Research Article

Composing Science: Everyday Genres and the Power of Literate Activity

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Abstract

STEM education often reinforces a hierarchy in which scientific reasoning is treated as expertise students gain by first mastering sanctioned genres, including lab reports, IMRaD articles, and research posters. This article argues that everyday genres offer a different route: composing in any genre is epistemic work, and the literacies students already bring—storytelling, visual design, multimodality—are among the means through which they enter that work. Drawing on a three-year study of the Picture Book Assignment in an undergraduate environmental science course at a Hispanic-Serving Institution, we show how treating communication as literate activity can create classroom conditions in which reasoning and belonging emerge together. Students analyzed children's picture books and developed public-facing multimodal artifacts—videos, games, animations, infographics—that translated complex ecological systems into accessible forms. Across three iterations, artifacts and reflections indicate reported gains in conceptual understanding, communication with non-experts, and recognition of creativity as scientific practice. Four dimensions of literate activity organize our findings: composing as reasoning, students' literacies as epistemic assets, affect as epistemic infrastructure, and public circulation as accountability. We conclude that accessibility is not accommodation but an epistemic measure of excellence, and that classrooms that recognize students' everyday literacies as legitimate sites of scientific reasoning can support disciplinary understanding alongside the public-facing reasoning science now requires.

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Introductory STEM education often reinforces a hierarchy of genres. Lab reports, IMRaD articles, and research posters are frequently positioned as sites of scientific reasoning while everyday genres—videos, infographics, games, picture books—are framed as communication that happens after the science is completed. By everyday, we mean genres with wide public circulation and low institutional gatekeeping: forms students may consume regularly and can reasonably produce without specialized credentialing. The term describes the genres' cultural position, not an assumption that every student finds them equally familiar—for some students, infographic design is more unfamiliar than a lab report. Many science faculty are neither trained in nor institutionally rewarded for working across this boundary, and students absorb this hierarchy early: scientific authority is expertise they must earn by mastering sanctioned forms before their own literacies count as epistemic work. Yet, writing studies has long challenged this separation. Bazerman (1988), Prior (1999), and Latour and Woolgar (2013) each show that composing—in any genre—participates in the making, stabilization, and circulation of scientific knowledge. The binary between "real science" and "mere communication" is not a finding of writing studies but an institutional habit the field has long pushed against. We call such classrooms resistant spaces: institutional arrangements in which genre hierarchies persist despite this evidence. Importantly, resistant describes a structural condition, recognizable by its effects—which genres count, whose literacies register as epistemic—rather than by the intentions of people working within them. The hierarchy is sustained by Gieryn's (1983) concept of boundary-work, the rhetorical and institutional labor through which fields demarcate legitimate from illegitimate knowledge to defend authority and allocate resources. Genre hierarchies in STEM are one such boundary, policing which forms of composing count as "scientific reasoning" and which are filed under "communication."

To challenge this habit in practice, we designed the Picture Book Assignment (PBA) to treat students' everyday literacies as legitimate entry points into scientific reasoning. The assignment tests what becomes possible when students are invited to reason through public-facing forms instead of first proving their competence in sanctioned ones. We do not treat everyday and high-status scientific genres as interchangeable, nor do we collapse the distinctions between experimental and representational work. Rather, we argue that these genres participate in a shared epistemic activity that is distributed across sites, modes, and audiences. Experimental

genres often foreground data generation and stabilization within disciplinary systems, while everyday genres foreground translation, interpretation, and uptake beyond them. Yet both require overlapping acts of reasoning: selecting variables, modeling relationships, representing uncertainty, and anticipating how knowledge will be understood and used. Our analysis focuses on how everyday genres make these processes visible and accessible to students, not because they are simpler, but because they foreground the representational and relational labor through which scientific knowledge comes to matter.

The stakes of this hierarchy fall especially heavily on STEM majors who are first-generation students. At Hispanic-Serving Institutions (HSIs) like ours, the cost of requiring mastery of sanctioned genres before participation is high: first-generation students often navigate STEM pathways without inherited familiarity with the cultural and communicative norms of scientific practice, making access to those discourses an act of translation as much as learning (Engle & Tinto, 2008; Fernández, Rincón, & Hinojosa, 2021). Our study traces what happens when classrooms treat students' existing literacies—storytelling, visual design, multimodality—not as precursors to scientific reasoning but as the means through which such reasoning takes place. Across three iterations of the PBA, students' multimodal projects made reasoning visible through forms that foregrounded audience, representation, and uptake: they represented causal systems, translated uncertainty, and linked scientific knowledge to community experience. When everyday literacies are recognized as epistemic work, reasoning and belonging stop being sequential: students no longer have to belong *before* they can reason, or reason *before* they belong. They emerge together.

