

UC Davis

UC Davis Previously Published Works

Title

Leveraging Onto-Epistemic Heterogeneity for “Outward” Exploration: Cultivating Critical AI Awareness in the ELA Classroom

Permalink

<https://escholarship.org/uc/item/4v0156hp>

Journal

Journal of the Learning Sciences

ISSN

1050-8406

Authors

Higgs, JM

Kaimana, M

Isero, M

Publication Date

2026

DOI

10.1080/10508406.2026.2686084

Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial-NoDerivatives License, available at <https://creativecommons.org/licenses/by-nc-nd/4.0/>

Peer reviewed

[View Crossmark data](#)

Leveraging Onto-Epistemic Heterogeneity for “Outward” Exploration: Cultivating Critical AI Awareness in the ELA Classroom

Jennifer M. Higgs^a, Maria Kaimana^b, and Mark Isero^c

^aUniversity of California, Davis; ^bSkyline High School; ^cLatitude High School

ABSTRACT

Background: K-12 AI education has emphasized technical skills over critical inquiry, with fewer opportunities to examine how algorithmic systems encode and reproduce power. This study explores how ELA classrooms can foster students’ critical AI awareness—their capacity to analyze how AI, social hierarchies, and people’s ways of being co-constitute one another. Drawing on onto-epistemic heterogeneity, we centered students’ diverse experiences and knowledges as they investigated algorithmic bias and manipulation.

Methods: A three-month unit organized around reading, talking, and writing as exploration was implemented in two secondary English classes (n=69). In this social design-based experiment, we analyzed students’ pre- and post-unit surveys, discussions, and essays to trace the expansion of their thinking about AI.

Findings: Students developed “nested” critical orientations, increasingly situating personal (“inward”) concerns within broader systemic critiques. This “outward” expansion was mediated by the interplay of reading, talking, and writing. Students addressed AI’s racialized dimensions and began to envision collective action; surveys indicated expanded awareness of algorithmic influence.

Contribution: Grounded in onto-epistemic heterogeneity, this research positions ELA as a disciplinary home for critical AI inquiry, showing how humanities-based literacy practices can foster broadening orientations central to critical AI awareness and to informed, agentic participation in an algorithmic age.

CONTACT Jennifer M. Higgs  jmhiggs@ucdavis.edu  School of Education, University of California, 1 Shields Avenue, Davis, CA 95616.

© 2026 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Introduction

Although artificial intelligence (AI) has been present in education for decades, recent advancements in generative systems have created a sense of urgency in determining what K-12 students need to know to participate in an increasingly AI-driven world (LeBlanc et al., 2023; Touretzky et al., 2019; Vakil & McKinney de Royston, 2022). A central concern in K-12 AI education is the exploration of AI's social impacts and attendant ethical implications (Grover, 2024). This imperative calls for pedagogies that prioritize the sociopolitical and sociocultural dimensions of technology—approaches that are essential for justice-oriented learning and equitable civic participation (Lachney et al., 2021; Margolis et al., 2012; Morales-Navarro & Kafai, 2023; Ryoo & Blunt, 2024; Vakil, 2018).

As K-12 educators and policymakers work to identify practices and guidelines that can support AI teaching and learning, existing designs that engage learners in critical examinations of ethics and systems of power offer valuable insights (Vakil, 2018). A persistent question, however, is who has the opportunity to benefit from such learning. This scholarship has developed largely within computer science and engineering coursework—yet as society increasingly relies on AI and other computational technologies, the capacity to examine their often-undeclared power, and to confront the questions they raise about ethics, equity, and social impact, is increasingly fundamental for all learners, not only those on computing pathways (Grover, 2024; Lee et al., 2022; Ryoo, 2019; Vakil & Higgs, 2019). The field must therefore reimagine where critical AI education can take place and who has access to it, ensuring all students, regardless of career pathway, can understand, analyze, critique, and reimagine the technologies that shape their lives.

Repositioning AI education within the humanities shows promise for developing nuanced understandings of AI's sociopolitical and ethical implications (Burriss et al., 2024; Higgs & Stornaiuolo, 2024; Krutka et al., 2022; Nichols & Garcia, 2022; Vakil & Higgs, 2019). However, few empirical accounts examine how such approaches can be designed and enacted within widely accessible core subjects like English Language Arts (ELA). Our teacher-researcher team sought to address this gap through a social design-based experiment (Gutiérrez, 2016) that examined two 12th grade English (English 12) classes. We approached these classes as sites for cultivating *critical sociotechnical awareness*—the capacity to recognize and analyze how technological systems (such as AI), social hierarchies, and people's ways of being co-constitute one another, with attention both to how these systems mediate power, encode bias, and affect marginalized communities, and to how people live within and negotiate these systems. While this awareness applies broadly to the relationship between technologies and social hierarchies, our study focuses on its development in relation to AI,

which we term *critical AI awareness*. More specifically, we attended to algorithmic bias and manipulation for ethical and contextual reasons. These phenomena inflict documented, disproportionate harms on nondominant communities and on young people’s mental health (Costello et al., 2023; Eubanks, 2017; Noble, 2018). They were also evident in our own observations of students’ intensifying engagement with and dependence on social media following the return to full-time in-person learning in Fall 2022. As literacy educators interested in digital tools and ecologies, our aim was to help students develop the capacity to interrogate the forces shaping their digital lives.

We take up this challenge within ELA, a discipline whose long-standing engagement with technology, society, and power is rarely linked to computing education (Lynch, 2019; Santo et al., 2024), yet whose emphasis on inquiry, discourse, and varied literacy practices, we contend, offers a strong basis for developing critical AI awareness. Our work is informed by the theoretical framework of onto-epistemic heterogeneity (Vossoughi et al., 2023; Warren et al., 2020), which grounds the reimagining of disciplinary learning in diverse ways of being and knowing that students bring to the learning process.

The learning design in these classes centered on three pedagogical stances: *reading as exploration*, *talking as exploration*, and *writing as exploration*. These stances, which are integral to ELA disciplinary practices, guided students’ engagement with diverse texts (literary works, contemporary scholarship, nonfiction, documentaries), fostered collective meaning-making through discourse, and supported varied composing purposes. Our analysis of student essays, discussions, and surveys reveals a notable expansion in student orientations toward AI’s impacts. Students increasingly extended their individual-oriented concerns (an *inward* orientation) toward broader understandings of social harm and community impact (an *outward* orientation). We examine how a design grounded in onto-epistemic heterogeneity—one that positions students’ lived experiences with technology as constitutive of disciplinary knowledge rather than supplementary to it—enabled students’ personal, inward concerns to anchor an outward orientation toward systemic critique. As we elaborate below, we understand these inward and outward orientations not as sequential stages but as nested and mutually constitutive. This study addresses the following research questions:

- (1) In what ways does an ELA-based pedagogical design—centered on reading, writing, and talking as exploration—afford or constrain students’ critical orientations toward AI’s sociotechnical implications, such as algorithmic bias and manipulation?

- (2) How did students' critical orientations toward AI's sociotechnical implications, specifically the relationship between inward and outward orientations, surface and change from pre-unit to post-unit?

In the following sections, we first review existing approaches to critical AI education—from their roots in computing to emerging work in the humanities—and the gap our study addresses. We then outline our theoretical framework of onto-epistemic heterogeneity (Vossoughi et al., 2023; Warren et al., 2020), detailing its application to cultivating critical AI awareness within ELA. We subsequently describe the learning design developed for English 12 classes, highlighting how the exploration stances were enacted as pedagogical tools. Our findings, drawn from qualitative data including students' digital journals, class discussions, essays, and pre- and post-unit surveys, demonstrate how an ELA learning environment can foster critical AI awareness. Finally, we discuss the implications of our findings for the broader field of AI education, highlighting the importance of humanities-centered approaches that draw on ELA's distinctive affordances to cultivate critical AI awareness for all learners.

Critical AI Education and the Case for ELA

The Urgent Imperative for Critical AI Education

While the precise content of AI education remains a subject of debate (Grover, 2024; LeBlanc et al., 2023; Touretzky et al., 2019), the increasing prevalence of AI in daily life necessitates a focus on its multifaceted social impacts (Borenstein & Howard, 2021; Roll & Wylie, 2016). Despite the proliferation of AI-powered tools and services that students encounter daily, both in and out of school, K-12 education frequently lacks sufficient opportunities for students to examine the ethical and societal implications of these technologies. This lack of engagement leaves gaps in students' understandings of AI ethics, particularly issues of bias and manipulation (Akgun & Greenhow, 2022; Fu & Weng, 2024; Higgs & Stornaiuolo, 2024). In this study, we focus on two interconnected concepts: algorithmic manipulation and algorithmic bias. Algorithmic manipulation refers to the intentional design of AI-driven systems (such as social media recommendation algorithms) to influence user behavior, perceptions, and decision-making through personalized content curation, persuasive nudges, and exploitative engagement tactics. Algorithmic bias, by contrast, refers to the systematic errors in these computational systems that create unfair outcomes, often by amplifying and perpetuating existing social hierarchies of race, class, and gender. Addressing these

gaps in critical awareness is essential for all learners, especially for those from nondominant communities. As critical technology scholars have suggested, the complex interactions of technologies and society significantly impact how marginalized groups experience daily life (Benjamin, 2019; Eubanks, 2017; Noble, 2018; Shew, 2023). These dynamics surface across multiple domains, including law enforcement and criminal justice (e.g., over-policing of predominantly Black and Brown neighborhoods), economic systems (e.g., predictive models’ assessments of poor and working-class individuals), job displacement (e.g., task automation that can result in downsizing, especially in sectors where marginalized communities are overrepresented), and accessibility (e.g., AI tools unusable by people with disabilities). Opportunities to develop students’ awareness of these implications are therefore crucial to equitable social and civic participation.

Current Approaches to AI Education: Emphasizing Sociotechnical Understandings

To address this need, a growing body of scholarship advocates broadly situated approaches to AI ethics and its social impacts (Burriss et al., 2024; Grover, 2024; Higgs & Stornaiuolo, 2024; Nichols & Garcia, 2022; Thrall et al., 2024; Vakil & Higgs, 2019). Much of this work has developed within computer science and engineering, building on justice-centered approaches that expand traditional access and achievement frames (e.g., Lee & Soep, 2016; Ryoo et al., 2020; Salac et al., 2023; Tanksley, 2024; Vakil, 2018). Yet the call to extend these critical perspectives to all learners (Vakil & Higgs, 2019) invites approaches that combine the strengths of different domains. Nichols and Garcia (2022), for example, argue for coalitional and relational approaches to platform technologies that eschew boundary-making, inviting “consideration of where different modes of knowledge production intersect and . . . might be generatively combined” to address the urgent questions these technologies raise (Nichols & Garcia, 2022, p. 224).

The case for these broadly situated approaches was sharpened by the public release of generative AI (GenAI) models in late 2022, dramatically reconfiguring conversations about AI in education (Nash et al., 2023). This debut catalyzed immediate concerns about students using AI to “cheat” on writing assignments and broader worries about how this technology—widely framed as a major shift in literacy and learning—would redefine literacy pedagogy (Behizadeh et al., 2023; Enriquez et al., 2024; Gee & Zhang, 2024; Kalantzis & Cope, 2025; Spector, 2023). While this initial focus on practical applications and the nature of writing in the age of AI is understandable, it

risks obscuring the broader ethical and societal questions that require a sociotechnical lens.

ELA's Longstanding Engagement with Critical Literacies and Sociotechnical Inquiry

English Language Arts (ELA) is well positioned to cultivate critical AI awareness. Disciplinary literacy scholarship holds that disciplines are constituted by characteristic ways of reading, writing, and reasoning that are shaped by disciplinary goals and commitments (Moje, 2007, 2008; Rainey & Storm, 2023; Rainey et al., 2023; Shanahan & Shanahan, 2008). A core commitment of ELA, we argue, is the navigation of polysemy and plurality through language, literature, and various forms of media, fostering deep inquiry into diverse human experiences (National Council of Teachers of English, 2019; Storm, 2025). This commitment is enacted through practices such as critical analysis, literary interpretation, and discursive meaning-making (Fisher & Lapp, 2024; Freedman et al., 2016). These same practices position ELA to engage the social and ethical dimensions of AI (LeBlanc et al., 2023). While recent innovations in large language models have spurred conversations about “AI literacy” (Gee & Zhang, 2024; Kalantzis & Cope, 2025; Velander et al., 2024), the field has a longer history with AI. Literacy researchers have considered its implications for writing pedagogy and practice for years, from automated writing evaluation to intelligent tutoring systems (Roscoe & McNamara, 2013; Warschauer & Grimes, 2008). More broadly, ELA has a rich history of grappling with the complex interplay of technology (digital and non-digital), literacy, society, and power, as evidenced by robust literature in new literacies (Coiro et al., 2014), digital literacies (Lankshear & Knobel, 2008), critical literacies (Luke, 2004), and critical digital literacies (Avila & Pandya, 2013). These research areas, sharing an understanding of literacies (in the plural) as socially, culturally, politically, and historically situated practices (Hull & Schultz, 2002; Scribner & Cole, 1981), offer frameworks for examining AI as an evolving cultural tool. Given these theoretical orientations and their practical applications in professional guidelines (National Council of the Teaching of English, 2018, 2024), examining the social impacts of AI within ELA classrooms is a natural extension of the field's existing work.

Despite this capacity, AI in English education has been approached largely from the perspective of use: how to harness it productively, particularly in the writing process. A systematic review of AI platforms in writing instruction bears this out, finding that research has concentrated on the technical and cognitive dimensions of writing while a concern for equity remained “notably absent” from the empirical record (Stornaiuolo et al., 2023). Opportunities to learn *about* AI, rather than simply *with* it, thus remain

uncommon in ELA classrooms, even amid growing concern about AI’s social implications and young people’s own expressed desire for such learning (Higgs & Stornaiuolo, 2024; Ryoo & Blunt, 2024; Thrall et al., 2024; Vakil & McKinney de Royston, 2022). This emphasis on technical skills over ethical inquiry has drawn criticism for overlooking the systems of power embedded in AI (Enriquez et al., 2024; Smith et al., 2024). As Shaw et al. (2024) argue, prioritizing the technical sidesteps “oppressionist logics that undermine the possibilities of AI in literacy education” (p. 13).

Pedagogical Designs for Critical AI Education: Examples from the Humanities

While comprehensive pedagogical models for studying the social impacts of AI in core humanities disciplines are still emerging, recent scholarship highlights the generative potential of these contexts. For instance, Thrall et al. (2024) demonstrated how a digital civic ecologies framework could support 8th grade US History students in examining the political-economic dimensions of AI. Their findings revealed a significant tension: while students readily used speculative fiction to envision dystopian AI futures—such as the expansion of state power or worsening labor conditions—they struggled to identify collective civic actions to address these issues, often defaulting to narratives of individual self-preservation. Thrall and colleagues suggest this reflects a broader “social indeterminacy” regarding sociotechnical crises. Ultimately, this work illustrates how humanities-centered literacy practices, like speculative writing and discursive inquiry, can provoke new ways of considering AI’s ethical dimensions, while simultaneously highlighting the need for designs that can help students move from speculative critique toward collective agency.

