies developed through the new CAIL framework would empower learners to understand the manipulative nature of language and use language to build a sustainable future.

Keywords: Critical AI Literacy, English, Language Teaching, Education for Sustainable Development.



Introduction

Advancements in the application of Artificial Intelligence (AI) are phenomenal and almost all-pervasive. Generative Pre-trained Transformers (GPTs) using Large Language Models (LLMs) are among the next big things and all domains would do well to adapt and adopt the new technology. As the UNESCO framework for the adoption of Information and Communication Technologies (ICTs) (2018) emphasizes, incorporating technological developments is essential

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and inevitable, but the important thing to ensure is that those who use these technologies develop appropriate competencies that will enable them to use the technologies ethically and sustainably to build an equitable, peaceful and fair ecosystem (p.7). The responsibility to develop such competencies and transfer them to the younger generation is compounded in the field of education since for sustainable development, education is the only domain, one may argue, that could bring about transformation from the grassroots and empower individuals with the “knowledge, skills, and attitudes” imperative to sustainable development (UNESCO, 2017, p. 7). Of the eight competencies UNESCO identifies for Education for Sustainable Development (ESD) - Systems thinking, Anticipatory, Normative, Strategic, Collaboration, Critical thinking, Self-awareness, and Integrated problem-solving (p. 10) - no one competency is expected to be taught or acquired in isolation. In fact, these competencies form part of the metanarrative on literacy proposed by UNESCO (2023). Cognizant of the necessity to have a similar all-encompassing approach to literacy in the face of rapid technological advancements, especially in the digital world, researchers have for some years now explored various iterations of Critical Digital Literacy (CDL). However, as digital innovations in AI like LLMs are on the rise, literacy as envisioned in the educational domain must build further on the ‘critical’ and ‘digital’ in ‘critical digital literacy’ to account for AI. Since LLMs are advancements in Natural Language Processing (NLP) (Milano, McGrane, & Leonelli, 2023), it seems natural to focus our efforts on developing relevant critical AI literacy in language education. English language has a global reach in the digital world (Lazou & Tsinakos, 2023), and therefore, English language teaching would be an excellent opportunity to develop relevant literacies to critically navigate the digital world. While the field of CDL in language education is well-researched, there are few pedagogical frameworks on incorporating emerging technological advancements like LLMs in teaching learning of languages (Kostka & Toncelli, 2023, p.4). This paper aims to propose a framework for Critical AI Literacy (CAIL) that could be used when integrating LLMs like ChatGPT-3 in language classes. The framework would be synthesized based on the cognitive, affective, and conative domains of ESD to ensure that Critical AI Literacy would empower individuals towards sustainable cognitive structures.

Critical Digital Literacy

The foundations of critical digital literacy is in the confluence of academic preoccupations with the concept of literacy that went beyond mere reading, writing, or technical skills, and included raising awareness about the socio-cultural, political and ultimately the power equations involved in the use of language, and the role of digital technology in everyday experiences and meaning-making (Pötzsch, 2019; Bacalja, Aguilera, & Castrillon-Angel, 2021). CDL involves an understanding of the sociocultural implications in the permeation of digital technologies into everyday living while exploring its contextual and cultural dimensions. True to its roots in critical literacy, CDL promotes a transformative pedagogy in an attempt to engender a more equitable, empowered and inclusive society (Pangrazio, 2016).

Education for Sustainable Development

The eight competencies that UNESCO ESD propounds intend to achieve cognitive development, attitudinal change and sustainable action-oriented disposition in learners. Systems thinking encourages individuals to understand how systems function in themselves and within contexts. Anticipatory competency enables individuals to think in terms of future actions, consequences, and risks. Normative competency enlightens the ideological context in which individuals exist and provides opportunities to negotiate conflicting situations mindful of all concerned. Strategic competency is about action in the local context and beyond to promote sustainability. Collaborative competency as the term suggests encourages individuals to be open to multiple perspectives and be able to resolve conflicts and solve problems in the multidimensional contexts. Critical thinking empowers individuals to question one's own and others' norms, values, and belief systems which taking a stance on sustainability. Self-awareness is an attitude of understanding oneself as a local and global agent of action. Integrated problem solving integrates all competencies and enables individuals to be inclusive and equitable when solving problems sustainably. The Systems thinking, Normative, and Critical thinking competencies seem to promote cognitive transformation, while the Anticipatory, Strategic, and Integrated problem-solving competencies encourage action. Collaborative and Self-awareness competencies seem more inclined to encourage attitudinal transformation towards compassion, respect, inclusion, and equitable practices. For Critical AI literacy to be aligned to education for sustainable development, the CAIL skills should be a combination of cognitive, affective and conative elements.

Methodology

This research follows the premises of the Integrative literature review methodology as delineated by Torraco (2016). Integrative literature review is the recommended methodology when developing frameworks for relatively new fields of study (Torraco, 2005; Whitemore & Knafl, 2005; Snyder, 2019). The process involves establishing the need for integrative literature review, conducting the review, analyzing and synthesizing the findings. Torraco (2005, 2016), also states that synthesis in integrative literature review provides opportunities for establishing new relationships between concepts from diverse disciplines. In this paper, an attempt is to use an integrative literature review approach to synthesize the recommendations of ESD with the existing research on CDL to propose a framework for the newly emerging field of Critical AI Literacy (CAIL) in language education. The review was informed by the PRISMA flow diagram (Figure 1) developed by Page et al. (2021) and it used a specific set of search strings (Table 1). The researcher explored peer-reviewed journal articles published in English between 2018 and 2023 and indexed in databases like Google Scholar and Science Direct. 2018 was used as the starting point for the integrative review since it was in June 2018 that OpenAI launched GPT-1 the precursor to GPT-3 and now GPT-4 (Ray, 2023) which has sent the academic community into a flurry of activity about incorporating LLMs in education.

The initial search yielded 1038 records which were reviewed and 1009 abstracts and titles were screened using the criteria (Table 2) formulated based on the research objective. 927 search records were removed and 82 potential papers were identified for in depth screening. After excluding papers that did not provide any explicit framework for teaching critical digital literacy, or were focused only on defining the concept, or were not about language teaching, or were targeted specifically toward pre-service/teacher training, 17 peer-reviewed articles were finally selected for in depth study.