We argue, then, that everyday genres reconfigure scientific reasoning in the classroom by making students' literacies constitutive of it, not preparation for it. We trace this claim through four dimensions of literate activity—composing as reasoning, literacies as epistemic assets, affect as epistemic infrastructure, and public circulation as accountability—each examined as both theory and classroom practice. Consider Maria, Madison, Nallely, and Antonio,[1] whose short video—inspired by *The Lorax* (Seuss, 1971)—follows a CEO who profits from local trees until she learns about the ecological services they provide. The project's epistemic work lies not only in the story it tells but also in the design decisions through which the students translated

[1] Student names are real and appear with their informed consent. This research was reviewed and classified as exempt by the University of Texas at San Antonio Institutional Review Board (IRB) and supported by the USDA NIFA HSI Collaborative Grant, #EcoJEDI: Facilitating Career Readiness in Food and Agriculture Sciences through Science Literacy and Counter Storytelling.

environmental science into story: what to make visible, what to leave implicit, how to pace causal connections. Multimodal composing here renders reasoning and science identity visible together. As one student reflected, the PBA "helped me understand that science is everywhere and doesn't necessarily have to be boring; it can be creative."

Literate Activity, Resistant STEM, and Missing Everyday Genres

Writing studies has long demonstrated that communication is not a neutral conduit but a mode of inquiry, a set of multimodal, situated practices through which knowledge is produced, circulated, and taken up. Bazerman (1988; 2013) shows that scientific texts do not merely report knowledge but help constitute it, while Prior (1999) describes literate activity as the distributed work through which disciplinary reasoning develops across time, texts, and communities. Latour and Woolgar's (2013) laboratory ethnography extends this account by demonstrating how inscriptions—graphs, tables, and notations—stabilize knowledge through material, rhetorical acts of representation. Boundary-work, in Gieryn's (1983) sense, sustains this institutional habit by sorting epistemic labor into categories the institution can more easily discount: representational labor is separated from analytic labor and credited to communication; affective labor is separated from cognitive labor and credited to motivation; public-facing labor is separated from research labor and credited to outreach. The cost extends beyond the classroom: many scientists are trained within institutional systems that reward research and teaching while relegating public engagement to service (Sutter, 2023). These accounts establish the first dimension of our framework: Composing is not a later report of scientific composing but one of the means through which reasoning is organized, stabilized, and made available to others.

If composing participates in scientific reasoning, then students' existing literacies are not stylistic flourishes but epistemic resources, the means through which knowledge is produced, interpreted, and shared (Kovanen et al., 2022). Genre theory has long shown that high-status forms confer legitimacy precisely by marking disciplinary boundaries, reinforcing a deficit model in which students must master sanctioned forms *before* they can participate meaningfully (Berkenkotter & Huckin, 1995; Devitt, 2004). When this gatekeeping shapes introductory "weed-out" environments, first-generation STEM majors can experience participation as contingent on prior familiarity with disciplinary discourse, a condition linked to lower persistence (Seymour & Hunter, 2019). Everyday genres challenge this

hierarchy by enabling students to reason through their own cultural and experiential literacies, what González, Moll, and Amanti (2005) term "funds of knowledge" that sustain learning within their home communities. At HSIs, where many students are first generation and Latinx, the institutional cost of treating sanctioned forms as prerequisites is especially consequential: recognizing students' literacies as epistemic resources—rather than as preparation for them—is the second dimension we develop.

Asset-based frameworks in higher education (Nora, 2003; Yosso, 2005) similarly show that persistence and belonging emerge when institutions recognize students' existing forms of capital—familial, linguistic, aspirational, among others—as foundations for academic success (Fernández, Rincón, & Hinojosa, 2021). Applied to STEM communication, this approach redefines expertise as relational and community-based rather than detached or purely technical. Roozen (2024) sharpens this account by showing that writing develops through the repurposing of semiotic practices along embodied histories rather than the transfer of isolated skills. Students are not simply applying pre-existing literacies to new tasks; they are continually transforming those practices as the practices themselves entangle and reshape their trajectories of becoming. Kovanen et al. (2022) extend this perspective by showing that disciplinary knowing emerges through embodied histories of literate activity, where writing, representation, and participation are inseparable from becoming. Because these histories are textured by affective intensities as much as by intellectual ones, their account raises the question of how belonging and emotion shape students' capacity to see themselves within scientific communities. Belonging takes shape, in part, through the affective and embodied dimensions of composing. Crosswhite and Hum (2026) describe literate activity as inherently affective and embodied: when students compose through personal, cultural, or creative literacies—storytelling, animation, or digital design—they integrate dimensions of the self that conventional scientific discourse often brackets or leaves less visible. Kress (2010) provides a broader multimodal frame for this claim, showing that meaning emerges through the orchestration of modes rather than through language alone. Airey and Linder (2009) extend this insight to science learning specifically, showing that disciplinary knowing depends on coordinated movement among semiotic resources—graphs, visuals, words, and equations—rather than on treating language as a secondary delivery system for scientific content. Govender's (2025) review of digital literacies in STEM education similarly demonstrates that visual and digital composing are integral to contemporary scientific collaboration. Within this multimodal frame, everyday composing mobilizes cultural and affective repertoires—Rose's (1989) "intelligence of practice"—so that play and creativity function not as add-ons to learning but as