Building on this need, broader perspectives on AI in literacy research are pivotal for addressing issues of social justice. These perspectives must expand beyond technical skills to consider AI platforms as sociotechnical systems that shape and are shaped by the complex interplay of technology, society, and human experience, particularly for nondominant groups (LeBlanc et al., 2023; Nichols & Garcia, 2022; Robinson & Hollett, 2024; Smith et al., 2024; Stornaiuolo et al., 2023; Tanksley, 2024). Reflecting these ecological orientations, a growing body of literacy research has shown how AI systems can perpetuate existing inequalities, from racialized logics in automated feedback systems (Dixon-Román et al., 2020) to exploitative labor arrangements in digital writing contexts (de Roock, 2021). While this work critically illuminates AI’s social impacts, there remains a gap in translating these insights into designed learning experiences within ELA classrooms. Although some studies have explored ethics-centered pedagogies in out-of-school journalism and media programs for youth (e.g., Lee et al., 2022), there is a notable

dearth of empirical accounts examining how ELA teachers can cultivate classroom spaces that foster critical inquiry into AI's sociotechnical dimensions. This absence is particularly concerning given ELA's unique focus on language, power, and social justice, which positions the discipline as a fundamental site for interrogating how algorithmic systems encode and enforce power. Our study addresses this gap by investigating a pedagogical design centered on reading, talking, and writing as exploration, supporting students in contextualizing their lived digital experiences within the broader social impacts of technology.

An Onto-Epistemic Framework for Critical AI Awareness in ELA

As the preceding section suggests, ELA's disciplinary commitments and its long engagement with technology, literacy, and power make it a generative, if underused, site for critical AI awareness. Realizing that potential requires more than adding AI to existing curricula; it calls for a theoretical account of how students' diverse knowledges become resources for disciplinary inquiry. We locate this account in onto-epistemic heterogeneity (OEH).

Onto-Epistemic Heterogeneity: Core Principles

OEH posits that ontology (ways of being) and epistemology (ways of knowing) are interconnected, and that liberatory education must be deeply grounded in the multiple values, purposes, and arcs of human learning (Warren et al., 2020). This framework maintains that learners' identities, experiences, histories, and cultural backgrounds profoundly shape their ways of knowing, just as their ways of knowing shape who they are and become, challenging notions of objective, value-neutral knowledge. OEH offers a critical departure from equity initiatives that merely broaden access to disciplines assumed to be settled or impervious to sociohistorical critique (National Academies of Sciences, Engineering, and Medicine [NASEM], 2024). Instead, OEH transforms disciplinary learning by valuing students' cultural and epistemic diversity as constitutive of disciplinary knowledge, not supplementary to it. In the context of AI, this means moving beyond the technical "how to" to interrogate whose ways of being are prioritized or marginalized by algorithmic design.

OEH is central to critical AI education within ELA because algorithmic systems often embody particular ways of knowing and being, reflecting dominant cultural norms and perpetuating colonial ideologies (Benjamin, 2019; Lachney et al., 2021; Shaw et al., 2024; Vakil, 2018). In this sense, AI functions as a singular, settled epistemology, one that presents its outputs as neutral and authoritative. Foregrounding OEH allows ELA classrooms to challenge this by treating students' diverse ways of knowing AI—from

extensive engagement with AI-driven social media to limited technological access—as indispensable to understanding its social impacts. This orientation aligns with longstanding ELA scholarship on diverse knowledges as resources for disciplinary learning (e.g., C. D. Lee, 2001; Martinez, 2017).

Operationalizing OEH Through Pedagogical Sensibilities

Drawing on Warren et al. (2020), we operationalize OEH through three interconnected sensibilities: multiplicity, horizontality, and dialogicality. Within our study, these sensibilities are enacted through our pedagogical design, which centered on reading as exploration, talking as exploration, and writing as exploration. We pair each sensibility with a stance below (multiplicity with reading, horizontality with talking, dialogicality with writing) for analytic clarity, but these are emphases rather than exclusive relationships; in practice, the three sensibilities ran across all three stances. While these are fundamental to thoughtful ELA instruction, we specifically detail how they were leveraged to cultivate critical AI awareness and operationalize OEH’s commitment to epistemic and ontological plurality.

Multiplicity and Reading as Exploration

Multiplicity asserts that knowledge is not singular or objective but plural and situated, produced from diverse experiences and ways of knowing, with power dynamics shaping which and whose knowledge is valued (Vossoughi et al., 2023; Warren et al., 2020). For AI education in ELA, recognizing multiplicity means valuing students’ diverse racialized, gendered, socioeconomic, and technological experiences as essential to understanding AI’s social impacts, including algorithmic bias and manipulation. This draws on ELA’s deep engagement in challenging singular narratives and embracing counter-storytelling in response to dominant discourses, particularly around technology and marginalized communities (McBride et al., 2024; Shaw et al., 2023; Thomas & Stornaiuolo, 2016; Toliver, 2021). Through reading as exploration, students critically analyze texts and algorithmic representations to uncover the multiple perspectives, assumptions, and biases embedded in AI systems and their social implications.

Horizontality and Talking as Exploration

Horizontality recognizes that individuals learn across multiple activity systems (e.g., home, school, community) and validates cultural repertoires of practice as resources for disciplinary learning (Gutiérrez & Rogoff, 2003; Warren et al., 2020). Rather than ranking everyday knowledge below academic knowledge, horizontality positions students’ outside-school knowledge as a legitimate disciplinary resource. In our project, horizontality highlights how students’ lived experiences with AI technologies, both in

and out of school, fundamentally shape their understandings of AI. Through talking as exploration, students bridge the perceived divide between everyday and academic knowledge, bringing their varied cultural and linguistic backgrounds and everyday language use to discussions, fostering a space where different forms of knowledge intertwine to enrich individual and collective understanding. This approach is consistent with ELA scholarship emphasizing the critical role of students' diverse semiotic and cultural repertoires in meaning-making (e.g., Baker-Bell, 2020; de los Ríos et al., 2019; González Ybarra, 2022) and the reorganization of syncretic literacies (Gutiérrez, 2008).

Dialogicality and Writing as Exploration

Dialogicality emphasizes the discursive, layered nature of meaning-making as a site for refusing, delinking, and re-imagining normative structures of disciplinary learning (Warren et al., 2020). Drawing on Bakhtin (1981, 1986) theories of social language, this sensibility highlights that language is never neutral but fundamentally dialogic—always a product of interacting with other social voices and historically contingent (Higgs & Freedman, 2023; Rosebery et al., 2010). For AI education in ELA, dialogicality guides our understanding of how students collaboratively construct meaning about AI's social and ethical implications through engagement with diverse texts and social voices. Recent ELA scholarship, for instance, explores the dialogic nature of human-AI interactions and the co-construction of meaning with emergent technologies (e.g., Li, 2024). Building on these internal and external dialogues, writing as exploration provides the space for students to grapple with the tensions among these competing viewpoints, synthesize complex ideas, and articulate their own evolving understandings of AI's societal implications.

Inward and Outward Orientations of Critical AI Awareness

Building on these onto-epistemic sensibilities, we characterize the development of critical AI awareness through the expansive scope of students' inquiry, which we term *inward* and *outward* orientations. We define an inward orientation as a focus on the personal and individualistic impacts of technology, such as concerns regarding one's own screen time or individual psychological well-being. Conversely, an outward orientation reflects a widening of this analytic aperture toward systemic and collective social dimensions, including algorithmic bias, corporate profit motives, and the broader ethical implications of AI for communities and society.

In alignment with the principles of OEH, we do not view these as binary or sequential categories, but as nested, permeable, and mutually constitutive; deeply personal, inward experiences often provide the epistemic entry point for students to develop sophisticated, outward

critiques of sociotechnical systems. Grounding inquiry in OEH invites students’ wide-ranging life experiences and knowledges into the disciplinary space as legitimate resources for analysis, rather than as a motivational “hook” that is set aside once “real” academic work begins. This positioning has particular value for the study of AI. Because AI often presents itself as a settled authority, students’ situated knowledge becomes a resource for examining and questioning rather than deferring to that authority. Such inquiry is possible because OEH treats lived experience as constitutive of disciplinary knowledge itself (Vossoughi et al., 2023; Warren et al., 2020). When the personal is positioned as a legitimate epistemic resource, students’ inward concerns can anchor outward critique; the systemic analysis grows from their own knowledge rather than being imposed upon it. For example, a student’s inward concern regarding the psychological impact of social media face filters is not merely a personal health issue; it is a localized experience of a systemic sociotechnical phenomenon (i.e., the algorithmic mediation of societal beauty standards), where the personal provides an epistemic anchor for understanding the broader systemic impact. Together, these interconnected sensibilities and the resulting orientations of student inquiry provide a framework for designing ELA contexts that support students’ critical AI awareness by valuing diverse ways of knowing and being.

Research Design and Methods

We used social design methodology (Gutiérrez, 2016) to investigate how ELA classrooms can support critical inquiry into AI’s social impacts, and, in particular, how such inquiry can bolster the agency of students from nondominant communities in the face of algorithmic bias and manipulation. Like more traditional forms of design-based research (e.g., Brown, 1992; Cobb et al., 2003), social design experiments explore new possibilities for learning in specific contexts and build theory about how learning and participation connect to the social ecologies in which they occur. However, they also seek to transform the systems and structures that work to disempower particular groups, tying the design of learning environments to a “social imagination” of conditions that are “equitable, resilient, sustaining, future oriented, and necessarily contextualized in participants’ meaningful life activities” (Gutiérrez et al., 2020, p. 331). This transformative aim is what makes the methodology well suited to this study, which invites young people from nondominant communities to explore humanities-centered critical technology education oriented toward socially just futures.

Research Context and Participants

School Site

The study took place at Inspiration Academy (pseudonym), a tuition-free public charter school in California. Inspiration prepares its students for college and beyond through a project-based curriculum organized around five competencies: knowledge and love of self and land; collectivism; critical thinking; self-determination; and leadership. Students and staff form a close, diverse community drawn from the surrounding neighborhoods. At the time of data collection, Inspiration had 24 full-time teachers and enrolled approximately 350 students in grades 9–12. Approximately 50% of students identified as Latinx (we use Latinx to recognize nonbinary gender identifications among individuals of Latin American origin or descent), 36% as Black, 9% as mixed race, 4% as white, and under 1% as Asian, Native American, or Pacific Islander. Approximately 78% of the student population qualified for economic assistance programs. Because students from nondominant populations are often the least likely to have access to computing education yet the most likely to be harmed by computing technologies (Google & Gallup, 2015; Ryoo et al., 2013), the sociotechnical lived experiences of Inspiration students—whose communities are often marginalized in discussions about technology—guided our design decisions. Inspiration's explicit commitment to social justice and student empowerment through critical thinking made it well suited for exploring how critical approaches to AI education could be integrated into the ELA curriculum.

Student Participants

Participants were students in Maria's Period 2 and Period 3 English 12 classes ($n = 69$; typically ages 17–18). The relatively unstructured English 12 curriculum at the time of the study gave us the flexibility to integrate and adapt the unit. While all 69 enrolled students participated in the instructional unit as a part of their standard curriculum, data were collected from consenting students only, following the IRB-approved invitation to participate.

The demographic makeup of student participants in these classes was consistent with the school's culturally and linguistically diverse population: approximately 52% identified as Latinx, 37% as Black, 5% as Middle Eastern, 2% as mixed race, 2% as Asian, and 2% as white. These classes included a range of learning needs, including five English language learners and six students with IEPs for reading and writing support. Students' home languages reflected the linguistic diversity of Inspiration, including Spanish, English, Arabic, and French. Participants used a variety of pronouns, including she/her, he/him, and they/them, with some declining to specify usage.

Teacher-Researcher Team

Maria, who was an ELA teacher and curriculum coordinator at Inspiration at the time of the study, brought extensive knowledge of the school's student population and a commitment to culturally relevant pedagogy. Mark, with over 25 years of experience as an ELA and social studies teacher and literacy coach, contributed expertise in facilitating student discourse and collaborative learning. Jenni, a university researcher and former high school ELA teacher, brought research perspectives on new literacies and equitable learning contexts, providing the theoretical frameworks that anchored the project. Together, these complementary forms of expertise allowed us to design a unit that was responsive to students' lives.

Maria acted as teacher for all instructional sessions. Jenni and Maria participated in all design sessions; Jenni was present weekly in Maria's classes to observe instruction, document the sessions with field notes and audio recordings, and collaboratively iterate on the design with Maria. Mark was not present during instruction or lesson debrief sessions; rather, he contributed to the project as an analyst, coding discourse data and helping to identify patterns, and offering feedback on design and interpretation at team meetings before, during, and after implementation.

Our engagement with this work is shaped by our shared commitments as equity-oriented educators who care deeply about how learning opportunities enable or hinder young people's social possibilities. These commitments also created an analytic risk that we monitored throughout the project: as the designers of a unit intended to broaden students' critical orientations and also the analysts evaluating whether such broadening occurred, we could be inclined to see the expansion we hoped to produce. We addressed this in three ways: first, by deriving our central analytic constructs inductively from student data rather than our design goals; second, by testing those constructs across independently analyzed data sources; and third, by surfacing and challenging one another's interpretations in regular team discussions. Mark's role was especially valuable here; because he analyzed data without having designed or taught the unit, he offered perspectives less bound to the designers' expectations, questioning and at times reframing our interpretations of data.

Unit Design and Iterative Process

Consistent with social design methodology and onto-epistemic heterogeneity (Vossoughi et al., 2023; Warren et al., 2020), our team designed a three-month unit for Maria's English 12 classes (from January to April, approximately 50 sessions of 55 minutes each) to support students in learning about AI bias and manipulation. We aimed to organize a learning environment where students' diverse experiences and histories served as resources for building knowledge about AI's social impacts, enacted through

literacy practices that foregrounded multiplicity, horizontality, and dialogicality. To achieve this, we structured the design around three pedagogical stances: reading as exploration, talking as exploration, and writing as exploration. The exploration metaphor framed the unit as an inquiry-based journey, aligning with a view of ELA as a dynamic discipline that must continually explore how to center plurality to help young people flourish (Haddix et al., 2024). Students did not compose with AI tools as part of this unit; the pedagogical focus was on critically analyzing AI's sociotechnical implications rather than using AI for content creation. We also prioritized examining current and historical impacts of AI bias and manipulation, rather than speculative futures, to build foundational critical awareness.

Following design-based research, our unit design was not static but iterative. We began with an initial design informed by our shared commitments to the exploration stances and our belief that critical learning about AI belonged in the ELA classroom. During unit implementation, we continuously gathered data from the classroom (e.g., student work samples, class observations, informal student feedback), examined the data to determine if we moved closer to our pedagogical objectives, and used these insights to refine the unit as needed. This process was a collaborative effort between Maria and Jenni. We met weekly throughout the unit to reflect on student progress, identify areas needing support, and generate adjustments based on our observations of student engagement and learning. For example, when we noticed many students initially focused on individual mental health impacts of AI without broader consideration of how race, class, and/or gender might mediate these impacts, we added texts and activities explicitly addressing how algorithmic bias reproduces existing social inequities.