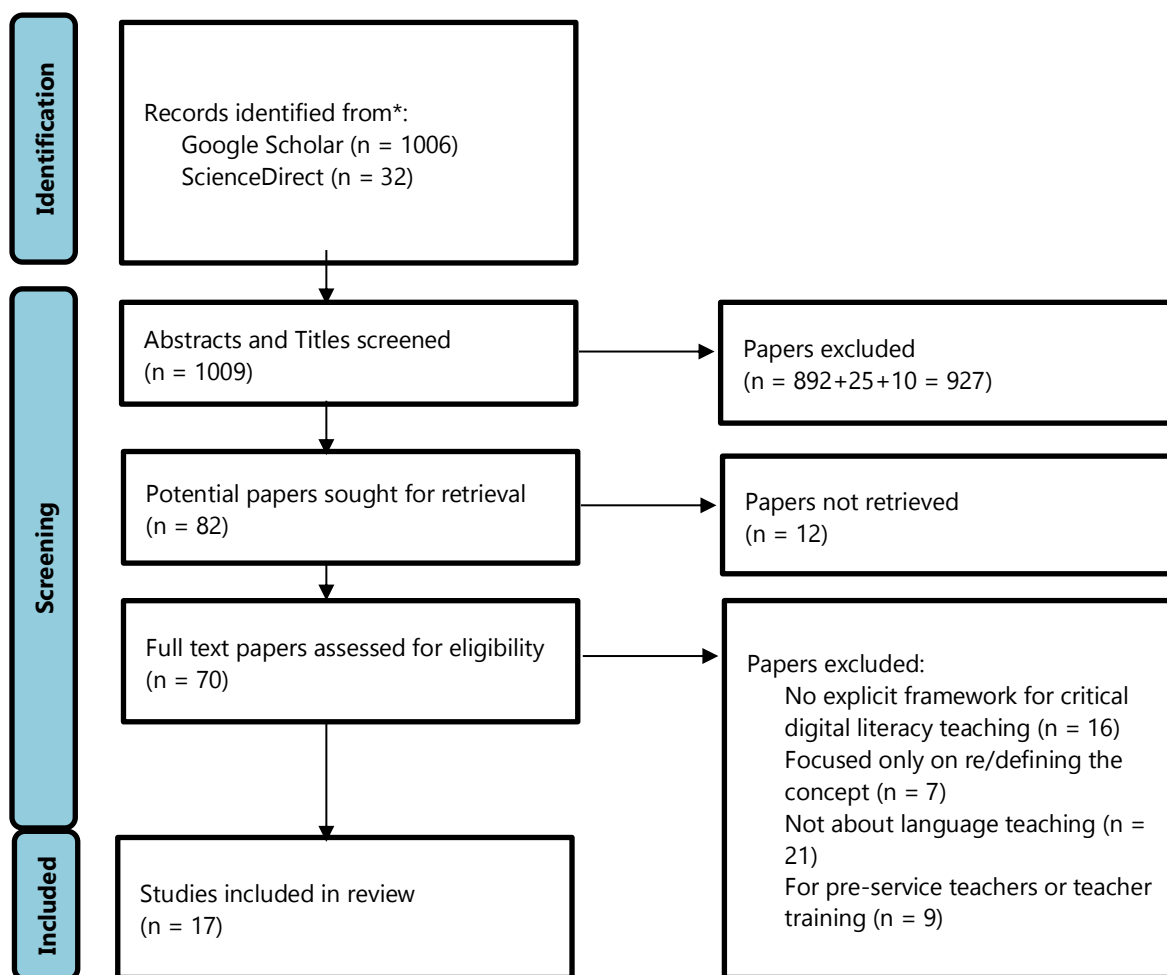


Figure 1: Adaptation of PRISMA flow diagram 2020

Topic	Search term
Critical digital literacy	Critical digital literacy
AND Language Teaching	"English" OR "English as Second language" OR "English as Foreign language"

Table 1: Initial search string

Inclusion Criteria	Exclusion Criteria
Published between 2018-2023	Published before 2018
English Language	Not in English
Indexed in Google Scholar and ScienceDirect	Not Peer-reviewed Journal articles
Peer-reviewed Journal articles	Conference Proceedings
Framework for Critical digital literacy identified	Policy reports
The context of research is English language classroom	Thesis
	Dissertations
	No framework for Critical digital literacy
	Not situated in English language classes

Table 2: Inclusion and Exclusion criteria

One of the limitations of this integrative review study would be the exclusion of variants of critical digital literacy nomenclature. Moreover, the study is limited to articles published in English and those that appear in the two databases.

The articles identified were synthesized using the ESD competencies domains namely, the cognitive, affective and conative. The CDL framework proposed in each of the 17 studies was mapped to these three domains. The mapping revealed the extent to which the proposed CDL frameworks aligned with the sustainable pedagogy outlined by UNESCO's ESD.

Results

The 17 articles that were reviewed suggested CDL frameworks for language teaching. When tallied (see Appendix A) against the three major domains of ESD, 16 studies provided CDL frameworks that focused on the development of competencies in the ESD cognitive domain that fosters Systems thinking, Normative, and Critical thinking competencies. Systems thinking pedagogy primarily focused on encouraging students to examine the interplay between the visual, semiotic, and semantic in texts (Nguyen, Chambers, & Abbott, 2022; Schildhauer, Gerlach & Weiser-Zurmühlen, 2023; Blume, 2022; Barnes & Tour, 2023; Molin & Godhe, 2020), the structural manipulations in texts that shape meaning (Valdez, Ugalingan & Garinto, 2022) and the contextual influences on texts (Tour, Gindidis. & Newton, 2021; Mustifa & Lestari, 2023; Khasbani, 2018; Heafner, Triplett, Handler, & Massey, 2018). Normative thinking competencies promoted by these studies include the ability to question assumptions and beliefs that inform texts (Valdez, Ugalingan & Garinto, 2022), examine the power dynamics implied in the way texts give or suppress voices and promote biases (Schildhauer, Gerlach & Weiser-Zurmühlen, 2023;