embodied conditions for curiosity, persistence, and confidence. Treating science as cultural participation aligns with work showing that science stories organize experience, identity, and emotion (Chen et al., 2023; Davies et al., 2019). Affect, then, is not a support for reasoning but part of how reasoning happens, the third dimension we develop.

The fourth dimension is public circulation as accountability. If composing organizes scientific reasoning, then circulation tests whether that reasoning travels across audiences and contexts. Public-facing genres make this movement visible because they require writers to anticipate audiences beyond the instructor and to design explanations that can hold up across different forms of expertise, experience, and concern (Hunter, 2016). Science communication scholarship shows that public understanding depends not only on accurate information but also on forms that make scientific reasoning legible, situated, and open to response (Intemann, 2023; Sutter, 2023). Myers (2003) similarly challenges the boundary between scientific and popularized discourse, arguing that public science communication is not a degraded version of expert knowledge but a discursive site where scientific meaning is reworked. Fahnestock (1986) makes this reworking visible by showing how scientific facts are rhetorically transformed as they move from expert research reports into public accounts. Writing studies offers a parallel account of the genre mechanisms through which such movement occurs: genres do not simply carry knowledge outward but function as forms of social action that organize recurring relations among writers, audiences, and publics (Miller, 1984; Bazerman, 1994; Devitt, 2004). In the PBA, public-facing genres such as videos, infographics, games, and animations are not departures from scientific reasoning; they are sites where reasoning becomes accountable to uptake, where audiences beyond the classroom can test, adapt, and respond to scientific knowledge.

Research Context: Everyday Genres in an Ecology of Literate Activity

This study emerged from a cross-campus collaboration among three Hispanic-Serving Institutions across San Antonio, Texas: The University of Texas at San Antonio (UT San Antonio), Our Lady of the Lake University (OLLU), and Northeast Lakeview College (NLC). Funded through the U.S. Department of Agriculture's National Institute of Food and Agriculture, the project supports cross-campus coordination, faculty workshops on science communication, and multimodal storytelling activities. The San Antonio context matters because the city is majority-Latinx and because many students at the participating institutions balance

coursework with employment and caregiving. The partnership brings together UT San Antonio's research capacity with the community-based teaching missions of OLLU and NLC. The Picture Book Assignment (PBA) emerged from this partnership as a means of translating environmental science into everyday genres that circulate across the communities students call home.

The PBA was implemented in Environmental Science and Sustainability II at OLLU, a lower-division, general-education course aligned with the university's mission of social justice and applied learning. OLLU is a private Catholic HSI on San Antonio's Westside that serves many first-generation, Pell-eligible students who often arrive with uneven access to prior research opportunities. The course retains many conventional features of introductory STEM instruction—labs, exams, reports—with communication typically positioned as secondary, a positioning the PBA sought to interrupt. The PBA was scaffolded across the semester as a four-week module nested within a twelve-week project arc. At HSIs, writing that links coursework to public audiences supports leadership development and cross-cultural engagement (Soria & Johnson, 2017), and the PBA was designed to bring the literacies students already carry into the work of scientific reasoning.

Our analysis draws on three iterations of the PBA (Spring 2023, 2024, 2025) and combines three data sources: student artifacts produced across all three iterations (n = 90 students, working in small groups of two to four), required end-of-project reflections submitted through the course management system, and a Likert-plus-open-response survey administered on the last day of class in Spring 2025 (n = 29). The survey, reported in Table 1, assessed perceived gains in conceptual understanding, communication with non-experts, and the role of creativity in scientific work, with an open-response section eliciting reflection on the final project. Artifacts and reflections were treated as one corpus and analyzed inductively in two cycles. The first cycle attended to how students made scientific reasoning visible through representation, translation, and audience design. The second cycle focused on three analytic categories: how scientific concepts were modeled, how affective stance and identification surfaced in students' composing processes and reflections, and how audience considerations shaped explanation. Artifacts and the reflections of their authors were read together so that compositional choices could be interpreted alongside the rationales students offered for them. Iterations were analyzed as a single corpus rather than longitudinally, since assignment design and instructor remained constant across years and our interest is in the genre's affordances rather than year-to-year change. Survey responses were used to corroborate qualitative patterns and to surface points of tension, not as outcome measures.