Unit Structure and Activities

The unit unfolded in two sections. The first (six weeks) integrated the study of Shakespeare's *Othello* with an introduction to algorithmic manipulation. Maria was required to teach *Othello* and rhetorical strategies, so we connected themes of manipulation in the play (e.g., Iago's rhetorical deceptions) to the persuasive tactics of social media algorithms. Students engaged in reading as exploration through texts like *Othello* and excerpts from Sherry Turkle's (2011) *Alone Together*, Bill Davidow's (2012) *Atlantic* article on internet addiction, and Safiya Noble's (2014) TED talk (see Table 1). Talking as exploration activities centered on rhetorical strategies in literature and daily life and on how social media algorithms prioritize content. We consistently connected this understanding to critical perspectives on AI's social impacts (e.g., discussions after viewing *The Social Dilemma*). Writing as

Table 1. Three design stances and their translation to unit design.

Stances	Translation to Unit Design
Reading as exploration	Engaging diverse perspectives through a wide range of texts: ● <i>Othello</i> (1622; play by William Shakespeare) ● <i>The Social Dilemma</i> (2020; documentary directed by Jeff Orlowski) ● <i>Alone Together</i> (2011; book by Sherry Turkle) ● “Exploiting the Neuroscience of Internet Addiction.” (2012; <i>The Atlantic</i> article by Bill Davidow) ● “Ten Things to Know About How Social Media Affects Teens’ Brains.” (2023; KQED online article by Cory Turner) ● “Key Aspects of Critical Literacy.” (2019; NCTE blog post by Vivian Maria Vasquez, Hilary Janks, and Barbara Comber) ● <i>Race After Technology</i> (2019; book by Ruha Benjamin) ● “How Biased Are Our Algorithms?” (2014; TED talk by Safiya Noble) ● <i>Coded Bias</i> (2020; documentary directed by Shalini Kantayya based on research by Joy Buolamwini) ● “When Black Death Goes Viral: How Algorithms of Oppression (Re)Produce Racism and Racial Trauma.” (2022; SAGE Perspectives blog post by Tiera Tanksley)
Talking as exploration	Engaging collective meaning making to build textual interpretations, ask and answer questions about AI, grapple with developing understandings of AI: ● Structured whole-class discussions (e.g., <i>Othello</i> Socratic seminars) ● Structured small group discussions (e.g., discussions of texts guided by teachers’ prompts, jigsaws) ● Informal small group discussions (e.g., turn-and-talk responses to concepts and texts)
Writing as exploration	Engaging diverse types of writing to promote reflection on and critical analysis of AI’s social impacts, engage with diverse social voices, and express perspectives on AI: ● Digital journal entries ● Unit final essays ● Collaborative composing in small groups (e.g., infographics, synthesizing information)

exploration involved reflective journal entries connecting these concepts to their own experiences.

In the second section of the unit (seven weeks), students explored the complexities of algorithmic bias, examining its connections to race and racialization. Building on their developing understandings of the ethical, social, and technical aspects of AI, they investigated how dominant societal biases embedded in algorithms can reinforce existing power structures and perpetuate systemic racism. This section emphasized reading as exploration through close readings of texts such as Ruha Benjamin’s (2019) *Race After Technology* and the 2020 documentary *Coded Bias*. Talking as exploration activities included small group discussions on examples of algorithmic bias in their everyday lives and brainstorming solutions for addressing discrimination. Writing as exploration involved collaborative projects (e.g., creating posters illustrating understandings of algorithmic bias), reflective writing connecting Noble’s TED talk to personal experiences, and analytic essays as the cumulative writing task. Throughout the unit, we prioritized student

agency and focused on actions they could take for social change, mindful of the potential for retraumatization when exploring racial injustice.

Data Sources

To investigate how reading, writing, and talking supported students' critical engagement with AI's social impacts (Research Question 1), and to assess how students' understanding changed following the unit (Research Question 2), we analyzed data from the following sources: classroom discussions, student writing, and pre- and post-unit student surveys. While data from design sessions and post-class debriefings were collected and used to inform the unit's development and refinement, the present analysis prioritizes student perspectives and evidence of student learning. Across data sources, participant counts vary by consent and submission: 53 completed pre-surveys, 51 completed post-surveys, and 62 submitted final essays, out of 69 enrolled students.

Pre- and Post-Unit Surveys

Maria and Jenni created surveys to capture students' understandings of sociotechnical issues related to AI technologies before and after the unit, and their feedback on the unit. Surveys measured students' conceptualizations of a "critical technology user," their concerns about technology, perceptions of new learning, and overall assessment of unit impact. The pre-survey also collected data on digital device usage (types of devices, apps, screen time) for contextual knowledge, though these are not a focus of the present analysis. Post-unit surveys documented the expansion of student orientations and feedback on the unit's influence via open-ended questions and a Likert-scale question about the unit's perceived influence. They also asked students to identify specific ELA activities that they found helpful in learning about technology and its sociotechnical implications. We administered surveys through Google Forms, assured students of anonymity, and encouraged honest feedback. See [Appendix A](#) for survey items.

Class Discussions

Classroom discussions played a central role in the unit, providing students with opportunities for dialogical meaning-making and co-construction of knowledge about the social impacts of AI. These discussions, which took various forms (e.g., informal "turn and talk" discussions, Socratic seminars, small group discussions), were designed to encourage student-led inquiry and critical thinking. Several discussions were audio-recorded and transcribed to facilitate analysis of student interactions and inform iterative unit refinement. Our analysis focuses on different types of class talk during the unit: a Socratic seminar, small group discussions, and sections from

a student discussion of the documentary *Coded Bias*. These discussions offer insights into how talk, in conjunction with reading, supported students’ exploration of AI’s social impacts, fostering dialogicality and horizontality.

Students’ Digital Journals and Unit Essays

Students wrote in digital journals several times a week during the unit. These low-stakes entries served as a space for ongoing reflection and grappling with complex ideas, fostering critical inquiry as a process. They allowed students to document their evolving understandings and connect emerging concepts to their personal experiences with technology.

As a culminating activity for the unit, students in both classes wrote analytical essays exploring the social impacts of technology. To encourage expansive and personalized reflection, the open-ended prompt asked students to critically analyze rhetorical strategies used by technology platforms, examine the influence of technology on their identities and communities, and reflect on their own technology use (see full prompt in [Appendix B](#)). A total of 62 essays were submitted. These essays provided data regarding students’ capacity for critical analysis, their application of course concepts to real-world situations, and their more developed perspectives on the complex relationship between technology and society.

Classroom Observations

Jenni conducted classroom observations throughout the study, including prior to unit implementation to become familiar with students and class routines, and regularly during the unit itself. Jenni recorded detailed field notes on classroom activities, student interactions, and Maria’s pedagogy. These notes captured how the unit unfolded in practice and informed the team’s weekly reflections and design adjustments.

Data Analysis

Survey Analysis

Pre- and post-unit survey data from Google Forms were imported into ATLAS.ti. All authors analyzed open-ended items collaboratively and systematically (Cornish et al., 2014), reaching consensus through discussion. First cycle attribute coding (Saldaña, 2012) captured respondent information. For open-ended responses, we used descriptive coding to summarize major topics, with simultaneous coding for complex responses. Through independent coding and team meetings, we reached consensus on categories for students’ conceptualizations of “critical user of technology” (e.g., frequency of use/addiction; awareness/purposeful use; technical knowledge/understanding; critical thinking/evaluation; impact on life/time management) and technology concerns (e.g., addiction/excessive use; societal

impacts; control/manipulation; safety/security; other concerns). We developed these categories with OEH in mind, attending to multiplicity (range of perspectives) and horizontality (connection to students' experiences). Following independent coding, we analyzed code frequencies to characterize the expansion of student orientations and concerns. We also collaboratively coded responses to the question, "What information about technology in this unit was new to you?," identifying broader categories of student learning (e.g., negative impacts of AI technologies, algorithmic influence, the role of tech companies, impacts of technology on specific groups).

Discussion Analysis

Recorded classroom discussions, including informal small group exchanges, the *Coded Bias* small group discussion, and the Socratic seminar, were transcribed and uploaded to ATLAS.ti. These conversations were analyzed using a hybrid approach of thematic content analysis (Braun & Clarke, 2006; Krippendorff, 2019) and discourse analysis (Sacks et al., 1974; Schegloff, 2007), and we present them to illustrate what talking as exploration looked like in practice.

Initial coding focused on identifying instances where students constructed collaborative meaning through engaging diverse viewpoints/social voices (dialogicality); connected concepts to their experiences and observations (horizontality); brought their diverse ways of knowing to the discussion (multiplicity); analyzed power dynamics (critical perspectives); and grappled with complex ideas and refined understanding (evolution of thinking). We applied simultaneous coding when utterances aligned with multiple codes.

This initial coding then informed fine-grained discourse analysis of selected, representative excerpts. Excerpts were selected for further analysis if they (a) illustrated high concentrations of our theoretical codes (e.g., moments where multiplicity, horizontality, and dialogicality converged), and (b) reflected the broader patterns of inward-to-outward conceptual expansions observed across the larger corpus of class discussions. Although teacher prompts were central to the design and scaffolding of these discussions, we represent them selectively in what follows to keep the focus on student discourse and how students' collective understanding broadened. We read the transcripts multiple times, examining how questions and responses built on each other, how students affirmed or challenges ideas, and how they collectively reframed concepts related to AI's social impacts.

We conducted this coding collaboratively, refining codes and ensuring consistency through iterative team discussions. During one of these sessions, Maria and Mark noticed a recurring expansion in the scope of student discourse, from personal, individual concerns toward systemic and collective ones, and the team inductively developed this observation into the constructs of inward and outward orientations. Because these constructs arose from

discourse data rather than our design commitments, we treated their application to other data sources as a test of their analytical reach. As we describe below, we applied them deductively to an independently analyzed corpus of student essays to examine whether the same pattern held beyond the discussions. This choice of terminology also resonated with our team’s grounding in ELA, reflecting the discipline’s long-standing interest in the relationship between personal meaning-making and broader social participation.

Student Writing Analysis

Guided by the theoretical framework of onto-epistemic heterogeneity, our analysis of student writing explored how students’ critical orientations toward technology changed over time. This involved a multi-step process for both digital journals and final essays.

We analyzed digital journals to capture ongoing exploration and expanding understandings. We initially reviewed all journal entries to identify patterns in engagement, types of reflection, and connections to unit themes. For in-depth analysis, we focused on representative entries from two focal students (Anthony, a 12th grader who started the unit with primarily inward, device use concerns, and Bianca, a 12th grader who entered with questions about data privacy) whose trajectories exemplified the inward-to-outward expansions central to our analysis. We then examined these entries using qualitative content analysis, attending to how writing served as a low-stakes space for students’ initial outward-oriented thinking.

For final essays ($n = 62$), our analysis began with a focused, collaborative examination of five student essays. These were purposively selected by Maria to represent a diverse range of student demographics and academic profiles, drawing on her expertise as the classroom teacher to help identify preliminary patterns and themes (e.g., textual references, technical knowledge about AI, types of technological impacts, connections to personal experiences, power awareness, social identities, rhetorical knowledge, community impacts, AI manipulation, social action).

Building on this initial collaborative discussion, Jenni then conducted a comprehensive analysis of the full 62-essay corpus using deductive and inductive approaches. Deductive codes—including the inward and outward orientations previously induced during our team’s analysis of classroom discourse—were applied to the essays to examine whether this pattern of expansion, first observed in talk, also characterized students’ writing. For example, “community impacts” and “textual references” were used to explore horizontality, while “AI manipulation” and “rhetorical knowledge” assisted in exploring dialogicality by revealing how students synthesized language and knowledge from various sources to construct their perspectives. That the same inward-to-outward movement appeared across two independently analyzed data sources strengthened our confidence that it reflected

a pattern in students' sense making of AI rather than an artifact of any single setting or our own analytic expectations. Jenni used inductive coding to surface themes beyond our initial framework—for example, how students synthesized course content, applied their learning to real situations, and developed critical perspectives on technology. To support the observed expansion toward outward orientations, she conducted frequency counts of student mentions of “social impacts” and “social action.” Consistent with qualitative approaches that prioritize interpretive depth over inter-coder reliability statistics, we supported trustworthiness through independent coding reconciled in team discussion, consensus on coding categories, and triangulation across data sources.

Cross-Data Source Analysis

To provide a comprehensive understanding of student learning and triangulate our findings, we analyzed data sources iteratively and in relation to one another. We used field notes from classroom observations to triangulate rather than to code in fine detail; we read them alongside transcripts and student artifacts for context on teacher pedagogy, student participation, and the broader classroom ecology. For example, survey patterns in how students' understandings expanded (e.g., the interplay of inward and outward orientations) took on fuller meaning when we analyzed classroom discussions, which surfaced the dialogic processes contributing to these shifts. Similarly, themes from student essays revealed how individual students synthesized concepts and applied their learning to real-world contexts, extending what we initially saw in survey responses. This cross-data analysis allowed us to build a narrative of student learning trajectories and to demonstrate how the unit design supported critical engagement with AI's sociotechnical implications (RQ1). It also illuminated how student orientations expanded through “nested” syntheses of lived experience and systemic critique (RQ2), while accounting for the non-linear and overlapping nature of these shifts.

Findings

This section presents the findings organized by our two research questions: (1) how the ELA pedagogical design supported critical engagement with AI's sociotechnical implications, and (2) how the relationship between students' inward and outward orientations surfaced and changed over the unit. We integrate evidence across data sources—surveys, discussions, digital journals, and final essays—to follow these shifting orientations. While surveys provide a quantitative baseline for this expansion, our qualitative analysis centers on the inward and outward orientations as nested and interconnected. Our analysis suggests a collective movement toward

outward-oriented perspectives; for example, 89% of final essays moved beyond individual utility to address community-level concerns, and 35% explicitly interrogated the racial dimensions of AI.

To address our first research question, we have organized the following analysis around the three primary pedagogical stances of our design: talking, reading, and writing as exploration. The theoretical framework introduces these stances as reading, talking, and writing. Here, we present them in the sequence in which they supported the expansion of student orientations: talking first, as the entry point for students’ lived knowledge; then reading, as the site of textual and systemic critique; and finally writing, as the space for synthesis. Although we present these as distinct subsections, we recognize that in practice, these stances and their associated sensibilities—multiplicity, horizontality, and dialogicality—are deeply intertwined and mutually constitutive. We separate them here to illuminate how specific teacher-initiated design elements created pedagogical openings for students to enact ELA disciplinary practices, which in turn supported the expansion of student orientations. In what follows, we illustrate these broad trends through analytic vignettes that showcase the pedagogical moves and student interactions that helped foster critical AI awareness.

RQ1: Fostering Critical Engagement Through ELA as Exploration

Talking as Exploration: Leveraging Horizontality in Collaborative Inquiry

To support the sensibility of horizontality—the valuing of knowledge across activity systems—Maria designed tasks centered on talking as exploration. This pedagogical stance prioritizes low-stakes, peer-led environments where students can engage in the ELA practice of collaborative dialogic inquiry. By treating students’ everyday digital knowledge as a valid starting point, this design encouraged students to move beyond surface-level utility toward a critical examination of algorithmic power.