O'Byrne, Crandall, Dail, Goering, Mora, Price-Dennis, & Witte, 2022), and also examine the ideological, political, and individual contexts that situate the structure, information, and intention of texts (Janusz, 2022; Molin & Godhe, 2020; Khasbani, 2018; Ostenson & Silva, 2019). Critical thinking competencies suggested in these CDL frameworks insist on familiarizing students with multimodal texts in the contexts of both production and reception (Kustini, Suherdi, & Musthafa, 2020; Reinhardt & Thorne, 2019; Mustifa & Lestari, 2023; Molin & Godhe, 2020), empowering learners to identify and filter the nature of information obtained from online medium (Nguyen, Chambers, & Abbott, 2022; Ostenson & Silva, 2019), and developing their abilities to analyse and evaluate factual (Schildhauer, Gerlach & Weiser-Zurmühlen, 2023), rhetorical (Khasbani, 2018; Heafner, Triplett, Handler, & Massey, 2018; Molin & Godhe, 2020; Janusz, 2022), structural (Valdez, Ugalingan & Garinto, 2022), and metacognitive (Lazou & Tsinakos, 2023) aspects of texts and the meaning-making process. Molin & Godhe's (2020) empirical research is a representative sample of comprehensive pedagogy focusing on the development of Systems thinking, Normative, and Critical thinking competencies using CDL framework. The authors situate their study in a Swedish language lesson. Students were expected to deconstruct a video clip following a five resources model of CDL (Hinrichsen & Coombs, 2014 as cited in Molin & Godhe, 2020, pp. 154-155) including practices such as breaking codes, meaning-making, using texts functionally, analysing texts, and persona. They ensured that the video clip was chosen from the students' lived experience since this is an essential aspect of the five resources model. Students then watched the entire video clip and engaged in small group activity discussing the perspectives in terms of the content, the creator's intentions, the prominent voices in the clip, the perspectives hidden in the video, and the context of reception of the video clip. It could be noted that the discussion activity enabled students to examine to some extent the visual, semiotic and semantic relations in the text and also explore the contextual implications thus engaging students in Systems thinking. The exploration of the creator's intentions and the dominant and hidden voices promoted Normative competency. Critical thinking was an inherent skill exercised during these activities since all discussions were based on the analysis and evaluation of the content design, hidden assumptions and intentions, and the students' interpretation of the video clip. The authors contend that including digital multimodal texts positively impacts the critical awareness of the texts and their contexts.

Six of the 17 studies examined, explicitly included strategies to transfer competencies that matched the ones in the ESD affective domain. Nguyen, Chambers, & Abbott (2022) proposed that language classes should be venues for learners to manage their own online identities while developing intercultural understanding and keeping an open mind to multiple perspectives from across the virtual world. Reinhardt & Thorne (2019) agree to the identity-building opportunity provided by CDL and add that the teaching strategies should also focus developing skills of self-regulation when engaging in online communication. Lazou & Tsinakos (2023) explore the advantages of collaborative content creation that encourages interpersonal and intercultural understanding. They also include a final component of reflective content creation at the end of their lessons to enable students to develop awareness about their learning process, choices, and learning. Reinhardt & Thorne (2019), Blume (2022), Nguyen, Chambers, & Abbott (2022), Valdez, Ugalingan & Garinto (2022) and Mustifa & Lestari, (2023) also recommend taking advantage of

the possibilities offered by the participatory nature of language learning immersed in digital technology to collaboratively question the norms dictating the use of language in the production and reception of texts. The authors reinforced the need to collaboratively explore perspectives and narratives that shape realities. Lazou & Tsinakos' (2023) study is an empirical exploration of the use of Augmented Reality (AR) applications incorporated into the Content and Language Integrated Learning. Conducted in a transnational English as Foreign Language setting, the researchers developed AR-based learning materials to enable students to develop subject knowledge, learning, thinking and creative abilities, communication skills, and intercultural understanding. The focus on developing Collaborative competency was built into the collaborative content creation activity that the researchers had designed. The activity required students to teach and learn from one another, work as a team, and participate in group decision-making and negotiation. The researchers observed that the collaborative learning process had a significant impact on the students' intercultural understanding. The researchers also required students to make a reflective film at the end of the course, where the students had to reflect on how they learned, the challenges they faced, the choices they made, and their overall learning. This exercise in reflection mediated by digital technology was a fruitful exercise for students applying their awareness about the nature, advantages and limitations of the digital text.

The most action-oriented competencies posited by ESD Conative domain are the Anticipatory, Strategic, and Integrated problem-solving competencies. Eight studies propose CDL frameworks that promote action-oriented pedagogy in language teaching. Kustini, Suherdi, & Musthafa, (2020), Nguyen, Chambers, & Abbott, (2022) and Novianti, Thomas & To, (2021) adopted the call to design and redesign using multiliteracies (Vasquez, Janks & Comber, 2019) in order to formulate a transformative pedagogy. By redesign, the authors required learners to use multimodal digital technologies to rework the dynamics of power, equity, and voice to shape more inclusive, just and equitable realities. Though not directing referring to principles of redesign, Schildhauer, Gerlach & Weiser-Zurmühlen, (2023), Lazou & Tsinakos, (2023), Valdez, Ugalingan & Garinto, (2022), O'Byrne, Crandall, Dail, Goering, Mora, Price-Dennis, & Witte, (2022) and Barnes & Tour, (2023) use CDL frameworks to assert the need for learners to act through expository discourses, open-minded discussions, interrogative explorations, and creative actions that promote social justice and understanding. Kustini, Suherdi, & Musthafa's (2020) study situated in an English for Specific Purposes classroom provides an empirically tested strategy to develop Anticipatory and Strategic competencies in students. Students were tasked to collaboratively create an 'e-MiniMagz', a magazine-like image text using multiple modes on a given topic. Second, students were also required to individually create a video presentation, a digital multimodal expository text. Clearly, the individual task developed students' anticipatory and strategic competencies to address issues of significance in real world through an examination of the issue and exploring possible solutions.

Taken together the CDL frameworks in the 17 studies are unequivocal about the feasibility of language classes as spaces for cognitive development, emotional maturation, and change-oriented action when integrating digital technologies. Empirical studies examined showed that CDL frameworks promoted not only language acquisition and proficiency development but also enabled the development of the key competencies for sustainable development. Examined in

light of the premises of Education for Sustainable Development, the pedagogical proposals in these studies have the potential to be adapted and adopted for significant revolutions in the digital world.