Student names and quoted reflections appear with informed consent under the IRB exemption noted above. We write from intersecting positions as designers and analysts of the assignment. Hum, a rhetoric and writing studies scholar, led the writing-enriched curriculum intervention across the partner institutions; Crosswhite, also in writing studies, developed the storytelling pedagogy at OLLU; Salas, an environmental scientist, integrated the PBA into her course, led classroom implementation, and managed data collection across the three iterations. Together, we designed and revised the assignment across iterations, with Salas leading course implementation and data collection. Because we are not neutral observers of an intervention we designed, we treat the PBA throughout as both pedagogy and research site, and we have foregrounded student voice in the corpus to check and complicate our reading of it.

The PBA enacts literate activity by distributing reasoning, creativity, and identity across texts, media, and audiences. A complete description of the four-stage scaffolding, the genre-selection process, and the public showcase appears in Appendix A; the list of picture books from which groups selected appears in Appendix B. In summary, students worked in groups across four lab periods (each two hours and forty-five minutes) and continued the project outside class. Stage one analyzed a self-selected children's picture book for environmental themes (climate change, pollution, biodiversity loss) and connected those themes to course content. Stage two asked groups to propose a multimodal project in a genre of their choosing, with no genre prescribed, so that students could compose with literacies they already held or wanted to develop. Stages three and four covered drafting, peer feedback, and revision. The module culminated in a mini-symposium open to peers, faculty, and invited guests.

Everyday Genres Deepen Scientific Reasoning

Although high-status genres often structure introductory STEM education, everyday genres make core scientific practices—modeling, visual integration, and iterative explanation—visible to students. When students compose videos, games, infographics, animations, and other public-facing artifacts, they enact the composing and interpretive labor through which scientific knowledge is produced (Bazerman, 1988; Prior, 1999). In the PBA, this enactment appeared across student artifacts, reflections, and survey responses: in the Spring 2025 survey, 93 percent of students agreed that the assignment deepened their conceptual grasp of science (Table 1), and reflections used the vocabulary of reasoning rather than recall, describing how composing helped them "understand," "explain," and "connect" scientific ideas. One

student located this shift in the act of drawing itself: "I had to learn how certain things functioned to draw them out appropriately…by drawing them accurately, I felt that I truly understood exactly what I was learning and attempting to teach my classmates." Drawing here functions as representational reasoning: knowledge made visible through the work of composing.

Reasoning deepened when students designed for audiences beyond themselves. 90 percent of students reported improved ability to communicate with non-experts (Table 1), and the act of simplifying, translating, and contextualizing knowledge for peers, children, and other non-specialist audiences required them to reconstruct what they understood. As one student put it, "simplifying a complex topic for peers and children revealed how a small scientific effect can cause chain reactions," a recognition of causal mechanism that arrived through audience design (Gere et al., 2019). Haas's (1994) case study of "Anne" similarly shows how learning biology required navigating and interpreting networks of scientific texts: composing was the learning. Creativity functioned as part of that same cognitive process: 89 percent of students agreed that the PBA helped them appreciate how creativity, storytelling, and visual design contribute to scientific work (Table 1). One student traced the connection directly: "Creating a picture book showed me the different ways a topic can be conveyed to properly target a certain audience. It also showed me how interdisciplinary science can be as we had to use graphic design to properly display our information."

Reasoning in the PBA was also collaborative and distributed across people, tools, and modes, rather than confined to individual cognition (Prior, 2018; Roozen, 2024). Aaliyah, a biology major, and Katie, an art major, built an animated video[2] on synthetic pesticide use and natural alternatives, modeled on *Rachel Carson and Her Book That Changed the World* (Lawlor, 2012) and informed by *Silent Spring* (1962). Katie animated while Aaliyah narrated, and the division of labor turned reading into modeling: narration and motion became analytic tools. Both reported that the multimodal project taught them more than traditional reading-summary tasks. As Katie explained: "Working with animation in another field let me express my personal interests while teaching about the environment…My peers even said they would remember the science because of the visuals." Aaliyah added that the project "helped me understand the science better because I had to think about how to explain it, not just memorize it." Their collaboration shows how everyday genres distribute reasoning across disciplinary strengths, media tools, and audience expectations.

[2] The video can be viewed at this link: https://www.youtube.com/shorts/EUaTnlkUf8E

Where Aaliyah and Katie's animation translated through narration and motion, other groups translated through play.