Vignette: Unpacking TikTok’s Algorithm in an Early Collaborative Task. In the early weeks of the unit, Maria structured an activity where students researched a popular app of their choice in small groups. The task (a collaborative poster) invited students to use their own devices and lived experiences as primary epistemic resources. During one session, a group of three students—Harmony, Rocio, and Marvin (pseudonyms; these students all identified as people of color)—focused on TikTok. Their discussion illustrates how this horizontal design allowed them to bridge everyday digital practices with the disciplinary practice of academic evidence-seeking.

1	Rocio:	Anything about TikTok?
2	Harmony:	This platform is best for people who plan on taking social media
3		serious long-time, and who are just bored. Something like that.
4	Marvin:	This platform is best because-
5	Harmony:	No, it's best "for" people. It says "best for."
6	Marvin:	[writing on poster paper] Best-
7	Harmony:	This platform is best for people with businesses and people who
8		plan on taking social media long-term.
9	Rocio:	Why do you say that?
10	Harmony:	Because mainly people who want to become TikTok famous or
11		become an influencer are on there, and people with small
12		businesses, so a lot of people go to show all their small
13		businesses, it's a lot of brand artists. Oh, for small businesses
14		artists go on there and make videos for their songs.
15	Marvin:	Or also like when, you know, someone, some people post
16		something, and that shit—I mean, that thing goes so viral, and
17		people just start going there just to get that one thing.
18	Rocio:	Yeah.

This initial exchange grounds the discussion in the students' experiences as TikTok users. Harmony's emphasis on who the platform is "best for" establishes a user-centric lens that directly informs her later critique. Because the design prioritized student-led discovery over teacher-led lecture, the group was able to enact a rapid pivot from the app's utility to its underlying mechanics. This shift signals an initial outward expansion, as Harmony introduces a critical stance: "TikTok does manipulate their platform. TikTok manipulates their users a lot. That's what the algorithm's for." Her assertion sparks a collaborative deconstruction of the algorithm's functions:

1	Harmony:	TikTok does manipulate their platform. TikTok manipulates
2		their users a lot. That's what the algorithm's for. It takes the
3		videos that you've liked or pages that you've watched, and
4		constantly those videos—
5	Marvin:	Takes your data, basically.
6	Harmony:	Yeah! It constantly—based off the videos you've liked, saved to
7		your favorites, watched all the way through—it'll throw videos
8		like at you continuously, therefore keep you interested.
9	Marvin:	It suggests you stuff.
10	Harmony:	Videos in the algorithm based off of stuff you've already seen.
11		That's why Instagram created Instagram-
12	Marvin:	Based off what you love?
13	Harmony:	Based off of things . . . Based off of data it's collected on you.

Here, students did not wait for a “correct” technical definition; instead, they built upon one another’s nascent understandings of the algorithm’s “invisible” workings, the horizontal task opening space for this dialogic, collaborative meaning-making. Their articulation of concepts such as “manipulation,” “data,” and “suggestions” indicates an emerging collective understanding of the system. Rocio then pushes the conversation into evaluative territory.

1	Harmony:	TikTok does manipulate their platform. TikTok manipulates.
2	Rocio:	You think that’s, like, okay? That they feed you things that they
3		think you like?
4	Harmony:	Yes and no, because one’s kind of like, what if I want to see
5		something different? They don’t know that.
6	Marvin:	Yeah.
7	Rocio:	Right, right.

When Rocio asks, “You think that’s, like, okay?” she is prompting a move toward multiplicity, as the group begins to weigh the perceived benefits of personalization against the constraints of algorithmic control. Harmony’s “Yes and no” response engages the conflicting perspectives inherent in sociotechnical systems. She recognizes both the benefit of personalization and the potential loss of agency: “what if I want to see something different? They don’t know that.” This critical reflection culminates in Harmony’s proactive search for evidence:

1	Marvin:	Okay. Do you have any evidence to support your thinking?
2	Harmony:	[takes out her phone, laughing]: Yes! types on screen to search
3		for information] See? [tapping on phone and reading]
4		According to blog.hootsuite.com , “no two users will see the
5		same videos on their For You page, and the videos you see
6		might change over time, based on your viewing preferences and
7		even your current state of mind.”
8	Marvin:	Okay. You got that evidence.
9	Harmony:	Pow, pow, pow, pow, pow. Yeah. Evidence come crazy this
10		morning, let me tell you.
11	Rocio:	Good for you. Look what you got.

Harmony’s triumphant search for evidence illustrates the horizontality the design fostered. Because the environment was peer-led and open to diverse digital resources (including smartphones and laptops), she could treat reaching for her phone to search the web as legitimate evidence-seeking. Here, her everyday digital practices became disciplinary work. That work happened in an everyday register: her celebration (“Pow, pow, pow . . . Evidence come crazy this morning, let me tell you.”) frames the disciplinary act of substantiating a claim in her own voice, rather than code-switching into an “academic” register. The group’s affirmations (“You got that evidence,” “Good for you.”) reinforce the value they placed on reasoned

inquiry, and show students reclaiming epistemic authority over how knowledge gets built.

Reading as Exploration: Interrogating Multiplicity in Sociotechnical Texts

To support the sensibility of multiplicity—the valuing of varied perspectives, assumptions, and ways of knowing—Maria drew on reading as exploration. In this section, we illustrate how students treated both “classic” literature and contemporary documentaries as sociotechnical texts, using the ELA disciplinary practice of intertextual synthesis (drawing meaning across disparate texts) to decode the rhetorical workings of algorithmic systems. While multiplicity is present in the varied texts and readings students brought to bear, the vignette most strongly illustrates how reading as exploration enabled this synthetic work as students drew on literary analysis to interpret AI’s persuasive design.

Vignette: Othello’s Manipulation in the Age of Algorithms.

Approximately four weeks into the unit, Maria facilitated a Socratic seminar after students finished reading Shakespeare’s play *Othello* and the documentary *The Social Dilemma*. This activity was intended to build a humanities-based foundation for AI critique by inviting students to engage in intertextual synthesis. Maria guided the discussion with a specific “bridge” prompt: “How does at least one theme in *Othello* relate to the ideas in *The Social Dilemma*?” Her primary objective was for students to explore literary themes of manipulation and persuasion in *Othello* and then engage in intertextual synthesis with the rhetorical strategies of AI-driven platforms.

The students’ response illustrates how the reading as exploration stance allowed them to treat the algorithm’s design as a rhetorical text to be decoded. They quickly identified “manipulation” as a central theme in *Othello* and began drawing parallels to contemporary technology:

1	Maria:	Question four is how does at least one theme in <i>Othello</i> relate
2		to the ideas in [<i>The Social Dilemma</i>]? Use evidence and
3		examples from both to support your theme.
4	Cristina:	Going back to manipulation, I said Othello was easily
5		manipulated by Iago . . . And then <i>The Social Dilemma</i> , I said it
6		makes me think, just controlling teenagers and everything you
7		see [the documentary] give us, for example, TikTok.
8	Pierce:	I do want to go off your idea of manipulation. When you think
9		about in <i>Othello</i> , it’s envy and jealousy. It’s a tool for
10		manipulation. And so is our social media and apps and stuff
11		like that—jealousy and envy is a tool, it’s used to manipulate
12		us . . . And it’s so much like Roderigo, he is easily influenced . . .
13		These tools that we see online are used to make us do things
14		like spend hours or weeks on phones. But we shouldn’t.

This exchange demonstrates students engaging in reading as exploration by connecting literary analysis to sociotechnical critique. Maria’s guiding question—a key element of the pedagogical design—provided the “on-ramp” for students to perform intertextual synthesis. Cristina applies the theme of Iago’s manipulation of Othello to the “controlling” nature of TikTok. Pierce amplifies this, asserting that “envy and jealousy” are tools for manipulation in both *Othello* and social media. By drawing a direct link between Iago’s interpersonal deceit and the persuasive design of AI-driven platforms, students treated the algorithm itself as a text to be decoded, bringing the disciplinary resources of literary analysis to bear on a sociotechnical system. The range of textual readings students offered, rooted in both literary interpretation and their own digital experiences, reflects the multiplicity this design invited.

The conversation then deepened, as students used the disciplinary practice of character analysis to probe the psychological mechanisms of manipulation across both texts:

1	Harmony:	I agree with you, in the sense that Othello was very gullible in
2		the book. And I connected that to <i>The Social Dilemma</i> .
3		Because I feel like in the play, what we saw the most or what
4		we took away from the most was that how insecurity can make
5		you gullible, or make you believe anything. And in <i>The Social</i>
6		<i>Dilemma</i> , like you remember there was a little scene where it
7		was the girl ... she was believing that something was wrong
8		with her ear. Just because she felt that insecurity. I think that’s
9		why I connected with the two.
10	Cristina:	Yeah. I feel like I would agree upon that. Because jealousy,
11		like with it being with Othello, and how it’s close to <i>The Social</i>
12		<i>Dilemma</i> . Because I—so, typically on social media, it’s like ...
13		you become jealous of this one person that’s [viral], she’s
14		skinny ... You end up buying into diets or using filters
15		constantly, you buy into ads and stuff like that. I feel like that’s
16		also in <i>Othello</i> , Othello is kind of buying into what Iago was
17		saying ...

Here, students explored the mechanisms of manipulation through a comparative reading. Harmony connected *Othello* to a specific scene in *The Social Dilemma*—the girl concerned something was wrong with her ear—showing how insecurity-driven deception recurs across the different texts.

Cristina’s interpretation goes furthest: reading “buying into” Iago’s lies alongside “buying into diets or using filters” brings a personal, gendered experience of social media into the literary analysis, showing how students’ own lives shaped the synthetic work. In merging insights from “classic” literature and contemporary digital culture, students built a cross-contextual synthesis that supported their expanding critical orientations.

Throughout, the design fostered a space for students to collaboratively interpret how manipulation operates across spheres of influence.

Vignette: Unpacking the “White Mask” of Algorithmic Bias. Building on the classroom’s broader shift toward reading as exploration, Maria transitioned the unit’s focus from the rhetorical mechanics of algorithmic manipulation (anchored in *Othello*) to the systemic impact of algorithmic bias and racialization. If the *Othello* seminar showed students transferring literary analysis to algorithmic systems, the discussion that follows shows that synthetic work deepening, as students drew their own lived experiences into a collective critique of racialized design. In Week 8, following their reading of excerpts from Ruha Benjamin’s (2019) *Race After Technology*, students watched the documentary *Coded Bias*, which investigates how facial recognition and machine-learning algorithms exhibit biases against women and people of color (also examined in Higgs et al., 2026, as a micro-level case; here treated as one vignette in a broader unit-level analysis). This design move—treating a documentary as a text for critical interrogation—illustrates how, in practice, the three sensibilities operate in concert rather than in isolation. Although we pair reading as exploration with multiplicity, this extended inquiry drew multiplicity, horizontality, and dialogicality together; students voiced varied readings of racialized technology (multiplicity), grounded their analysis in lived experience (horizontality), and built understanding collaboratively across turns (dialogicality). The following vignette illustrates how Kia, Amaya, and Veronica (pseudonyms; these students all identified as women of color) enacted these sensibilities to examine the purported neutrality of facial recognition systems.

The discussion begins as students collaboratively identify the primary issue the film raises: the technical erasure of Black faces.

1	Amaya:	Okay, so one of the first things that they started talking about in
2		the movie was the facial recognition technology that they use.
3		And it started off with this Black female professor, and she was
4		talking about how well she showed when she put a white mask
5		on. It [facial recognition software] could connect all the dots and
6		recognize the face, but when she took it off, it would be like
7		there was nothing there. And then they also went on to show it in
8		action in the streets, and then it would literally show the AI
9		matching people on a wanted list. But they’re actually innocent
10		people that got wrongfully matched.
11	Veronica:	Just because of their skin tone or something, or the way their
12		name or something. And just like the professor, she even said
13		that when these people have the face recognition, it’s mostly just
14		white people and not like of colored people. So that’s why it
15		easily recognizes the white mask than her actual color. It’s kind

(Continued)

(Continued).

16		of unjust because it shows how biased it is, just concentrated on
17		the white community and only recognizes white people.
18	Kia:	It's falsely accusing them . . . I think this stands out because
19		when she was looking at the examples given to the technology to
20		learn how to recognize faces, most of them were white men . . .
21		especially Black women or women of a darker skin tone are the
22		least accurate.

In this initial exchange, the students are not merely learning about bias; they are interpreting the white mask used for facial recognition as a physical signifier of a racialized technical design. Amaya's observation that the software could only “connect all the dots” when faced with whiteness acts as a starting point for their collective inquiry. Veronica and Kia then build upon this, reading the software's failure as an injustice rooted in systemic privileging of whiteness (“Just because of their skin tone or something, or the way their name or something”). Kia further refines this shared understanding by citing the film's demographic evidence, enacting multiplicity by voicing varied observations grounded in shared experiences of racialized technology. This illustrates dialogicality as they collectively reconstruct the text of the algorithm to move from surface observation to a deeper understanding of systemic bias.

The conversation then shifts from the film's evidence to an interrogation grounded in students' own lived experiences, probing the narrative of technological convenience:

1	Amaya:	We're under the impression that it's just a convenience thing. But
2		what if that's not the case? Is it really that convenient to have to
3		pull down your mask every time you want to open your phone
4		and scan you face . . . I don't know if that's really convenient.
5	Veronica:	Or if there's something behind the face tracking stuff.
6	Amaya:	And there was always something like that before it was Face ID.
7		It was your fingerprint, the Touch ID.
8	Veronica:	Yeah. Honestly, yeah, and I never really even thought about it 'til now. The
9		fingerprints, because Apple does have a whole
10		bunch of people's fingerprints, like deadass saved on their things.
11		They really track everything. Yeah, that's crazy.
12	Kia:	And they were so good at making it look like such a cool thing
13		for a reason to have an iPhone . . . In middle school, I remember
14		we would be going around and telling our friends, “If you're my
15		friend, I can put my fingerprint in your phone.” Yeah, and we
16		would all do it.
17	Veronica:	Just normalized.
18	Amaya:	Yeah, it was so normal. Like, nobody ever thought, “Why do I
19		need a fingerprint to open my phone?” you know?

Amaya's critical question ("But what if that's not the case? Is it really that convenient?") challenges the pervasive narrative of technological neutrality and convenience, essentially interrogating the rhetorical masking of Big Tech. This prompts a collaborative exchange that demonstrates horizontality, as students connect their personal experiences with technology (iPhone Touch ID in middle school) to broader concepts of data collection and corporate surveillance ("Apple does have a whole bunch of people's fingerprints . . . they were so good at making it look like such a cool thing"). Veronica's candid admission ("I never really thought about it 'til now.") signals a situated expansion in her orientation. This "lightbulb moment" is echoed by Kia and Amaya, whose reflections on the normalcy of sharing fingerprints suggest a collective reevaluation of previously unexamined digital behaviors. The exchange exemplifies a nested synthesis; the students are not abandoning their personal histories with technology but repositioning them within an outward critique of data collection.