Discussion

The results of the integrative review inform the proposed framework for Critical AI Literacy. Language teachers could use the latest in the Large Language Model Generative Pre-trained Transformers to generate texts when integrating the CAIL framework. CAIL framework (Figure 2) will be an organic evolution of the CDL frameworks for language teaching synthesized using the ESD domains. The much-discussed innovative edge of LLMs like GPTs is in their ability to reason like humans (Huang & Chang, 2023). However, this apparent ability to reason like humans is also a cause for concern since developers and researchers are unable to confirm if these models are actually reasoning like humans or generating reasoning-like responses (Huang & Chang, 2023; Kasneci et al., 2023). In English language classes, the CAIL framework applied to texts generated by LLMs could enable learners to understand and be mindful of this uncertainty.

The CAIL framework is founded on the cognitive, affective and conative ESD domains that incorporate the development of the eight key competencies essential to achieve the Sustainable Development Goals. The framework builds on the main pedagogical strategies identified in the review of CDL frameworks for English language classes. In the cognitive domain of CAIL, learners would hone their Systems thinking, Normative, and Critical thinking competencies. To develop the Systems thinking competency, learners should examine the apparent reasoning used in the generated text, identify the contextual implications of the reasoning, and examine how the text type and its conventions inform the nature of the generated text. This should be followed by immersion in Normative competency strategies like identifying the values, beliefs, and ideologies in which the generated text is situated, examining one's own ideological stance, belief systems and values that are brought to the interpretation of the text, examining the voices heard and suppressed in the text. Critical thinking competency is something that learners will engage in during the entire exercise. Learners will verify facts used in the generative texts, analyse the structure and components of the arguments in the generative text, and evaluate the meaning and message in the digital and real world contexts. The learners will now be ready to move into the affective domain of the framework where they will fine-tune their Collaborative and Self-awareness competencies. Learners should discuss with in-class and virtual peers the perspectives on the generated text. They should use multiple modes of interacting with virtual peers. They should then examine how the mode of communication with peers affects the production and interpretation of perspectives. These strategies will help learners develop Collaborative competency which should be simultaneously developed along with the Self-awareness competency. To engage in self-reflection, learners should follow the codes for the chosen mode of communication when presenting one's perspective. They should examine how the mode of communication affects the production and interpretation of their own perspectives. The learners will then move into the final phase of the CAIL framework that addresses the conative domain including Anticipatory, Strategic and Integrated problem-solving competencies. To develop anticipatory competency, learners will engage in a reflective planning

process. They will plan to redesign LLM-generated text by identifying the assumptions and power dynamics that influence the text. They should also verify facts that will be used in the redesigned text. They should then both individually and collaboratively brainstorm how the redesigned text could represent the power dynamics and ideological positions in an inclusive and just manner. Learners should then identify and use multiple modes of production to generate redesigned text. With that, they will engage their Strategic competency. During this stage, they should also ensure that local contextual considerations are factored into the redesign. If the text type permits, learners should ensure that the redesigned text is expository, analytical, and self-evaluative in nature. For the CAIL to effectively contribute to ESD, the final stage of Integrated problem-solving is crucial. Learners should use the redesigned texts in real world contexts to address issues of local and global significance. They should consciously ensure that values of inclusion, social justice, and collaboration inform the redesigned text. Moreover, learners should iteratively evaluate redesigned texts for sustainability indicators and go back to the drawing board for constant refinement. Language teachers are advised to repeatedly use the CAIL framework throughout the academic year to empower learners to contribute to the achievement of SDGs.

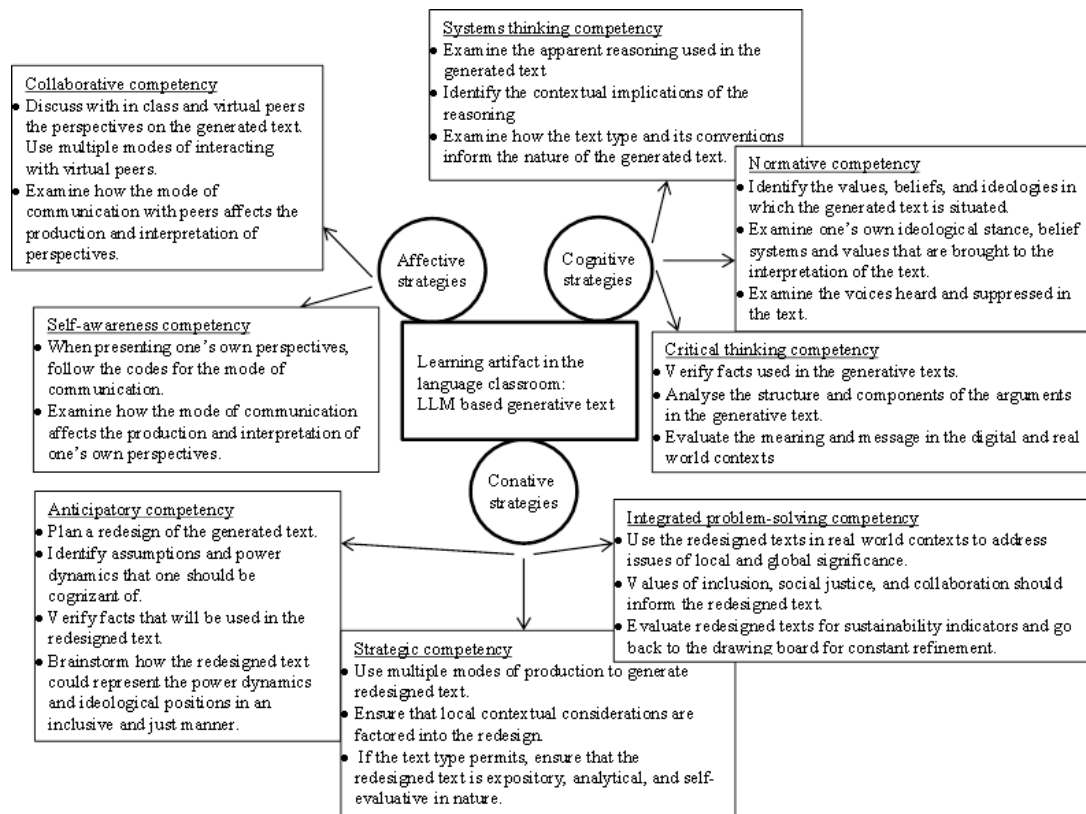


Figure 2: Critical AI Literacy (CAIL) framework

Sample application of CAIL to a generative text

To exemplify the application of CAIL in the context of language teaching, the researcher used OpenAI's ChatGPT-3 to prompt the model to generate text on the analysis of the poem, 'The

Traitress' by the Indian poet, Meena Kandasamy. The following prompt was used by the researcher: Write an essay on the use of allusion in Meena Kandasamy's poem "Traitress". The prompt was deliberately made specific to avoid ambiguities that might affect the response generated. The ChatGPT-3 generated response (Figure 3) is then analysed using the CAIL framework, to show how the framework enables the development of the key competencies for ESD.