Play extended this reasoning by turning uncertainty into something students could manipulate: a form of exploratory reasoning that turns risk into experimentation and constraint into invention (Dewey, 1938; Sutton-Smith, 1997). Drawing on *The Pout-Pout Fish Cleans Up the Ocean* (Diesen, 2019), Marlia and Emily built a playable model of coral-reef health organized around the causes and effects of coral bleaching, translating ecological complexity into an interactive system. The game board asked players to move through a reef ecosystem by drawing positive, negative, or change cards. Positive cards represented actions or conditions that supported coral health and moved players forward; negative cards represented stressors associated with coral bleaching and moved players backward; change cards introduced uncertain effects that could alter the direction of play. In this structure, coral bleaching was not presented as a single event but as an accumulation of pressures and interventions. Players had to track how human action, ocean conditions, and chance events changed reef health over time. Each unexpected "plot twist" prompted laughter and surprise as players tested how a small disturbance propagated through the reef. As Marlia and Emily translated environmental data into rule cards and refined them through repeated playtesting, the game became both a study and a performance of how knowledge is built. Across projects of this kind, design and iteration made causal reasoning visible: play surfaced uncertainty as a feature of scientific systems rather than a flaw in student understanding.

Across these examples, everyday genres made scientific reasoning visible and participatory: representation, iteration, and audience design exposed forms of intellectual labor that can remain less visible when communication is treated only as final reporting. They also foregrounded the assets students already bring—narrative sense-making, visual design, multilingual and community knowledge—a point we take up next.

Everyday Genres Reveal the Epistemic Assets Students Bring to Science

Everyday genres can loosen closed systems of science by expanding what counts as expertise and by foregrounding the literacies students already possess. An asset-based framework reframes these community-derived knowledges as epistemic resources rather than deficits (González, Moll, & Amanti, 2005), challenging a culture in which authority resides in sanctioned genres and the performance of "sounding scientific" can be mistaken for reasoning. As Dewsbury (2025) argues, deficit

narratives in science education often frame underrepresentation as a problem of individual lack rather than systemic exclusion, obscuring the cultural and relational dimensions that shape who is recognized as capable of doing science. Students enter STEM classrooms with sophisticated communicative repertoires—bilingual and multimodal literacies, social media fluency, community storytelling, and artistic design—that are often rendered invisible by traditional assessments of scientific writing. At HSIs, where many students are first-generation and Latinx, this invisibility carries especially significant institutional cost. The PBA counters this gatekeeping by treating communication as an entry point rather than a filter, making reasoning public and giving students early, authentic successes in disciplinary discourse and fostering the belonging and self-efficacy associated with persistence in STEM. Women and students from historically underserved populations continue to leave STEM disciplines at disproportionate rates (Eddy & Brownell, 2016), but when classrooms treat communication as literate activity and everyday literacies as assets, they can make participation more visible and attainable, while redefining rigor as relational and reasoning as collective.

Asset-based approaches reveal that literacies developed outside science classrooms can serve as resources for inquiry and innovation (Yosso, 2005; Moll et al., 1992). By privileging only technical or data-driven expertise, institutions reinforce the hierarchies that narrow participation and prize grants and publications above the relational, rhetorical work that makes knowledge matter (Sutter, 2023; Núñez, 2024). In practice, scientific expertise now depends on navigating multiple textualities, visual, oral, and digital, as knowledge circulates through networks rather than silos (Steinke et al., 2024). The PBA surfaces these capacities by treating students' existing literacies as tools for building and sharing scientific knowledge, as one student explains: "The connections I noticed were how it goes hand in hand with filmmaking or having some type of knowledge for making video in media. Also, having skills like public speaking and having the ability to draw people's attention to what you are trying to present, which would be marketing." The student's response names film, public speaking, and marketing not as distractions from science but as resources for making science legible to others.

Everyday genres expand scientific authority by integrating professional, cultural, and community ways of knowing. Student projects illustrate how these literacies broaden participation. Jeyden, a Mass Communication – Digital Film and Multimedia major, created a live-action video, inspired by *Our House Is on Fire* (Winter, 2019). His short film follows a college student returning to a sweltering dorm room, where a televised news segment on climate change turns frustration into curiosity. The result

is both humorous and persuasive. Jeyden's media storytelling background, developed outside the science classroom, became the very means through which he reasoned about global warming. His attention to sound, editing, and pacing translated abstract concepts into an emotionally compelling narrative. Rather than diluting science, his work demonstrated that communication skills make environmental issues legible, urgent, and audience-centered. Lived experience also operates as an epistemic asset in the PBA. Working from *Penguins Don't Wear Sweaters* (Tamura, 2021), Anastacia, Angel, and Nathanial produced an animated short film on offshore drilling, shaped by personal history: the animator's father survived the Deepwater Horizon explosion. Through timing, visual metaphor, a deliberate cut to black, and the use of community knowledge, the team linked lived experience to policy response, making ecological risk visible as shared concern. Here, personal experience guided design, salience, and argument, showing how storytelling turns memory into evidence and emotion into explanation.