Finally, the students examine the authorship of the algorithm, debating the elusive nature of intent and human responsibility:

1	Kia:	So what I wanted to say is that how AI was created by white
2		men, and they talk about the racist algorithms and all that, but
3		it's really showing what it's like—she said in the thing
4		[documentary]—this machine is simply replicating the world as
5		it is. That's what she said in the thing. So I was like, that is crazy.
6		It does really just do what it sees. And I mean, it was created by
7		a white man. So what were we thinking? [laughs]
8	Amaya:	That's true. I was thinking when they [documentary makers]
9		were showing the examples that they give the AI to know how to
10		recognize people, why did they make it a point – make it so sure
11		that they can recognize white faces? That's the people who they
12		don't want to be matched and don't want to be captured, right?
13		So it's like, if that's all the examples you're giving to the AI, of
14		course the AI is going to match those ones perfectly. Yeah, I
15		don't know.
16	Kia:	I think, how do I say it, it goes back to tracking, like tracking
17		people of color and of wrongfully accusing them and all of that
18		. . . Also in one of the interviews they were putting on the film, it
19		was saying this guy, he was saying he doesn't know why the
20		algorithm is doing what it's doing. They don't know why it's
21		being racist or sexist or any of that.
22	Amaya:	When I hear things like that, it kind of scares me. If you don't
23		know how the AI is doing that, that must mean that the AI is
24		starting to form a brain of its own. And that's scary because if
25		you don't know how to fix it, I don't know.
26	Veronica:	Or they could just be lying. You know what I mean? How it
27		works—I mean, someone made it, it really learns off of stuff. I
28		don't even think it can learn by itself.
29	Kia:	That's what I'm saying. They have to show that data or teach it
30		how to do things.
31	Amaya:	It's the data they feed it.

In this final segment, students interrogate AI’s design as an authored artifact. Kia initiates by directly linking AI’s racist algorithms to its creators (“created by white men”), citing the film’s argument that “this machine is simply replicating the world as it is.” Amaya then poses a question regarding intentionality: “Why did they make it a point—make it so sure that they can recognize white faces? That’s the people who they don’t want to be matched and don’t want to be captured, right?” Here, Amaya is attempting to reconcile the technical text with her own theories of power. While this moves beyond the film’s focus on biased training data, it demonstrates her active probing of the “why” behind algorithmic harm, suggesting her developing sociotechnical awareness.

This exchange illustrates the collaborative resolution of a complex inquiry, a hallmark of dialogicality. When Amaya expresses fear that AI is “forming a brain of its own,” a common misconception of AI autonomy, Veronica and Kia use sociotechnical reasoning to challenge this narrative. By asserting that “someone made it,” Veronica reframes the “black box” as a human-directed system, offering a key insight: “I don’t even think it can learn by itself.” Through this back-and-forth of counterarguments and affirmations, Amaya synthesizes the group’s insights into a conclusive, outward-oriented statement: “It’s the data they feed it.” In co-constructing this understanding of human agency and data dependence, the group demystifies the “black box” of autonomous AI, arriving at a critical perspective on human responsibility in which AI outputs are no longer neutral or inevitable but direct reflections of intentional design and systemic input.

Collectively, these exploratory inquiries, ranging from informal, peer-led examinations of TikTok to structured Socratic seminars bridging *Othello* and *Coded Bias*, demonstrate how the pedagogical stances of talking and reading as exploration functioned as a unified vehicle for sociotechnical critique. By treating both “classic” literature and contemporary digital artifacts as sociotechnical texts, the unit design created the pedagogical openings for students to enact ELA practices that prioritized multiplicity, horizontality, and dialogicality, though students took up these invitations unevenly.

Through these interactions, students like Amaya, Kia, and Veronica showed an outward expansion in their orientations. They did not merely “learn about AI”; they used the interpretive tools of the humanities to contextualize personal observations within the broader, racialized implications of algorithmic design. The explicit design choices, such as the “bridge” prompts and the intentional validation of hybrid expertise, were central to this growth. By fostering a classroom culture where dialogicality built shared understandings and horizontality positioned students’ technological experiences as legitimate analytic resources, the design supported students in developing understandings of human responsibility behind seemingly autonomous technologies.

Writing as Exploration: Documenting Evolving Insights

Just as talking and reading provided the conceptual foundations for inquiry, writing as exploration was the generative space where students sustained that inquiry and documented their expanding understandings. This approach aligns with ELA scholarship that views low-stakes, informal writing as essential for intellectual risk-taking, metacognition, and the developmental nature of composing (e.g., Christenbury et al., 2011; Freedman et al., 2016; Hinchman & Appleman, 2017; Skerrett & Warrington, 2018). Where talk and reading offered rich snapshots of collaborative meaning-making, the digital journal—structured as a series of reflective entries, exit tickets, and responses to specific texts—uniquely captured the trajectory of students’ thinking as it unfolded across the unit. Writing in dialogue with the voices they encountered (in films, scholarship, and class), students used these recursive, low-stakes entries to grapple with ideas and, over weeks, to expand the scope of their critique. These were intentionally low-risk spaces where Maria encouraged students to experiment with ideas freely, prioritizing “grappling” with ideas over the constraints of grammar, spelling, or exact word counts.

To trace the trajectory of thinking across the unit, this section examines representative entries for two focal students, Anthony and Bianca. In what follows, we examine how the design of reflective journaling facilitated student-led composition. Our goal is to demonstrate how these moments of insight—and the process of grappling with ideas on paper—contributed to an outward-oriented expansion that served as an important bridge to the synthesis observed in their final essays.

Anthony’s Explorations. At the time of the study, Anthony was an 18-year-old high school senior who identified as a Black male. He described himself as a frequent user of technology and as being comfortable with a range of digital devices and apps including TikTok, Instagram, and game apps. His pre-unit survey responses indicated a primary concern with individual screen time and balancing technology use with his other obligations (school, work, hanging out with friends and family). Anthony was often a willing and cheerful participant in class, offering thoughtful responses to discussion questions and finding amusing ways to integrate references to some of his favorite topics (his dogs and basketball). While he consistently contributed to discussions, his work submission was not always regular. Maria described him as a bright student who added interesting ideas to class conversations. His journey through the writing as exploration stance illustrates a movement from a purely personal “tech addiction” narrative to a sophisticated critique of algorithmic “ownership.”

Anthony’s early journal entries reveal a marked inward orientation. In Week 2, responding to *The Social Dilemma*, he used the journal space to articulate his immediate takeaways from the film and his personal concerns:

January 11 Prompt: Based on what we’ve seen in *The Social Dilemma* so far, what are TWO things you agree with? What are TWO questions you have?

I agree: social media is addictive, and the day social media was monetized started the downfall. We are the product. Two questions are why has social media changed and can we fix it before it’s too late? One thing I want to start is watch my time spent on social media.

Anthony’s initial reflections establish a baseline for his understanding, framing technology’s impact primarily through the lens of individual habit. While his agreement that “social media is addictive” and “we are the product” reflects a clear grasp of the film’s critique, his focus remains firmly inward. His primary concern is his own well-being, specifically his desire to “watch my time spent” online. By Week 6, however, Anthony began to turn outward, from his own habits to the texts themselves. Responding to Sherry Turkle’s (2011) *Alone Together*, in which the author argues that the rise of technology correlates with a decline in emotional lives, Anthony began to move beyond his own experience to interrogate the rhetorical moves Turkle uses to make that case:

February 15 Prompt: In your own words, what is Turkle’s argument? What assumptions was Turkle making in her intro? Do you agree or disagree with these? Why?

Turkle’s argument is that as technology ramps up our emotional lives ramp down and uses multiple interviews of present day people in order to show the effects of how technology has changed us. Turkle calls it alone together as people have rare connections with each other and rather focus on their electronic devices instead of each other. One assumption she makes is that people today all have a second life, that is your digital image. Some ideas that are persuasive throughout the text are the idea that technology is seductive and will satisfy all of our human needs. Technology will also be completely in our control which can lead to people becoming detached from reality. One idea I disagree with is that technology is entirely a bad thing when in reality it depends on the user and their intentions.

Anthony’s summary of Turkle’s argument demonstrates strong comprehension of central ideas such as emotional decline and “rare connections.” Importantly, the act of writing as exploration allowed him to critically identify Turkle’s “assumption” about a universal “digital image,” showing a burgeoning capacity to decode rhetorical moves within academic writing.

Anthony articulates specific persuasive ideas from the text, such as technology’s potential to cause users to become “detached from reality.” However, his concluding disagreement, noting that technology’s impact “depends on the user and their intentions,” reflects a subtle but real expansion from his Week 2 entry. While he previously viewed negative impacts like addictions as inevitable, he now frames the human-technology relationship as contingent. This shift illustrates an emerging multiplicity of perspective,

where the act of writing serves as a bridge, situating his personal concerns with a more critical, evaluative stance toward technology's broader implications and individual responsibility.

By Week 9, Anthony's journal writing had carried him toward a more pronounced outward expansion. He began to explicitly connect personal identity to algorithmic design and the profit motives driving contemporary AI. Having engaged with sociotechnical critiques like Ruha Benjamin's (2019) *Race After Technology*, Tiera Tanksley's (2022) blog post on viral Black death, and Safiya Noble's (2014) TED talk on "algorithms of oppression," Anthony used the final journal prompts to perform a close "read" of algorithmic influence and intertextual synthesis:

March 9 Prompt: How do you think a person's identity impacts content they see? Why do you think so?

I 100% believe a person's identity impacts the content they see. First we have to identify, "identity" which not only includes who you are biologically, socially, but also where you live and your characteristics. You put this information into tech apps in cute little boxes and next thing you know you're getting all your favorite dopamine fixed content, for better or worse.

Building on my previous answer, I think that an algorithm is just an automatic system. It has no goals or biases of it's own, only those of it's creator/controller. So if the controller programs the algorithm or AI with the goal of showing Spanish elderly cute cat videos, when that criteria is met, here come the videos. This could be for a lot of reasons but mainly retention and lure . . . in order to gain traction on the platform to make a profit, for others it's ownership.

This entry showcases growth in Anthony's outward-oriented thinking. He begins by defining "identity" through biological and social lenses, reflecting a multiplicity of understanding, then connects the personal act of inputting data into "cute little boxes" to the systemic outcome of corporate "retention and lure."

Through this recursive writing process, Anthony questions the perceived autonomy of AI. By asserting that the algorithm has "no goals . . . only those of its creator," he directly challenges the "black box" misconception. This insight reflects his developing understanding of human agency and responsibility, marking a shift from seeing himself as a passive "product" to a critical observer of the profit-driven forces behind algorithmic manipulation. The journal functioned as a disciplinary tool, allowing Anthony to "nest" his personal identity within a broader, systemic critique of digital ownership, specifically how corporate platforms "own" and monetize the datafied versions of users' identities.

Anthony's trajectory through these journal entries illustrates an outward-oriented expansion, demonstrating how a sustained reflective space helped him to move from self-focused concerns toward a systemic critique of AI's profit-driven design. Bianca's entries reflect a similar expansion, though her journey highlights how writing as exploration can support civic agency and a commitment to social responsibility.

Bianca’s Explorations. At the time of the study, Bianca was a 17-year-old high school senior who identified as Latina. Fluent in both Spanish and English, she would often converse with friends in Spanish before class began. Bianca described herself as a frequent and highly comfortable user of technology, engaging with various devices and a range of apps including TikTok and YouTube. Her pre-unit survey responses indicated concerns about the safety of technology use alongside her own extensive phone usage, which she estimated at over seven hours a day. Maria described Bianca as a creative thinker who was most comfortable exploring ideas in small groups or within the private, low-risk space of her digital journal. Her trajectory illustrates a compelling expansion from individual safety concerns to a strong call for collective civic action.

Bianca’s first entries show her already reaching beyond her own experience, using the journal to pose fundamental questions about the “invisible” side of data.

January 11 Prompt: Based on what we’ve seen in *The Social Dilemma* so far, what are TWO things you agree with? What are TWO questions you have?

Two things I agree with is that it can get addictive and increase mental health issues. Everyone using the internet should have the right to know hidden information. These are all important because it can bring awareness. My questions are, Where does our information go? How do they manage to keep up with everyone’s info on the internet? How is it causing addiction?

This entry illustrates Bianca enacting the disciplinary practice of writing as exploration by using the journal as a site to grapple with her initial reactions to the unit’s themes. Her agreement that technology “can get addictive and increase mental health issues” is rooted in her own “seven hours a day” of phone usage, reflecting an early inward-oriented perspective on technological impact.

However, the pedagogical design of the journal—specifically the invitation from Maria to take up entries as a space to pose and explore questions—provided the opening for her to articulate a burgeoning ethical stance. Bianca’s assertion that “everyone using the internet should have the right to know hidden information” moves her from ruminations on personal habit to a broader demand for transparency. By asking, “Where does our information go?” Bianca begins to identify the systemic information asymmetries that shape her digital life, setting the stage for her later calls for civic agency.

By Week 6, Bianca’s thinking expands from asking fundamental questions about data to articulating a critical stance on platform ethics. In response to a prompt regarding technology’s impact on society, she explicitly links her personal distrust to systemic issues of transparency and manipulation:

February 7 Prompt: Research suggests people are heavily impacted by technology. How do you feel about how much impact technology (including social media platforms) might have on people? Why do you feel this way?

I don't really "trust" many media platforms as much as I would trust a book or a journal written by an expert. The reason for this being how easily information can be manipulated on the internet. I don't trust social media with my information either because once users agree to their terms they can do whatever they want with the data collected from their users. I think I distrust platforms that aren't transparent the most, a trustworthy platform is honest and doesn't withhold information. I think some of the worst are large right wing media platforms because they push harmful fear mongering rhetoric as if it's fact . . .

This entry illustrates how the practice of informal composing allowed Bianca's general concern about "hidden information" to evolve into more discerning criteria for trustworthiness in digital environments. Her comparison between "media platforms" and "a book or a journal written by an expert" points to a developing critical literacy and a broadening understanding of information credibility. Notably, Bianca foregrounds systemic issues over individual ones. Her distrust stems from the lack of user control over "data collected from their users" and the power dynamics of platform terms and conditions. By critiquing platforms that "withhold information" or contribute to social harms through rhetoric, she signals an expanding outward-oriented perspective. Here, she enacts multiplicity by recognizing the diverse and often problematic agendas of media "voices," reflecting a growing sense of social justice in her understanding of technology's impact.

By Week 9, Bianca used the journal to articulate what it means to navigate technology critically. Responding to the prompt about what people need to know to "survive and thrive," she synthesized a broad vision for critical AI literacy:

March 3 Prompt: What do you think people need to know about technology in order to survive and thrive?