Title: The Multilayered Significance of Allusion in Meena Kandasamy's Poem "Traitress"

Introduction

Meena Kandasamy, a contemporary Indian poet, is known for her powerful and thought-provoking poems that delve into issues of social justice, identity, and feminism. Her poem "Traitress" is a compelling example of her use of allusion to convey layered meanings and engage the reader in a complex dialogue. In this essay, we will explore how Kandasamy employs allusion in "Traitress" to evoke historical and cultural references, creating a rich tapestry of meaning and challenging conventional narratives.

Historical Allusions

One of the primary functions of allusion in "Traitress" is to draw upon historical references, thereby enriching the poem's thematic depth. Kandasamy subtly references figures and events from history to shed light on contemporary issues. For instance, she alludes to Draupadi, a character from the Indian epic Mahabharata, who is known for her resilience and resistance against oppression. By invoking Draupadi's name, Kandasamy highlights the enduring struggle of women against patriarchal systems, making a connection between ancient mythology and contemporary feminist movements.

Additionally, the poem alludes to the historical figure of Joan of Arc, the French heroine who defied societal norms and led her country in battle. By referencing Joan of Arc, Kandasamy underscores the courage and determination of women who have challenged established power structures throughout history. This allusion serves to empower and inspire readers to recognize and confront contemporary injustices.

Cultural Allusions

In "Traitress," Kandasamy also utilizes cultural allusions to provide insight into the complexities of identity and heritage. She mentions "the bitter turmeric of betrayal," a reference to the significance of turmeric in Indian culture, which is often used in ceremonies and rituals. By invoking this cultural symbol, Kandasamy highlights the profound impact of betrayal within the context of one's cultural heritage, suggesting that acts of betrayal can carry significant cultural and personal consequences.

Furthermore, the poem refers to the "mythical border of decency," which serves as an allusion to the boundaries and norms that societies impose upon individuals, especially women. This allusion invites readers to question and challenge these societal expectations, encouraging them to break free from the confines of tradition and embrace their authentic selves.

Challenging Conventional Narratives

Kandasamy's use of allusion in "Traitress" goes beyond mere references to historical and cultural figures; it challenges and subverts conventional narratives. By reimagining these figures in a contemporary context, she disrupts traditional interpretations and encourages readers to reconsider established viewpoints. The use of Draupadi and Joan of Arc as symbols of resistance and defiance against oppression challenges the idea that women should conform to societal norms without question.

Moreover, the poem's title, "Traitress," itself carries an allusion to the label often placed on individuals who deviate from societal expectations or betray the status quo. Kandasamy subverts this label, suggesting that being a "traitress" can be an act of courage and liberation rather than betrayal.

Conclusion

Meena Kandasamy's "Traitress" is a profound exploration of the use of allusion to convey complex historical, cultural, and feminist themes. By drawing upon references from history and culture, Kandasamy creates a multi-layered narrative that challenges conventional narratives and invites readers to reflect on issues of identity, resistance, and empowerment. Through her skillful use of allusion, she transforms these references into powerful tools for social critique and commentary, making "Traitress" a compelling and thought-provoking work of poetry. (OpenAI, 2023)

Figure 3: ChatGPT-3 generated response to the sample prompt

Analysis of ChatGPT-3 generated response

Systems thinking competency

1. Examine the apparent reasoning used in the generated text: The reasoning in the introduction that connects the poem to the themes of justice, identity and feminism is convincing even on a cursory reading of the poem.
2. Identify the contextual implications of the reasoning: However, the rest of the introductory paragraph includes sweeping statements that do not contextualize or locate the response in the actual text of the poem. For instance, the themes of representation, identity, and the subaltern are not identified by the model.
3. Examine how the text type and its conventions inform the nature of the generated text: The prompt requires the model to generate an essay and the response clearly uses the conventions of an essay structure including an introduction, thematically organized body paragraphs, and a conclusion. Being a literary essay, the model also uses what appears to be quotes from the poem to develop a point.

Normative competency

1. Identify the values, beliefs, and ideologies in which the generated text is situated: By using phrases and words like 'the patriarchal systems', 'power structures', 'injustices', 'betrayal', 'boundaries', and 'norms' in the analysis, the response seems to situate itself in feminist critical traditions.
2. Examine one's ideological stance, belief systems, and values that are brought to the interpretation of the text: The researcher's ideological understanding of historicity, feminist identity, Dalit poetics, and subversive literature informs the interpretation of both the poem and the response generated by ChatGPT-3.
3. Examine the voices heard and suppressed in the text: Though the response seems to identify with the narrative voice in the poem, the factual errors and the lack of depth in the analysis suggest that the generated response does not highlight any voice.

Critical thinking competency

1. Verify facts used in the generative texts: The generated text claims that the historical allusion in the poem is to Draupadi, a character in the Indian epic, The Mahabharata and to Joan of Arc, the historical figure and patron saint of France. However, both allusions are factually wrong. The allusion in Kandasamy's poem is to Shoorpanaka, a character in the Indian epic, The Ramayana. Though there is no direct allusion to Joan of Arc, one could argue that Shoorpanaka's association in the political future of her nation makes her comparable to the historical figure. Moreover, all the apparent quotes from the poem are erroneous. These quotes seem fabricated by the model. The discussion of the cultural allusion to turmeric and its association with betrayal is not factually verifiable. The model seems to have syllogistically connected the significance of turmeric in the Indian culture to the feminist theme of betrayal because the two seem to occur in similar contexts.

2. Analyse the structure and components of the arguments in the generative text: The model uses the argument, evidence, explanation, and evaluation structure in all the body paragraphs.
3. Evaluate the meaning and message in the digital and real world contexts: If the factual errors were overlooked, the response seems to be superficially discussing a relevant message about the poem, that is, the call to disrupt and subvert the traditional narratives and encourage readers to perceive social and cultural narratives of women from a new perspective. The meaning conveyed by the generated text, however, is superficial and factually incorrect.