The reciprocity between literate activity and scientific expertise extends beyond the classroom. A regional parallel clarifies why these classroom practices matter. Though not part of the PBA itself, the Hill Country Alliance (HCA) shows how multimodal, asset-based composing already operates as scientific labor in our regional public ecology.[3] The HCA, a nonprofit dedicated to protecting the land, water, and communities of Central Texas, exemplifies this alignment between community-based and cultural literacies. The HCA employs a science storyteller whose primary role is to connect scientific research to everyday life. Through visual, spoken, and written narratives about aquifers, night skies, and native landscapes, she shows how conservation is relevant to people's daily lives. Her work models asset-based literate activity: she draws on rhetorical, visual, and cultural resources to make environmental knowledge legible and actionable across publics. In this context, narrative and design are not supplements to science but mechanisms of reasoning-in-public, translating specialized knowledge into forms that invite uptake, interpretation, and response. This parallel clarifies what students practice in the PBA: the same translational labor through which scientific knowledge circulates beyond expert communities.

Just as the HCA translates complex science for diverse audiences, students in the PBA engage in parallel acts of translation, drawing on their own literacies to make

[3] We became familiar with HCA's work, including Leah Cuddeback's science storytelling outreach, through a separate grant collaboration in which we contracted HCA to deliver a presentation on science storytelling and audience. Here, the HCA functions here as a parallel regional case, not a PBA partner.

science accessible and meaningful. At the same time, student uptake was uneven. Some described the PBA as an opportunity to use existing skills in film, public speaking, drawing, or marketing; others framed the project as a place where they learned unfamiliar tools such as video editing or graphic design. These differences complicate any simple claim that everyday genres are automatically familiar or empowering. Rather, the PBA's value lies in making a wider range of literacies available for scientific reasoning, whether students entered with those practices already in hand or developed them through the project. The broader account of scientific literacy also aligns with contemporary scientific work—grant proposals, policy briefs, data visualization, and public outreach—where, as Jensen et al. (2023) demonstrate, scientific meaning is constructed through communicative design that merges accuracy, narrative, and affect. A Penn State report on integrating data visualization in science and engineering education similarly notes that even students not pursuing research careers view visualization and communication as essential for stakeholder engagement and public understanding (Pennsylvania State University, 2023). Through these genres, students practice the collaborative habits that make science work: integrating ideas across disciplines, designing for clarity, and composing across modes. Such practices are not peripheral "soft" skills; they are how scientific expertise is built, shared, and sustained across networks of people, tools, and publics. They also shape how students come to see themselves within scientific work, a question we take up next.

Everyday Genres Make Affect an Epistemic Resource

Everyday genres reveal that affect is not separate from reasoning but one of the ways reasoning takes shape. Literate activity is inseparable from emotion, play and creativity; writing studies has long shown that affect functions as epistemic infrastructure for composing (Micciche, 2007; Ivanič, 1998; Shipka, 2011; Ware, 2021). Resistant STEM spaces often obscure affect where genre hierarchies sort affect into the category of distraction and cognition into the category of real work, a sorting that is not neutral but constitutive of what the institution counts as science. Science education research offers a parallel account: epistemic emotions—curiosity, frustration, the satisfaction of explanation—can initiate and sustain scientific engagement rather than decorate it (Jaber & Hammer, 2016; Vilhunen et al., 2023). Affect, in this account, is not what helps students reason; it shapes what their reasoning is about. When students compose in everyday genres, affect is not a byproduct of the work; it is part of what lets the reasoning become visible and durable. Pride in a craft tradition tunes attention to detail; curiosity pulls students back to a

problem a second and third time; the frustration of a failed explanation drives revision. Research has tied recognition, competence, and self-efficacy to science identity and persistence (Carlone & Johnson, 2007; Chemers et al., 2011; Davis & Philip, 2025), but the mechanism runs deeper than motivation: students learn—and persist in STEM—because the affective engagement can make certain problems worth pursuing, especially when the work connects with who they are (Prior & Olinger, 2019). This perspective clarifies affect in the PBA is not an overlay but a condition of reasoning: it sustains attention, shapes what counts as significant, and keeps students engaged in complex interpretive work.