I would say people need to learn how it targets you and learn about being a critical user. They should know that it can be a very dangerous place and that when one uses it, they should first learn about its history and its positives and negatives. It's important being able to know how much power do you have and what actions are you going to take such as helping the community or helping with certain groups. People need to double-check facts they see on the internet and always think if that information is affecting someone negatively or to be aware of the damage it can cause or the consequences it will have. Also, discourse of race and gender happens all the time in online spaces/social media. An example of an issue in online spaces was when a TikTok star called Charli D'Amelio posted a dance that a Black girl named Jalaiah Harmon created. There was conversations as to why Jalaiah wasn't as famous as Charli for the dance even though she made it. So the issue of white creators profiting off Black people's ideas comes up a lot in online spaces.

This entry shows Bianca turning her outward expansion into a specific critique of the hidden mechanics of influence. Her emphasis on understanding "how it targets you" reflects a more complex awareness of algorithmic targeting that extends beyond her initial concerns about phone usage, and her call for users to interrogate a technology's "history and its positives and

negatives” and to “double-check facts” signals real engagement with critical literacy practices.

Bianca’s reference to the Charli D’Amelio and Jalaiah case enacts horizontality. By taking up this widely known social media controversy as a lens for inquiry, she connects “online spaces” to systemic patterns of racialized algorithmic dynamics and cultural appropriation. In citing the erasure of Jalaiah Harmon, she looks past the singular narrative of a viral trend to the social voices and inequities beneath it, recognizing that “discourse of race and gender happens all the time” in digital contexts, including the systemic issue of “white creators profiting off Black people’s ideas.” Finally, she turns to power and agency, naming the specific “actions you are going to take” to support communities like hers. This reflects an expansion that situates her individual concerns within a broader commitment to collective action and social responsibility, fulfilling a major goal of the unit.

Collectively, the trajectories of Anthony and Bianca trace how the digital journal functioned as a pedagogical opening for extended, informal composing. By providing a low-risk environment for questioning and sensemaking sustained over time, the journals made the expansion of students’ orientations visible as it developed—a view the more episodic data of talk and reading could not offer. Writing in response to the texts and voices of the unit, students drew together the sensibilities the design sought to cultivate: weighing varied perspectives, grounding analysis in lived experience, and putting their own reflections in conversation with what they read. This recursive engagement allowed students to embed their personal concerns (e.g., individual screen time, data privacy) within broader examinations of power, racialized design, and corporate profit. Together, these written reflections provided the conceptual scaffolding necessary for students to bridge their evolving orientations with the complex, outward-oriented arguments presented in their culminating essays.

RQ2: Tracing the Expansion of Sociotechnical Orientations: The Interplay of Inward and Outward Perspectives

Our analysis reveals a marked expansion in student thinking regarding AI’s sociotechnical implications. As established, these orientations are understood as permeable and “nested” dimensions of awareness, where students’ inward concerns inform, and are resituated by, their expanding outward critiques. This section examines how this widening unfolded, and how inward and outward orientations interacted. We focus on how students did not simply abandon their personal concerns but instead situated those concerns within more systemic and justice-oriented critical AI awareness. The following subsections explore this expansion by triangulating the

qualitative depth of students' culminating essays with the broader conceptual shifts captured in pre- and post-unit surveys.

Synthesized Understandings and Expanding Perspectives in Final Essays

As the culminating task of the unit, the final essays let us observe how students synthesized information from diverse sources into a structured, outward-oriented stance. While the digital journals captured the “grappling” associated with writing as exploration, these essays represent the formalization of those emergent ideas into a coherent sociotechnical critique. The following analysis illustrates these culminating insights by first mapping prevalent patterns across the 62 final essays and then providing a closer examination of Anthony's and Bianca's individual trajectories.

Expanding Perspectives in Final Essays. A frequency analysis of the 62 essays provides an aggregate snapshot of the collective expansion of students' sociotechnical orientations. These patterns indicate how the unit's design—specifically the invitation to engage in intertextual synthesis and critical inquiry—facilitated a shift from purely inward concerns toward more systemic, outward-oriented analyses. Students showed strong engagement with course materials, with 59 essays (95%) incorporating multiple references to class texts, often exceeding the required three. A majority (85%) also displayed foundational technical knowledge about AI mechanisms; while not an explicit unit goal, this suggests students found understanding algorithmic basics necessary for analyzing sociotechnical implications. Students' engagement with technology's social dimensions appeared in descending intensity: while 89% raised community concerns, fewer engaged the more specific and demanding analyses of algorithmic harm (48%) and the racial dimensions of AI (35%), and 29% (18 essays) proposed concrete social action. This gradient suggests that the outward expansion, though broad, was uneven in depth; most students broadened their awareness, while fewer moved all the way to systemic analysis or action. While these quantitative trends provide an overview of the collective expansion toward outward orientations, the subsequent analyses explore the complex tensions between the personal and the systemic that characterized this expansion for individual students.

Writing as Exploration: Enacting Recursive Synthesis. The final essays, products of the unit's writing as exploration design, gave students a site for recursive synthesis. Over approximately two weeks, they formalized their evolving ideas and put their inward reflections in conversation with outward sociotechnical critiques. The following analyses of Anthony's and Bianca's trajectories indicate how their analytical horizons broadened to encompass

complex systemic issues while remaining firmly rooted in personal and community-based knowledge.

Anthony’s Essay Analysis. Anthony’s essay reflects an expansion into questions of meaning and authenticity in a technological world. Building on the philosophical questions explored in his digital journals, he interrogates the nature of “reality” in a world of digital artifice:

To truly thrive in this new age we must be critical of how we spend our time and what we consume through technology. We must differentiate the true and false and what is real. So how do we determine what is real? For something to be real it must be genuine, for something to be genuine it must carry meaning. In our lives we must create our meaning, something that is not birthed behind a screen but through our experiences with family, friends, and loved ones. It is through our relationships and our interactions with the world around us that we find meaning in life. As we navigate this new technological frontier we must strive to find meaning through our personal lives and not through media. With these steps, we can create a world where technology can enrich our lives, not replace them.

In this synthesis, Anthony treats the “new technological frontier” as a text to be questioned and interpreted. He does not abandon his inward concerns regarding personal well-being; instead, he nests those within a broader social critique. He defines “reality” not as an abstract concept but as a deeply human achievement anchored in relationships with “family, friends, and loved ones.” By situating his pursuit of meaning within the “technological frontier,” Anthony extends his critique outward. His argument that technology should “enrich our lives, not replace them” represents an outward orientation grounded in a humanistic defense of lived experience and relationships. Here, the personal (inward) acts as the epistemic foundation for a systemic vision (outward) of a future in which people are critical users who understand technology’s potential harms and benefits.

Bianca’s Essay Analysis. While Anthony’s expansion centered on questions of meaning and authenticity, Bianca’s essay reflects an expansion into the sociopolitical dimensions of AI. Drawing on Benjamin’s (2019) concept of the “New Jim Code,” Bianca addresses the intersection of systemic racism and technological design. In a selection read in class, Benjamin argued that names carry social and cultural weight, often encoding racial biases and shaping individuals’ experiences. Building upon her earlier reflections in her digital journal, Bianca uses intertextual synthesis—a disciplinary practice invited by the unit design—to bridge academic theory with the lived experiences of her Mexican American community:

Benjamin says, “Depending on one’s name, one is more likely to be detained by state actors in the name of ‘public safety.’” My community comes with lots of different names but when we encounter a complex or super traditional name, my community can’t ignore the fact that the name given at birth is going to

have its downfalls because . . . [t]he names we have would be assumptions for technology to think we are that one specific race and being kept hostage in the process. The result of technology is how easily it can be seen as a big search engine for my community to be easily targeted and held in records for us to be labeled as “criminals.” What the community needs to do to prevent tragic assumptions is create a racism free space and build more collaboration in the streets and in schools to become more accustomed with each other and learn more from each other’s race and names. This can clear this big search engine that technology has created and free people from being held hostage.

Bianca’s analysis exemplifies the porous nesting of inward identity and outward critique. By applying Benjamin’s (2019) scholarship to her own community, she interprets “names” not as neutral data points but as sites of historical vulnerability. By reframing search engines from tools of convenience into mechanisms of systemic control—where her community feels “held hostage”—Bianca shows an awareness of how digital records can restrict social and physical mobility. This reframing signals a shift where the algorithm is no longer viewed as a neutral tool, but as a site of racialized surveillance. Furthermore, her call to action—proposing a “racism free space” through “collaboration in the streets and in schools”—illustrates a situated agency. She does not abandon her personal or communal concerns; instead, she positions relational work at the heart of dismantling systemic racism. This synthesis demonstrates her ability to anchor individual acts of discrimination within a broader sociopolitical critique, indicating that her outward orientation remains firmly rooted in her community-based knowledge.

Aggregate Trends in Pre- and Post-Unit Surveys

To corroborate the broadening orientations observed in students’ discussions and essays, we analyzed pre- and post-survey data. These surveys assessed students’ conceptions of critical technology use, their specific concerns, and the unit’s perceived influence on their thinking.

Widening Conceptions of the “Critical User.” In the pre-unit survey ($n = 53$), students’ definitions of “a critical user of technology” primarily reflected an inward orientation, with 38% of responses focusing on personal use related to frequency and time spent on devices. This contrasted with the post-unit survey ($n = 51$), which revealed a clear shift in conceptual reach: 55% of responses focused on awareness of technology’s broader effects on society, and 40% emphasized the critical evaluation and analysis of underlying algorithmic systems. The 8% of students who initially responded “IDK” (I don’t know) no longer did so post-unit, suggesting that by the unit’s end, even students who had initially been unsure could articulate a stance.

Broadening Concerns: Resituating Personal Struggles. The porous nesting of inward and outward orientations was most evident in how students’ concerns evolved. In the pre-unit survey, the most frequent concern was addiction/excessive use (26%), highlighting an inward focus on personal struggles. By the post-unit survey, this theme dropped to 15%, as students’ concerns shifted toward sociotechnical implications. Forty-three percent centered on algorithmic bias and inequality, and 22% focused on control and manipulation (up from 13% in the pre-unit survey). This shift suggests that students did not stop worrying about “too much screen time” or “addiction”; rather, they began to situate those individual struggles within a larger systemic understanding of corporate practices and algorithmic design.

Perceived Influence of the Unit. To assess the unit’s influence on students’ thinking, the post-unit survey asked about the extent to which the unit had changed their perspectives on technology. Of the 51 post-unit respondents, 86% indicated that the unit moderately to very much changed their thinking, with 55% indicating a significant or very significant change (ratings of 4 or 5). This reported change aligns with the widening orientations observed across the survey comparisons (see [Figure 1](#) for Likert-scale responses).

Students also identified specific new insights integrated into their thinking about technology, including algorithmic bias (37%), social and ethical implications (31%), psychological manipulation (16%) and surveillance (10%). These figures suggest that the unit illuminated the often-hidden roles of algorithmic and corporate practices, providing the disciplinary tools

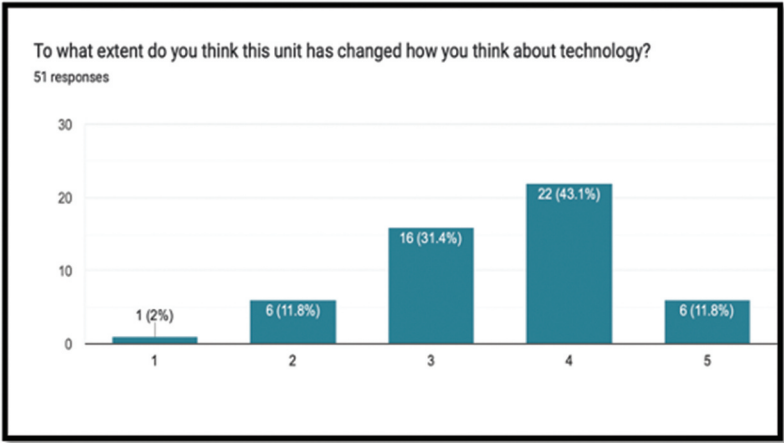


Figure 1. Post-unit survey Likert-scale responses.

necessary for students to connect their personal digital lives to the broader social world.

Collectively, these analyses of student surveys, classroom discussions, digital journals, and final essays suggest that the unit meaningfully influenced students' critical AI awareness. Rather than a linear move away from personal concerns, the data reveal a multi-dimensional broadening of student perspectives, where students' inward orientations (e.g., concerns about personal time and addiction) were increasingly embedded within broader systemic critiques of algorithmic harm and racial bias. This interplay between the personal and the systemic suggests that the unit's design—prioritizing reading, writing, and talking as exploration—provided the mediating disciplinary tools for fostering critical stances and a developing sense of situated agency. By grounding AI education within these ELA-based exploratory practices, the design supported students in repositioning their lived digital experiences within the broader, collective social impacts of technology.

Discussion

Our findings reveal that students in two ELA classrooms developed substantive critical orientations toward AI's social impacts, using their own lived experiences as the foundation from which systemic critique could emerge. This points to a form of humanizing AI education in which designs that leverage students' diverse ways of being and knowing are particularly positioned to make systemic critique feel personally necessary rather than abstractly imposed, an orientation more technical approaches to AI education may be less likely to foreground. The students used varied knowledge sources to construct arguments about real-world consequences, demonstrating an expansive critical focus on algorithmic bias and manipulation. Importantly, they resituated these core concepts within a complex interplay of personal experience and collective social concern.

We characterize this expansion not as a binary replacement of personal concerns, but as a widening of the analytical aperture—a process where inward-oriented understandings became the epistemic anchors for broader systemic critiques. This movement suggests that a design grounded in onto-epistemic heterogeneity can support more socially aware understandings of AI. By prioritizing multiplicity, dialogicality, and horizontality, the design positioned students as experts of their own digital lives, fostering critical lenses that integrated classroom learning and lived realities rather than separating them. Notably, this shift was not an analytical layer applied by our research team. Moments like Veronica's repositioning of her previously normalized digital practices suggest these expansions were genuinely felt.

Students’ own assessments echoed this, as 86% reported that the unit changed their thinking.

These findings challenge the artificial boundaries between disciplines, suggesting that sociotechnical AI education may belong across the curriculum, not only in computer science. Yet this kind of integrative work inevitably encounters epistemic tensions (Santo et al., 2024)—in our case, the challenge of examining algorithmic bias without making the ELA classroom feel like a computer science class. We addressed this by contextualizing algorithms as sociotechnical texts, leveraging critical literacy practices aligned with OEH. These tensions are not obstacles to be designed away; they are also generative. The students for whom technical framings of AI remained dominant, even as the unit encouraged sociotechnical critique, mark the limits of what this design accomplished—yet those limits are instructive to us as designers and researchers, signaling where disciplinary boundaries could be renegotiated in service of more expansive AI education. Even so, our findings speak directly to the “social indeterminacy” Thrall et al. (2024) identified, that is, the tendency for students to envision dystopian AI futures without being able to imagine collective responses: 29% of students moved beyond critique to outline concrete social actions, suggesting that grounding AI inquiry in students’ lived experiences and community-based knowledge can help bridge that gap. The expansion of critical awareness, as our findings remind us, is uneven, personal, and ongoing.