Collaborative competency

1. Discuss with in-class and virtual peers the perspectives on the generated text: Use multiple modes of interacting with virtual peers. The researcher would recommend engaging in a close reading of the text in small groups within the class. One could also communicate with the author, Meena Kandasamy, using digital multimodalities and engage in a conversation about the poem. The researcher and students could also engage in conversation with or explore the interpretations provided by other readers, commentators, and reviewers of the poem including those available in academically published papers.
2. Examine how the mode of communication with peers affects the production and interpretation of perspectives: The researcher and students could examine the difference in the perspectives they come across when using formal and informal means of digital multimodal communication. For example, the perspective exchanged over a video chat might be significantly different from those expressed in an email since most people perceive email as a written record.

Self-awareness competency

1. When presenting one's perspectives, follow the codes for the mode of communication: The researcher along with the students could explore the codes for multimodalities of digital communication and maintain a checklist to ensure that the codes are adhered to.
2. Examine how the mode of communication affects the production and interpretation of one's perspectives: Entries in a self-reflection journal of the entire process would enable the researcher and students to note how the mode of communication changed the way they produced interpretative texts and shared perspectives.

Anticipatory competency

1. Plan a redesign of the generated text: The plan would be to ensure factual correctness, in-depth analysis and theoretical grounding of the response.
2. Identify assumptions and power dynamics that one should be cognizant of: The theoretical grounding in Dalit poetics, feminist, Marxist, psychoanalytical, or New criticism should help identify the power dynamics implicit in the poem
3. Verify facts that will be used in the redesigned text: This would entail a detailed examination of facts using various reliable sources in multiple modes.

4. Brainstorm how the redesigned text could represent the power dynamics and ideological positions in an inclusive and just manner: A mapping of the redesigned response would help to collate all the information gathered.

Strategic competency

1. Use multiple modes of production to generate redesigned text: The researcher and students could individually generate their responses to the prompt using digital multimodalities and then peer evaluate the responses. Moreover, the researcher could explore multiple variations of the prompt to feed the model with information that could revise the generated response more comprehensively.

2. Ensure that local contextual considerations are factored into the redesign: An exploration into the local context of Dalit poetics would enable readers to understand the sociocultural and political underpinnings of the poem.

3. If the text type permits, ensure that the redesigned text is expository, analytical, and self-evaluative in nature: The response to the use of allusions in Kandasamy's poem will invariably be expository in nature since the text is an act of subversion giving voice to the marginalized and the disenfranchised.

Integrated problem-solving competency

1. Use the redesigned texts in real world contexts to address issues of local and global significance: The researcher would recommend collaborating with organizations that develop, train, and fine-tune LLMs to provide them with datasets that are more inclusive in nature.

2. Values of inclusion, social justice, and collaboration should inform the redesigned text: The redesigned response could be responsibly shared with stakeholders to initiate and engage in discussions and actions on the issues represented in the poem.

3. Evaluate redesigned texts for sustainability indicators and go back to the drawing board for constant refinement: All discussions and actions should be accompanied by an individual and collaborative reflective exercise to identify the gaps and bridge them.

Conclusion

This integrative review is a foundational activity that addresses the urgent need to incorporate AI and its language models. By situating the study in the English language classes, the research contextualizes the nature of the pedagogy in terms of Natural Language Processing (NLP), a fast advancing AI technology. The transformative potential of the proposed CAIL framework is immense if teachers and students were to engage in using sustainable cognitive structures in language use to understand, analyse, evaluate, and solve issues of local and global proportions. CAIL would empower individuals to effectively use technological advancements in AI to promote discourses and create narratives that are just, inclusive, and equitable in nature. The CAIL framework proposed in this study is a theoretical notion and therefore, needs empirical testing in diverse local conditions to understand its real life implications. Future research could also focus further on the integrative approach adopted by this paper, where the CDL discourse is synthesized with the ESD competencies. The participatory, social justice and action-oriented

CAIL pedagogy in language teaching is the need of the hour if human intelligence and artificial intelligence is to coexist in a sustainable space.

Declaration of Conflicts of Interests

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References

- Bacalja, A., Aguilera, E. & Castrillon-Angel, E. (2021). Critical Digital Literacy. In J.Z Pandya, R. Mora, J. Alford, N. Golden & R. De Roock (Eds.), *The Handbook of Critical Literacies* (1st ed.). 373-380. Routledge.
- Barnes, M. & Tour, E. (2023). Empowering English as an Additional Language students through digital multimodal composing. *Literacy*, 57(2), 106-119. <https://doi.org/10.1111/lit.12319>.
- Blume, C. (2022). My Text is in Another Tipi: Indigenous Serious Gaming for Critical Digital Literacy in the EFL Classroom. *Anglistik: International Journal of English Studies*, 33(1).77-95. <https://doi.org/10.33675/ANGL/2022/1/9>.
- Heafner, T.L., Triplett, N., Handler, L. & Massey, D. (2018). Situated Word Learning: Words of the Year (WsOY) and Social Studies Inquiry. *Theory & Research in Social Education*, 46(1), 110-148 <https://doi.org/10.1080/00933104.2017.1333473>.
- Huang, J. & Chang, K.C. (2023). Towards Reasoning in Large Language Models: A Survey. In *Findings of the Association for Computational Linguistics: ACL*.1049–1065. Association for Computational Linguistics. <https://doi.org/10.48550/arXiv.2212.10403>.
- Janusz, K. (2022). The importance of digital literacy in foreign language Teaching and learning. *Cultural Almanac*, 4, 186-193. <https://doi.org/10.31392/cult.alm.2022.4.24>.
- Kasneci, E., Sessler, K., Kuechemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T.,... Kasneci, G. (2023). ChatGPT for Good? On Opportunities and Challenges of Large Language Models for Education. *Learning and Individual Differences*, 103. <https://doi.org/10.1016/j.lindif.2023.102274>.
- Khasbani, I. (2018). Revealing possible truths behind “Coolest Monkey in the Jungle”: Ideational Making Analysis approach. *Humaniora*, 30(2), 204-214. <https://doi.org/10.2216/jh.v29i3.35191>.
- Kostka, I. & Toncelli, R. (2023). Exploring Applications of ChatGPT to English Language Teaching: Opportunities, Challenges, and Recommendations. *The Electronic Journal for English as a Second Language*, 27(3). <https://doi.org/10.55593/ej.27107int>.
- Kustini, S. Suherdi, D. & Musthafa, B. (2020). Beyond Traditional Literacies: A Multimodal-Based Instruction to Fostering Student Digital Literacy Learning. *Jurnal Pendidikan Bahasa dan Sastra*, 20(1), 37-47. https://doi.org/10.17509/bs_jpbbsp.v20i1.25969.
- Lazou, C. & Tsinakos, A. (2023). Critical Immersive-Triggered Literacy as a Key Component for Inclusive Digital Education. *Educ. Sci.*, 13, 696. <https://doi.org/10.3390/educsci13070696>.