Extending this insight, Crosswhite and Hum (2026) show how a multimodal counter-storytelling assignment—scaffolded with models, storyboarding, peer review, low-barrier tools, and feedback—enables students to move from knowledge-telling to knowledge construction. Their work demonstrates that when students compose through culturally and affectively resonant forms, affect does not supplement reasoning; it becomes part of how students think through the material. This is what we mean by *affect as epistemic infrastructure*: the "fun" of a board game, the pride in arts training, or the urgency of public storytelling do not distract from disciplinary work. They are representational, attentional, and relational conditions that shape what students notice, how long they stay with a problem, and what solutions they can imagine. In these moments, affect helps students inhabit scientific problems as problems they can interpret, model, and communicate.

This recognition carries particular weight at HSIs, where cultural and affective literacies already shape how students navigate academic spaces and where many students are first-generation or Latinx. Berthoff (1982) frames composing as the movement from sensing to thinking, the formative act that turns experience into concept: affect is not a prelude to knowledge but its medium. At HSIs, where students often arrive with rich narrative, visual, and linguistic repertoires cultivated outside STEM, recognizing affect as medium is not primarily about making students feel welcome (though it often does). It is about letting the repertoires they carry do disciplinary work. For the PBA, recognizing affect as epistemic means that feeling, reflection, identity, and community knowledge are not adjacent to rigorous inquiry; these affective and cultural resources are part of the material through which students decide what matters, how to represent scientific problems, and why an audience should care. If literate activity helps constitute scientific reasoning, then literate activity also helps constitute science identity. Everyday genres therefore make belonging epistemic: students come to see themselves as participants in science through the very practices by which they reason. The clearest case of affect as

epistemic infrastructure is not one where emotion sustained engagement, but one where it organized relevance. Working from *Saving American Beach* (King, 2021), Clarissa and Lauren filmed a site-based explainer at the UNESCO World Heritage San Antonio Missions, connecting cultural memory with environmental science. Their short video—grounded in on-site narration and a wry nod to solving problems "without TikTok tutorials"—invites viewers to care, framing the mission grounds as a site where cultural heritage, environmental knowledge, and public responsibility intersect. Though neither student is a STEM major, the everyday genre of a site-based explainer translates water conservation, pollution, aquifer recharge, urban growth, sustainable development, erosion, and biodiversity into locally meaningful reasoning. Pride in place structured what counted as relevant and engaging in the film. Clarissa and Lauren knew of the Missions as sites of cultural memory—and that knowledge let them see hydrological relationships that might remain less visible in a more abstract treatment of the same topic. Rather than motivational scaffolding alone, affect served as the condition under which certain scientific relationships became visible.

The same logic operates in a constructive register. In another project on offshore oil drilling, inspired by *Penguins Don't Wear Sweaters* (Tamura, 2021), Michaela, Miranda, and Noah built a working LEGO model of a drilling platform (Figure 1) to explain how fossil fuels are extracted from beneath the ocean floor and the environmental risks that result.

Figure 1

LEGO Drilling Platform Model

The LEGO platform functions as an everyday genre, translating specialized engineering and ecological systems into a familiar, playful medium that encouraged experimentation and visual reasoning. The construction itself became reasoning: building the platform required students to work out how extraction operates physically, what systems depend on each component, and where environmental failures occur. Students did not simply learn about drilling risk and then represent it. By working with the blocks, they reasoned their way into care, and that care shaped which failure points they modeled, which risks they foregrounded, and what counted as an adequate explanation. The affective investment became a filter on what the reasoning was about. Student reflections and survey responses echo this pattern across the cohort: students repeatedly described the PBA with affective language—"fun," "different," "creative," "out of my comfort shell"—that we read as evidence that affect shaped in their reasoning.

These projects make a claim about the shape of scientific reasoning. Affect does not enable reasoning or distract from it; affect influences what reasoning takes as its object, shaping what counts as a relevant variable, an adequate explanation, a problem worth modeling. As one student wrote: "I believe that with the picture book assignment, I was able to discover that anyone can learn about things that are going on with science topics." When affect is recognized as constitutive of reasoning rather

than ancillary to it, the strategies that help students reason well—authentic audiences, low-barrier multimodality, recognition-forward feedback—are also the strategies that let reasoning circulate beyond the classroom, as the next section discusses.

Everyday Genres as Public Infrastructures of Science

Everyday genres extend scientific reasoning by moving explanation into shared spaces where audiences can interpret, question, and respond to it. We argue that public-facing forms—such as short videos, murals, interviews, games, and reels—function as *infrastructures* of public science. By *infrastructure*, we mean the often-invisible systems through which scientific meaning circulates, is taken up, and is revised—the representational, institutional, and affective conditions that let reasoning cross between experts and publics. These forms do not simply transmit findings; they shape the conditions under which scientific reasoning becomes visible, situated, dialogic, and accountable. This shift clarifies why trust depends not on research data alone but on connection (Intemann, 2023). As Sutter (2023) observes: "giving the public more information isn't the best way" to build trust; publics need communication that offers access to scientists' minds and hearts, seeing them as "people whom they can empathize with and learn to trust."