Implications and Future Directions

Although the unit fostered onto-epistemic heterogeneity, the design could push toward even greater complexity. Future design iterations could juxtapose texts on AI’s beneficial applications with those on its ethical dilemmas, holding both in tension so students engage more deeply with contested views of AI. Such refinements could draw further on the OEH framework to support more multifaceted thinking about AI’s role in society. Future iterations might also incorporate speculative approaches, which open up technological futures and foster civic participation (e.g., Garcia & Mirra, 2023), to complement the unit’s focus on current and historical impacts.

Situating AI education in ELA carries implications for both research and practice. Our findings illustrate the generative potential of embedding AI concepts into the humanities and point to a research agenda: how learning designs might cultivate outward expansion in other disciplines, and how educators can integrate multiplicity, dialogicality, and horizontality to support more layered thinking about AI. Our teacher-researcher collaboration model also highlights the need to investigate the supports—including professional learning—that help

educators design and implement critical AI education across varied contexts.

The findings offer practical pathways for ELA educators seeking to integrate critical AI inquiry. Familiar disciplinary tools—close reading, collaborative meaning-making, and multi-genre composition—can act as exploratory “on-ramps” for examining power. By treating algorithms and their outputs as sociotechnical texts, teachers can illuminate often invisible logics without treating AI as a strictly technical subject outside the purview of literacy.

Supporting this integration requires professional learning that bridges the technical-humanistic divide, specifically by helping educators reframe their role from instructors of technology to designers of inquiry that surfaces students’ diverse knowledges. This involves demystifying AI through its social dimensions and curating diverse text sets that invite multiplicity, both of which let classroom discourse treat students’ lived experiences as genuine analytic resources. Even in contexts with less curricular flexibility, established ELA lenses—such as critical media literacy, rhetorical analysis, or power dynamics in storytelling—offer practical, standards-aligned entry points. Ultimately, these practices are most effective when grounded in a community of trust and open dialogue, providing the security necessary for students to explore the complex ethical dilemmas inherent in sociotechnical systems.

Limitations

Despite the insights gained, this study acknowledges several limitations. First, as a single-case design-based study, our findings demonstrate viability within a specific context rather than broad generalizability. Methodologically, Maria’s administration of surveys may have introduced social desirability bias (Krumpal, 2013), and the categorical nature of survey instruments occasionally obscured the nuance found in our qualitative data. Future research could implement independently administered surveys to mitigate these potential biases. In this study, triangulation across multiple data sources (discussions, journals, essays, surveys) served to partially mitigate this bias, though we acknowledge it cannot eliminate it entirely.

Second, our data analysis focused primarily on written and spoken modalities, potentially overlooking insights from other multimodal student artifacts. The intentional framing of our assessment prompts, which explicitly invited consideration of community impact, may have also influenced students’ articulation of outward orientations. Furthermore, while the unit intentionally foregrounded AI bias and manipulation to build foundational critical awareness, future research should explore more multifaceted views of

AI’s utility alongside its ethical dilemmas to reflect the full complexity of the sociotechnical landscape.

While we documented meaningful conceptual expansions, the trajectory toward outward orientations was rarely linear. For some learners, prior technical orientations remained dominant lenses, resisting the sociotechnical resituating invited by the pedagogical design. Acknowledging these nonlinearities and points of resistance matters for understanding critical AI education more fully; they suggest that the expansion of awareness is a personal and iterative process rather than an expected outcome.

Finally, the study benefited from a uniquely supportive environment for unit design and implementation. Maria, operating within a school committed to onto-epistemic heterogeneity, fostered a classroom culture of trust, a relational dimension important to exploring sensitive AI issues. While this emphasis on human relationships is essential to critical AI education, we recognize that such conditions are not universally guaranteed. Consequently, this trust-based classroom culture should be viewed as a necessary condition for the design’s success. Future research must examine critical AI education designs in contexts with varying degrees of curricular autonomy to ensure all students have opportunities for sociotechnical engagement.

Conclusion

This study makes the case for AI education that addresses both the “what”—social, ethical, and global impacts—and the “how”—the lenses, dispositions, and disciplinary practices that allow students to interrogate these systems. By demonstrating how the ELA classroom is a vital disciplinary home for critical AI inquiry, we show how humanistic frameworks can help students understand their own lives within broader platform ecologies (Nichols & Garcia, 2022). This approach moves beyond technical skills, fostering an expansion where students’ personal experiences become starting points from which they launch systemic critiques.

As AI technologies evolve with a speed that outpaces our collective understanding of their social implications, the humanities offer something distinctive: ways of reading, talking, and writing that help learners situate themselves within, and think critically about, the forces shaping their lives. The interpretive practices at the heart of ELA—inquiry, dialogue, storytelling, critique—are tools students need to make sense of a world where algorithmic systems increasingly mediate social possibilities. What emerged in Maria’s classes suggests that these practices do more than build critical awareness. They also orient students toward relational, community-sustaining ways of engaging with technology—orientations that, we suggest, run counter to the individualizing pull of algorithmic systems. In this sense, humanizing AI education is ultimately about keeping human

connection and collective responsibility at the center of how we respond to these systems—not merely understanding them, but deciding, together, what we want them to become.

Acknowledgments

We first and foremost thank the students at Inspiration Academy for the generosity of spirit with which they shared their time, lived experiences, and evolving expertise. Their insights are the heart of this work. We are immensely grateful to Wade Wilgus, whose thinking partnership enriched our broader thinking. We are further indebted to the school administrators for their unwavering support of this project and for fostering a campus culture that makes this kind of inquiry possible. Deep appreciation goes to Sepehr Vakil, Amy Stornaiuolo, Alexis Patterson Williams, and Lee Martin for insightful conversations and constructive feedback on earlier iterations of this manuscript. We also thank the anonymous peer reviewers for their rigorous and thoughtful comments that strengthened this article.

Author Contributions

CRedit: **Jennifer M. Higgs:** Conceptualization, Theoretical framework development, Methodology, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition; **Maria Kaimana:** Conceptualization, Methodology, Data curation, Investigation, Writing – review & editing; **Mark Isero:** Formal analysis, Writing – review & editing.

Disclosure Statement

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

Funding

This research was supported by a Postdoctoral Fellowship from The National Academy of Education and The Spencer Foundation. The views expressed are those of the authors and do not necessarily reflect the views of these organizations.

Ethical Standards

This study was conducted in accordance with the ethical standards of the University of California, Davis Institutional Review Board (IRB 1922145-1). All participants provided written informed consent, and parental consent was obtained for all minor students prior to data collection. Pseudonyms are used throughout this manuscript to protect the anonymity of the school site and student participants.

References

- Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *Artificial Intelligence and Ethics*, 2(3), 431–440. <https://doi.org/10.1007/s43681-021-00096-7>
- Avila, J., & Pandya, J. Z. (2013). *Critical digital literacies as social praxis*. Peter Lang.
- Baker-Bell, A. (2020). *Linguistic justice: Black language, literacy, identity, and pedagogy*. Routledge.
- Bakhtin, M. M. (1981) *The dialogic imagination: Four essays* (C. Emerson & M. Holquist, Trans.). University of Texas Press.
- Bakhtin, M. M. (1986). The problem of speech genres. In C. Emerson & M. Holquist, & V. McGee (Eds.), *Speech genres and other late essays* (pp. 60–102). University of Texas Press.
- Behizadeh, N., Johnson, L. L., & Garcia, M. (2023). Invited response: Promise and perils of GenAI in English education: Reflections from the National Technology Leadership Summit. *English Education*, 56(1), 8–19. <https://doi.org/10.58680/ee20235618>
- Benjamin, R. (2019). *Race after technology: Abolitionist tools for the new Jim Code*. Polity.
- Borenstein, J., & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. *Artificial Intelligence and Ethics*, 1(1), 61–65. <https://doi.org/10.1007/s43681-020-00002-7>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2), 141–178. https://doi.org/10.1207/s15327809jls0202_2
- Burriss, S. K., Hutchins, N., Conley, Z., Deweese, M. M., Doe, Y. J., Eeds, A., & Oliver, K. (2024). Redesigning an AI bill of rights with/for young people: Principles for exploring AI ethics with middle and high school students. *Computers and Education: Artificial Intelligence*, 7, 100317. <https://doi.org/10.1016/j.caeai.2024.100317>
- Christenbury, L., Bomer, R., & Smagorinsky, P. (Eds.). (2011). *Handbook of adolescent literacy research*. Guilford Press.
- Cobb, P., Confrey, J., DiSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9–13. <https://doi.org/10.3102/0013189X032001009>
- Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (Eds.). (2014). *Handbook of research on new literacies*. Routledge.
- Cornish, F., Gillespie, A., & Zittoun, T. (2014). Collaborative analysis of qualitative data. In U. Flick (Ed.), *The SAGE handbook of qualitative data analysis*. SAGE. <https://doi.org/10.4135/9781446282243.n6>
- Costello, N., Sutton, R., Jones, M., Almassian, M., Raffoul, A., Ojumu, O., & Austin, S. B. (2023). Algorithms, addiction, and adolescent mental health: An interdisciplinary study to inform state-level policy action to protect youth from the dangers of social media. *American Journal of Law & Medicine*, 49(2–3), 135–172.
- Davidow, B. (2012, July 18). *Exploiting the neuroscience of Internet addiction*. The Atlantic. <https://www.theatlantic.com/health/archive/2012/07/exploiting-the-neuroscience-of-internet-addiction/259820/>

- de Los Ríos, C. V., Martinez, D. C., Musser, A. D., Canady, A., Camangian, P., & Quijada, P. D. (2019). Upending colonial practices: Toward repairing harm in English education. *Theory into Practice*, 58(4), 359–367. <https://doi.org/10.1080/00405841.2019.1626615>
- de Roock, R. S. (2021). On the material consequences of (digital) literacy: Digital writing with, for, and against racial capitalism. *Theory into Practice*, 1–11. <https://doi.org/10.1080/00405841.2020.1857128>
- Dixon-Román, E., Nichols, T. P., & Nyame-Mensah, A. (2020). The racializing forces of in AI educational technologies. *Learning, Media and Technology*, 1–15. <https://doi.org/10.1080/17439884.2020.1667825>
- Enriquez, G., Gill, V., Campano, G., Flores, T. T., Jones, S., Leander, K. M., & Price-Dennis, D. (2024). Generative AI and composing: An intergenerational conversation among literacy scholars. *English Teaching: Practice & Critique*, 23(1), 6–22.
- Eubanks, V. (2017). *Automating inequality: How high-tech tools profile, police, and punish the poor*. St. Martin's Press.
- Fisher, D., & Lapp, D. (Eds.). (2024). *Handbook of research on teaching the English language arts* (5th ed.). Routledge.
- Freedman, S. W., Hull, G. A., Higgs, J., & Booten, K. (2016). Teaching writing in a digital and global age: Toward access, learning, and development for all. In C. Bell & D. Gitomer (Eds.), *Handbook of research on teaching* (5th ed., pp. 1389–1449). American Educational Research Association.
- Fu, Y., & Weng, Z. (2024). Navigating the ethical terrain of AI in education: A systematic review on framing responsible human-centered AI practices. *Computers and Education: Artificial Intelligence*, 7, 100306. <https://doi.org/10.1016/j.caeai.2024.100306>
- Garcia, A., & Mirra, N. (2023). Other suns: Designing for racial equity through speculative education. *Journal of the Learning Sciences*, 32(1), 1–20. <https://doi.org/10.1080/10508406.2023.2166764>
- Gee, J. P., & Zhang, Q. A. (2024). Cybersapien literacy: Integrating AI and human. *Phi Delta Kappan*, 106(3), 32–38. <https://doi.org/10.1177/00317217241295428>
- González Ybarra, M. (2022). “Because we have lived it”: Chicana Latinx youth multimodal literacies in youth participatory action research. *Reading Research Quarterly*, 57(3), 983–1002. <https://doi.org/10.1002/rrq.455>
- Google & Gallup. (2015). Searching for computer science: Access and barriers in U.S. K-12 education. <http://g.co/cseduresearch>
- Grover, S. (2024, March). Teaching AI to K-12 learners: Lessons, issues, and guidance. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1* (pp. 422–428). <https://doi.org/10.1145/3626252.3630937>
- Gutiérrez, K. D. (2008). Developing a sociocritical literacy in the third space. *Reading Research Quarterly*, 43(2), 148–164. <https://doi.org/10.1598/RRQ.43.2.3>
- Gutiérrez, K. D. (2016). 2011 AERA presidential address: Designing resilient ecologies: Social design experiments and a new social imagination. *Educational Researcher*, 45(3), 187–196. <https://doi.org/10.3102/0013189X16645430>
- Gutiérrez, K. D., Jurow, A. S., & Vakil, S. (2020). Social design experiments: A utopian methodology for understanding new possibilities for learning. In N. Nasir, C. D. Lee, R. Pea, & M. M. de Royston (Eds.), *Handbook of the cultural foundations of learning* (pp. 330–347). Routledge.
- Gutiérrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher*, 32(5), 19–25. <https://doi.org/10.3102/0013189X032005019>

- Haddix, M. M., Stevens, E. Y., & Hinchman, K. A. (2024). Cultivating equitable language arts practices. In D. Fisher & D. Lapp (Eds.), *Handbook of research on teaching the English language arts* (5th ed., pp. 161–178). Routledge.
- Higgs, J., & Freedman, S. W. (2023). Bakhtin and multicultural education. In D. Fisher & E. Gargroetzi (Eds.), *Routledge encyclopedia of education*. Routledge. <https://doi.org/10.4324/9781138609877-REE235-1>
- Higgs, J., Kaimana, M., Wilgus, W., Isero, M. (2026). Reading the black box: Dialogical inquiry and critical AI perspectives in the ELA classroom. *Inquiry: Critical Thinking Across the Disciplines*. <https://doi.org/10.5840/inquiryct202641040>
- Higgs, J., & Stornaiuolo, A. (2024). Being human in the age of generative AI: Young people’s ethical concerns about writing and living with machines. *Reading Research Quarterly*, 59(4), 632–650. <https://doi.org/10.1002/rrq.552>
- Hinchman, K. A., & Appleman, D. (Eds.). (2017). *Adolescent literacies: A handbook of practice-based research*. The Guilford Press.
- Hull, G. A., & Schultz, K. (Eds.). (2002). *School’s out: Bridging out-of-school literacies with classroom practice* (Vol. 60). Teachers College Press.
- 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>
- Krippendorff, K. (2019). *Content analysis: An introduction to its methodology* (4th ed.). SAGE.
- Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality and Quantity*, 47(4), 2025–2047. <https://doi.org/10.1007/s11135-011-9640-9>
- Krutka, D. G., Heath, M. K., & Smits, R. M. (2022). Toward a civics of technology. *Journal of Technology and Teacher Education*, 30(2), 229–237. <https://doi.org/10.70725/646887mojqit>
- Lachney, M., Ryoo, J., & Santo, R. (2021). Introduction to the special section on justice-centered computing education, part 1. *Association for Computing Machinery Transactions on Computing Education*, 21(4), 1–15. <https://doi.org/10.1145/3477981>
- Lankshear, C., & Knobel, M. (Eds.). (2008). *Digital literacies: Concepts, policies and practices* (Vol. 30). Peter Lang.
- LeBlanc, R. J., Aguilera, E., Burriss, S., de Roock, R., Fassbender, W., Monea, B., Nichols, T. P., Pandya, J. Z., Robinson, B., Smith, A., & Stornaiuolo, A. (2023). *Digital platforms and the ELA classroom: A policy brief*. National Council of Teachers of English. https://ncte.org/wp-content/uploads/2023/05/2023-NCTE-Squire-Office_Digital-Platforms-and-the-ELA-Classroom.pdf
- Lee, C. D. (2001). Is October Brown Chinese?: A cultural modeling activity system for underachieving students. *American Educational Research Journal*, 38(1), 97–141. <https://doi.org/10.3102/00028312038001097>
- Lee, C. H., Gobir, N., Gurn, A., & Soep, E. (2022). In the black mirror: Youth investigations into artificial intelligence. *Association for Computing Machinery Transactions on Computing Education*, 22(3), 1–25. <https://doi.org/10.1145/3484495>
- Lee, C. H., & Soep, E. (2016). None but ourselves can free our minds: Critical computational literacy as a pedagogy of resistance. *Equity & Excellence in Education*, 49(4), 480–492. <https://doi.org/10.1080/10665684.2016.1227157>
- Li, R. (2024). “Weaving tales of resilience”: Cyborg composing with AI. *English Teaching: Practice & Critique*, 23(1), 57–66. <https://doi.org/10.1108/ETPC-08-2023-0087>