- Milano, S., McGrane, J.A., & Leonelli, S. (2023). Large language models challenge the future of higher education. *Nature Machine Intelligence*, 5. <https://doi.org/10.1038/s42256-023-00644-2>.
- Molin, L. & Godhe, A. (2020). Students' critical analyses of prominent perspectives in a digital multimodal text. *Nordic Journal of Digital Literacy*, 15(3), 153-164. <https://doi.org/10.18261/issn.1891-943x-2020-03-02>.
- Mustifa, A., & Lestari, L. A. (2023). Literary criticism in the digital age: Addressing the problems and opportunities of digital literature in EFL pedagogy. *English Review: Journal of English Education*, 11(1), 263-274. <https://doi.org/10.25134/erjee.v11i1.7137>.
- Nguyen, H., Chambers, W. & Abbott, M. (2022). Building ESL Learners' Digital Literacy Skills Using Internet Memes. *Tesl Canada Journal/Revue Tesl Du Canada*, 39(1), 83-103. <https://doi.org/10.18806/tesl.v39i1/1368>.
- Novianti, N., Thomas, A. & To, V. (2021). Localities in critical literacy practice: A critical review of the frameworks. *Journal of Theories and Research in Education*, 16(1), 79-96. <https://doi.org/10.6092/issn.1970-2221/11471>.
- O'Byrne, W.I., Crandall, B.R., Dail, J.S., Goering, C.Z., Mora, R.A., Price-Dennis, D. & Witte, S. (2022). Digital wildfires: Tending to social media in the ELA classroom. *Critical Media Literacy*, 3, 19-26.
- OpenAI. (2023). ChatGPT (Mar 14 version) [Large language model]. <https://chat.openai.com/chat>.
- Ostenson, J & Silva, E. (2019). Avoiding fakery: Activities to prepare students for effective searches. *The English Journal*, 108(5), 46-53. <https://doi.org/10.58680/ej201930124>.
- Page, M.J., McKenzie, J.E, Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S.,...Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Systematic Reviews*, 10(89). <https://doi.org/10.1186/s13643-021-01626-4>.
- Pangrazio, L. (2016). Reconceptualizing critical digital literacy. *Discourse: Studies in Cultural Politics of Education*, 37(2). 163-174. <http://dx.doi.org/10.1080/01596306.2014.942836>.
- Pöttsch, H. (2019). Critical Digital Literacy: Technology in Education Beyond Issues of User Competence and Labour-Market Qualifications. *triple*, 17(2), 221-240. <https://doi.org/10.31269/triplec.v17i2.1093>.
- Ray, P.P. (2023). ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. *Internet of Things and Cyber-Physical Systems*, 3. 121-154. <https://doi.org/10.1016/j.iotcps.2023.04.003>.
- Reinhardt, J. & Thorne, S. L. (2019). Digital Literacies as Emergent Multifarious Literacies. In N. Arnold & L. Ducate (Eds.), *Engaging Language Learners through CALL*. 208-239. Equinox.
- Schildhauer, P, Gerlach, D. & Weiser-Zurmühlen, K. (2023). Considerations on Artifacts of Digital Cul-ture in English Language Teaching. Conspiracy Theories on the Instagram Feed. *PFLB – PraxisFor-schungLehrer*innenBildung*, 5(3), 242–257. <https://doi.org/10.11576/pflb-6388>.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>.
- Torraco, R. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, 4(3), 356-367. <https://doi.org/10.1177/1534484305278283>.

- Torraco, R. (2016). Writing integrative literature reviews: Using the past and present to explore the future. *Human Resource Development Review*, 14(4), 404-428. <https://doi.org/10.1177/1534484316671606>
- Tour, E., Gindidis, M. & Newton, A. (2021). Learning digital literacies through experiential digital storytelling in an EAL context: An exploratory study. *Innovation in Language Learning and Teaching*, 15(1), 26-41. <https://doi.org/10.1080/17501229.2019.1659278>.
- UNESCO. (2017). *Education for Sustainable Development Goals: Learning Objectives*. <http://unesdoc.unesco.org/images/0024/002474/247444e.pdf>.
- UNESCO. (2018). *UNESCO ICT Competency Framework for Teachers*. <https://unesdoc.unesco.org/ark:/48223/pf0000265721>.
- UNESCO. (2023). *What You Need to Know about Literacy*. <https://www.unesco.org/en/literacy/need-know>.
- Valdez, P.N., Ugalingan, G. & Garinto, L.A. (2022). Challenging Misinformation in the Online English Language Classroom in the Philippines. *MEXTESOL Journal*, 46(1). https://www.mextesol.net/journal/index.php?page=journal&id_article=46333.
- Vasquez, V.M., Janks, H. & Comber, B. (2019). Critical Literacy as a Way of Being and Doing. *Language Arts*, 96(5), 300-311. <https://doi.org/10.58680/la201930093>.
- Whittemore, R. & Knafl, K. (2005). The integrative review: updated methodology. *Journal of Advanced Nursing*, 52(5), 546-553. <https://doi.org/10.1111/j.1365-2648.2005.03621>.