- Luke, A. (2004). Two takes on the critical. In B. Norton & K. Toohey (Eds.), *Critical pedagogies and language learning* (pp. 21–31). Cambridge University Press.
- Lynch, T. L. (2019). Electrical evocations: Computer science, the teaching of literature, and the future of English education. *English Education*, 52(1), 15–37. <https://doi.org/10.58680/ee201930312>
- Margolis, J., Ryoo, J., Sandoval, C., Lee, C., Goode, J., & Chapman, G. (2012). Beyond access: Broadening participation in high school computer science. *ACM Inroads*, 3(4), 72–78. <https://doi.org/10.1145/2381083.2381102>
- Martinez, D. C. (2017). Imagining a language of solidarity for Black and Latinx youth in English language arts classrooms. *English Education*, 49(2), 179–196. <https://doi.org/10.58680/ee201728920>
- McBride, C., Lee, C. H., & Soep, E. (2024). “Gotta love some human connection”: Humanizing data expression in an age of AI. *Reading Research Quarterly*, 59(4), 678–689. <https://doi.org/10.1002/rrq.550>
- Moje, E. B. (2007). Chapter 1 developing socially just subject-matter instruction: A review of the literature on disciplinary literacy teaching. *Review of Research in Education*, 31(1), 1–44. <https://doi.org/10.3102/0091732X07300046001>
- Moje, E. B. (2008). Foregrounding the disciplines in secondary literacy teaching and learning: A call for change. *Journal of Adolescent and Adult Literacy*, 52(2), 96–107. <https://doi.org/10.1598/JAAL.52.2.1>
- Morales-Navarro, L., & Kafai, Y. B. (2023). Conceptualizing approaches to critical computing education: Inquiry, design, and reimagination. In M. Apiola, S. López-Pernas, & M. Saqr (Eds.), *Past, present and future of computing education research: A global perspective* (pp. 521–538). Springer International Publishing.
- Nash, B. L., Hicks, T., Garcia, M., Fassbender, W., Alvermann, D., Boutelier, S., & Young, C. (2023). Artificial intelligence in English education: Challenges and opportunities for teachers and teacher educators. *English Education*, 55(3), 201–206.
- National Academies of Sciences, Engineering, and Medicine. (2024). *Equity in K-12 STEM education: Framing decisions for the future*. The National Academies Press. <https://doi.org/10.17226/26859>
- National Council of Teachers of English. (2019, November 7). *NCTE position statement on definition of literacy in a digital age*. <https://ncte.org/statement/nctes-definition-literacy-digital-age/>
- National Council of the Teaching of English. (2018). *Beliefs for integrating technology into the English language arts classroom*. Position Statement. <https://ncte.org/statement/beliefs-technology-preparation-english-teachers/>
- National Council of the Teaching of English. (2024). *Exploring, incorporating, and questioning generative artificial intelligence in English teacher education*. Position Statement. <https://ncte.org/statement/exploring-incorporating-and-questioning-generative-artificial-intelligence-in-english-teacher-education/>
- Nichols, T. P., & Garcia, A. (2022). Platform studies in education. *Harvard Educational Review*, 92(2), 209–230. <https://doi.org/10.17763/1943-5045-92.2.209>
- Noble, S. U. (2018). *Algorithms of oppression: How search engines reinforce racism*. NYU Press.
- Rainey, E. C., & Storm, S. (2023). Tracing discourse across a century of language arts. *Language Arts*, 100(6), 431–441. <https://doi.org/10.58680/la202332531>
- Rainey, E. C., Storm, S., & Morales, G. (2023). What trends in contemporary literary studies have to offer English education. *English in Education*, 58(1), 59–73. <https://doi.org/10.1080/04250494.2023.2266453>

- Robinson, B., & Hollett, T. (2024). Literacy in the age of AI. *Reading Research Quarterly*, 59(4), 555–559. <https://doi.org/10.1002/rrq.581>
- Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, 26(2), 582–599. <https://doi.org/10.1007/s40593-016-0110-3>
- Roscoe, R. D., & McNamara, D. S. (2013). Writing pal: Feasibility of an intelligent writing strategy tutor in the high school classroom. *Journal of Educational Psychology*, 105(4), 1010–1025. <https://doi.org/10.1037/a0032340>
- Rosebery, A. S., Ogonowski, M., DiSchino, M., & Warren, B. (2010). “The coat traps all your body heat”: Heterogeneity as fundamental to learning. *Journal of the Learning Sciences*, 19(3), 322–357. <https://doi.org/10.1080/10508406.2010.491752>
- Ryoo, J. J. (2019). Pedagogy that supports computer science for all. *Association for Computing Machinery Transactions on Computing Education*, 19(4), 1–23. <https://doi.org/10.1145/3322210>
- Ryoo, J. J., & Blunt, T. (2024). “Show them the playbook that these companies are using”: Youth voices about why computer science education must center discussions of power, ethics, and culturally responsive computing. *Association for Computing Machinery Transactions on Computing Education*, 24(3), 1–21. <https://doi.org/10.1145/3660645>
- Ryoo, J. J., Margolis, J., Lee, C. H., Sandoval, C. D., & Goode, J. (2013). Democratizing computer science knowledge: Transforming the face of computer science through public high school education. *Learning, Media and Technology*, 38(2), 161–181. <https://doi.org/10.1080/17439884.2013.756514>
- Ryoo, J. J., Tanksley, T., Estrada, C., & Margolis, J. (2020). Take space, make space: How students use computer science to disrupt and resist marginalization in schools. *Computer Science Education*, 30(3), 337–361. <https://doi.org/10.1080/08993408.2020.1805284>
- Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking in conversation. *Language*, 50(4), 696–735. <https://doi.org/10.2307/412243>
- Salac, J., Oleson, A., Armstrong, L., Le Meur, A., & Ko, A. J. (2023, August). Funds of knowledge used by adolescents of color in scaffolded sensemaking around algorithmic fairness. *Proceedings of the 2023 ACM Conference on International Computing Education Research-Volume 1* (pp. 191–205). <https://doi.org/10.1145/3568813.360011>
- Saldaña, J. (2012). *The coding manual for qualitative researchers* (2nd ed.). SAGE.
- Santo, R., Hu, A. D., Phelps, D., Caskurlu, S., Dunbar, K., & Yadav, A. (2024). “These two worlds are antithetical”: Epistemic tensions in integrating computational thinking in K12 humanities and arts. *Computer Science Education*, 35(1), 153–189. <https://doi.org/10.1080/08993408.2024.2380163>
- Schegloff, E. A. (2007). *Sequence organization in interaction: A primer in conversation analysis I* (Vol. 1). Cambridge University Press.
- Scribner, S., & Cole, M. (1981). *The psychology of literacy*. Harvard University Press.
- Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review*, 78(1), 40–59. <https://doi.org/10.17763/haer.78.1.v62444321p602101>
- Shaw, M. S., Coleman, J. J., Thomas, E. E., & Kafai, Y. B. (2023). Restorying a black girl’s future: Using womanist storytelling methodologies to reimagine dominant narratives in computing education. *Journal of the Learning Sciences*, 32(1), 52–75. <https://doi.org/10.1080/10508406.2023.2179847>

- Shaw, M. S., Toliver, S. R., & Tanksley, T. (2024). The internet doesn't exist in the sky: Literacy, AI, and the digital middle passage. *Reading Research Quarterly*, 59(4), 690–705. <https://doi.org/10.1002/rrq.537>
- Shew, A. (2023). *Against technoableism: Rethinking who needs improvement*. WW Norton & Company.
- Skerrett, A., & Warrington, A. (2018). Language arts instruction in middle and high school classrooms. In D. Fisher & D. Lapp (Eds.), *Handbook of research on teaching the English language arts* (4th ed., pp. 410–435). Routledge.
- Smith, A., Higgs, J., Lizárraga, J. R., & Watson, V. M. (Eds.). (2024). Artificial intelligence and composing just education futures. *English Teaching: Practice & Critique*, 23(1), 1–5. <https://doi.org/10.1108/ETPC-04-2024-202>
- Spector, C. (2023, October 31). *What do AI chatbots really mean for students and cheating?* Stanford Graduate School of Education. <https://ed.stanford.edu/news/what-do-ai-chatbots-really-mean-students-and-cheating>
- Storm, S. (2025). Youth are literary scholars: What tracing aesthetic practices and interpretive scales suggests for disciplinary literacy in English language arts. *Reading Research Quarterly*, 60(3), e70029. <https://doi.org/10.1002/rrq.70029>
- Stornaiuolo, A., Higgs, J., Nichols, T. P., LeBlanc, R., & de Roock, R. (2023). The platformization of writing instruction: Considering educational equity in new learning ecologies. *Review of Research in Education*, 47(1), 311–359. <https://doi.org/10.3102/0091732X241227431>
- Tanksley, T. C. (2022). *When Black death goes viral: How algorithms of oppression (re) produce racism and racial trauma*. SAGE Perspectives. <https://perspectivesblog.sagepub.com/blog/research/when-black-death-goes-viral-how-algorithms-of-oppression-reproduce-racism-and-racial-trauma>
- Tanksley, T. C. (2024). “We’re changing the system with this one”: Black students using critical race algorithmic literacies to subvert and survive AI-mediated racism in school. *English Teaching: Practice & Critique*, 23(1), 36–56. <https://doi.org/10.1108/ETPC-08-2023-0102>
- TED. (2014, April 6). *How biased are our algorithms?* Safiya U. Noble. TEDxUIUC. Video. YouTube. <https://www.youtube.com/watch?v=UXuJ8yQf6dI>
- Thomas, E. E., & Stornaiuolo, A. (2016). Restorying the self: Bending toward textual justice. *Harvard Educational Review*, 86(3), 313–338. <https://doi.org/10.17763/1943-5045-86.3.313>
- Thrall, A., Nichols, T. P., & Magill, K. R. (2024). Speculative frictions: Writing civic futures after AI. *English Teaching: Practice & Critique*, 23(1), 67–82. <https://doi.org/10.1108/ETPC-08-2023-0095>
- Toliver, S. R. (2021). Freedom dreaming in a broken world: The black radical imagination in black girls’ science fiction stories. *Research in the Teaching of English*, 56(1), 85–106. <https://doi.org/10.58680/rte202131344>
- Touretzky, D., Gardner McCune, C., Martin, F., & Seehorn, D. (2019). Envisioning AI for K-12: What should every child know about AI? *Proceedings of the American Association for Artificial Intelligence Conference on Artificial Intelligence*, 33(1), 9795–9799. <https://doi.org/10.1609/aaai.v33i01.33019795>
- Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other*. Basic Books.
- Turner, C. (2023). *10 things to know about how social media affects teens’ brains*. KQED. <https://www.kqed.org/mindshift/61026/10-things-to-know-about-how-social-media-affects-teens-brains>

- Vakil, S. (2018). Ethics, identity, and political vision: Toward a justice-centered approach to equity in computer science education. *Harvard Educational Review*, 88(1), 26–52. <https://doi.org/10.17763/1943-5045-88.1.26>
- Vakil, S., & Higgs, J. (2019). It’s about power: A call to rethink ethics and equity in computing education. *Communications of the Association for Computing Machinery*, 62(3), 31–33. <https://doi.org/10.1145/3306617>
- Vakil, S., & McKinney de Royston, M. (2022). Youth as philosophers of technology. *Mind Culture and Activity*, 29(4), 336–355. <https://doi.org/10.1080/10749039.2022.2066134>
- Vasquez, V. M., Janks, H., & Comber, B. (2019). *Key aspects of critical literacy*. NCTE Classroom Resources. <https://ncte.org/blog/2019/07/critical-literacy/>
- Velander, J., Otero, N., & Milrad, M. (2024). What is critical (about) AI literacy? Exploring conceptualizations present in AI literacy discourse. In A. Buch, Y. Lindberg, & T. Cerratto Pargman (Eds.), *Framing futures in postdigital education: Critical concepts for data-driven practices* (pp. 139–160). Springer Nature Switzerland.
- Vossoughi, S., Marin, A., & Bang, M. (2023). Toward just and sustainable futures: Human learning and relationality within socio-ecological systems. *Review of Research in Education*, 47(1), 218–273. <https://doi.org/10.3102/0091732X231223505>
- Warren, B., Vossoughi, S., Rosebery, A., Bang, S., M., & Taylor, E. V. (2020). Multiple ways of knowing: Re-imagining disciplinary learning. In N. S. Nasir, C. D. Lee, R. Pea, & M. McKinney. de Royston (Eds.), *Handbook of the cultural foundations of learning* (pp. 277–293). Routledge.
- Warschauer, M., & Grimes, D. (2008). Automated writing assessment in the classroom. *Pedagogies: An International Journal*, 3(1), 22–36. <https://doi.org/10.1080/15544800701771580>

Appendix A.

Key Survey Questions

The following questions were included in the pre- and post-unit surveys and are the focus of this paper's analysis.

Pre-Unit Survey Items

- (1) What do you think it means to be a critical user of technology? [open-ended]
- (2) What concerns you about technology, based on your own experiences or what you have heard from other sources? [open-ended]

Post-Unit Survey Items

- (1) What do you think it means to be a critical user of technology? [open-ended]
- (2) What concerns you about technology, based on your own experiences or what you have heard from other sources? [open-ended]
- (3) What information about technology in this unit was new to you? [open-ended]
- (4) To what extent do you think this unit has changed how you think about technology? [1 = has not changed how I think, 2 = has minimally changed how I think, 3 = has moderately changed how I think, 4 = has significantly changed how I think; 5 = has very much changed how I think]

Appendix B.

Final Essay Prompt

The following prompt was given to students for their final analytical essay:

Analyze the ways that you are being influenced by technology, the steps you've taken or want to take to be a critical user of technology, and how technology is impacting your community. You can consider your community here at Inspiration Academy, your family, your friends, or another community that you feel connected with.