Appendix A

CDL framework synthesized using the ESD domains and competencies

Author/s Type of study	ESD Cognitive domain	ESD competencies	ESD Affective domain	ESD competencies	ESD Conative domain	ESD competencies
Kustini, Suherdi, & Musthafa, 2020 Empirical	Provide exposure to Multimodal texts	Critical thinking			Encourage Multiliteracies in terms of design semiotics situated in the lived context of the real world	Anticipatory
Nguyen, Chambers, & Abbott, 2022 Theoretical	Develop the knowledge and skill to understand and use hybridity of images, audios, videos, and texts to communicate online Develop skills in the Use of information. Develop the ability to use technological tools to search for and critically select and filter information.	Systems thinking Critical thinking	Collaboration – Personal, Network, Participatory, and Intercultural literacies where one manages one's own online identity, is aware of other, manages the level of engagement in the online context, and has intercultural understanding	Collaborative Self-awareness	Encourage Redesign where the student understands the role of language (in all forms) in shaping and altering realities. Ensure that student Changes, remixes and creates multimodal media for socializing and self-expression.	Anticipatory Strategic
Schildhauer, Gerlach & Weiser-Zurmühlen, 2023 Theoretical	Develop a reflective mindset. Encourage students to reflect on the constraints and affordances of online platforms while being aware of the dynamics and fragmentary nature of digital artifacts Encourage Lateral reading that focuses on fact checking	Systems thinking Critical thinking			Adopt creative strategies to plan action and to bring about change Develop communicative ability to reengage in expository discourses	Strategic, Integrated problem-solving

	Encourage Critical analysis that deconstructs the digital artefact using questions about Who's voice is heard, suppressed, and how power is distributed.	Normative				
Lazou & Tsinakos, 2023 Empirical	Pedagogy is informed by Project-based Content and Language Integrated Learning (CLIL) approach is explored using AR-enriched materials. The four major components of CLIL inform the strategies. Gain knowledge of the content or subject matter, Cognition that involves learning and thinking processes as well as creativity	Critical thinking	Collaborative content creation using the mixed-ability social construction approach Reflective film making that encouraged reflection on the learning process	Collaborative Self-awareness	Develop Communication skills of promoting discussions, remaining open to others' thoughts and values while expressing one's own Develop intercultural understanding and a global mindset	Strategic
Novianti, Thomas & To, 2021 Theoretical					The pedagogical focus is on redesign where the commonplace is disrupted/deconstructed, multiple viewpoints are interrogated, socio-political issues are examined to reconstruct them in the light of the interrogation of viewpoints, and social justice and social action is promoted.	Strategic Integrated problem-solving
Blume, 2022 Theoretical	Gaming could be one of the multimodal texts that could be examined for issues of representation, use of language,	Systems thinking	The participatory nature of gaming enables learners to question the use of	Collaborative		

	production, and audience.		language, representation, and codes in the making of the games.			
Valdez, Ugalingan & Garinto, 2022 Empirical	To counter misinformation students should be trained on understanding the structure, content, and language of digital texts, encouraged to interrogate assumptions and beliefs visible in the text and consider the motivations in creating texts	Systems thinking Critical thinking Normative	Encourages use of texts from multiple languages in class.	Collaborative	The need for collective action should be promoted	Anticipatory
Reinhardt & Thorne, 2019 Theoretical	Ensure the use of multimodal text reception and production Enhance media literacy to access, analyze, evaluate, create and participate with messages in a variety of forms	Systems thinking Critical thinking	Provide opportunities for participation and interaction while being aware of the broader worldwide audience Promote Information literacy which means not only knowing how to find and evaluate information, but also knowing when, with whom, and why it is appropriate to share it.	Collaboration Self-awareness		
O'Byrne, Crandall, Dail, Goering, Mora, Price-Dennis, &	Teach skills of Prebunking - an examination of the paratexts, peritexts, and epitexts surrounding the contextual factors of information.	Systems thinking			Encourage Participating to develop an online space that builds empathy, educates others, and champions social justice	Strategic

Witte, 2022 Theoretical	Use the Who, What, When, Where, and Why lens to examine the context of information. Teach skills of Problematizing - address the culture, bias, and microaggressions through critical dialogue opportunities and student-centered discussions. Use the discussion-feedback-reverse-pattern to ensure students develop listening skills as well.	Normative Critical thinking				
Barnes & Tour, 2023 Empirical	Give students access to digital multimodal texts	Systems thinking			Encourage students to reposition themselves as knowledgeable and capable meaning-makers, which embraces and reflects their interests and identities, while challenging deficit perspectives that are underpinned by existing codes of power.	Strategic
Tour, Gindidis. & Newton, 2021 Empirical	Enable students to participate in simulated contextualized digital technology based narratives	Systems thinking				
Mustifa & Lestari, 2023 Theoretical	Encourage students to interact with the hypertext using digital opportunities Provide opportunities for multimodal production	Systems thinking Critical thinking	Encourage students to connect to authors and other readers through online medium	Collaborative		

Ostenson & Silva, 2019 Theoretical	Encourage students to ask questions about how, what and why before any online interface search. Let them reflect on the previous search histories to understand how their searches affected the information received. Encourage students to critical examine the sources identified and the strategies that provided the sources. Also, encourage students to reflect on how information is created.	Systems thinking Critical thinking Normative				
Khasbani, 2018 Theoretical	Educate students about the reciprocal relationship between the components of language, the existence of opportunities for interpretation and ambiguity in texts, the ideological motivation of the text, and the degree of correspondence between various elements in the text and its context.	Systems thinking Critical thinking Normative				
Heafner, Triplett, Handler, & Massey, 2018 Theoretical	Educate students to contextualize information, analyze events or decisions, evaluate primary sources, and sequence cause-and-effect relationships over time	Systems thinking Critical thinking Normative				

Molin & Godhe, 2020 Empirical	Educate students in breaking codes - developing a familiarity with the structures and conventions of digital media and a sensitivity to the different modes at work within digital multimodal texts, including the design and presentational elements. Consider and separate different modes and their contributions to the message, and acknowledge that modes have different characteristics and conventions. Encourage students to understand meaning-making . Students should be encouraged to be in dialogue with authors and other readers. Enable them to examine their prior experience and knowledge that influences understanding and interpretation. Encourage students to follow narratives across diverse semantic and structural elements. Use texts functionally and develop the ability to translate the purpose or intention, in digital texts across a range of communicative modes and design elements. Educate that analysis involves critically discerning elements that	Systems thinking Normative				
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	contribute to the meanings, uses and messages of digital multimodal texts. Employ skills of analysis to question the role that modes have in content and interactions in a text. Use texts/issues from students real life lived experiences and interests.	Critical thinking				
Janusz, 2022 Theoretical	Ask questions about authorship, audience, purpose, content, creative techniques. Question how the media construct our individual realities, how the media are influenced by industrial pressures, how the media are influenced by political pressures, how the media are influenced by format, and to what extent audiences are active recipients of the media, and what the media tell us about who we are as a society.	Systems thinking Critical thinking Normative				