Writing studies research shows that everyday genres organize activity, move across settings, and recontextualize knowledge. Falconer (2024) demonstrates how genre systems shuttle discourse across institutional domains, carrying with them the roles, audiences, and constraints that make action possible. Popular and hybrid genres extend this reach: Riser et al. (2020) and Tidy et al. (2024) show that memes and other vernacular forms can foster conceptual uptake by compressing disciplinary content into accessible, remixable signs. Public art functions similarly: Thompson et al. (2023) describe community murals as "public laboratories" that bind environmental data to local memory and collective identity. Because today's publics are networked, Van Eperen & Marincola (2011) argue that social media does not sit outside science; it is a channel through which scientists can rapidly disseminate, test, and iterate meanings with diverse audiences. This scholarship clarifies the mechanism at stake in our classrooms: public-facing genres recontextualize scientific explanation into familiar forms, materializing ideas in media that invite interaction, and orienting reasoning toward audiences who evaluate claims through empathy, place, and shared stakes. When students compose for specific audiences beyond the instructor, they learn that representation is not secondary to science; it shapes what science can explain, invite, persuade, and make actionable.

These dynamics come into focus in students' public-facing projects, where design, narrative, and participation converge. Consider Casie and Julianna's Environmental Justice infographic, inspired by *We are the Water Protectors* (Lindstrom & Goade, 2020). Their work began with research—defining environmental justice, identifying historical cases, and tracing patterns of disproportionate harm—but the epistemic action happened in the design. By juxtaposing the Flint water crisis, Louisiana's "Cancer Alley," and the Dakota Access Pipeline, the students reframed disparate events as a visual argument about policy, race, and risk. Titles and micro-captions orient readers to systems rather than anecdotes; icons and spatial grouping enabled scanning without sacrificing complexity. The result is not a summary poster but a public reasoning device—a form designed to be shared, discussed, and challenged—through which environmental science became attached to public judgment. The students later reflected that choosing their cases and designing for peers "made the patterns hard to ignore." This is the distributional logic of everyday genres: they lower the threshold for public uptake while raising the floor for critical engagement.

A second project by Arely and Dasha, informed by *The Pout-Pout Fish Cleans Up the Ocean* (Diesen, 2019), extended this logic through embedded dialogue. Their public interview series along the San Antonio River Walk posed questions, such as "What does pollution mean to you?" and "Where do you see it?" Rather than test factual recall, the students elicited situated knowledge, inviting participants to narrate lived exposure to environmental harm. Editing choices—including muting ambient sound, lower-third captions, and stitched clips—transformed these conversations into a public text that, in turn, reshaped the students' own understanding of watershed dynamics and policy debates. The students did not present themselves as distant explainers but as participant-learners, modeling the posture Sutter (2023) advocates: scientists and science communicators as relatable, responsive humans whose credibility grows through listening and care. In the process, the PBA moved science from a classroom topic to a shared problem space, one that belongs to walkers, families, city workers, and students alike.

At the community level, the Texas Water Foundation's mural collaborations—though outside the PBA itself—extend the same distributional logic into the public sphere, showing how regional actors enact literate activity about water resources across Central Texas. In San Antonio's South Side, *Yanaguana Rain Dream* (Figure 2), by artist Cruz Ortiz (2022), reimagines water conservation through Indigenous and Latinx visual languages.

Figure 2

Yanaguana Rain Dream Mural

Situated in a working-class, majority-Latinx neighborhood, it grounds hydrological science in lived experience, linking sustainability to heritage, pride, and place (Carnett, 2022). Building on this model, the Foundation collaborated with the Hill Country Alliance (HCA) to co-sponsor the *Kerrville Runs on Water* (Figure 3), a 1,140-square-foot mural by artists Gary Lovlice and Melissa Muse (2024), who use native flora and fauna to frame water-conservation messages anchored in local pride (Cuddeback, 2024; Lavender, 2024; Lovlice & Muse, 2024).

Figure 3

Kerrville Runs on Water Mural

A companion project—*Junction's Living Water* (Figure 4)—was created with the Llano River Watershed Alliance, Junction High School students, and artists Oly Limon and Christian Powers (Limon & Powers, 2024). That mural translates hydrological science into intergenerational storytelling, blending the region's agricultural life, river systems, and cultural memory.

Figure 4

Junction's Living Water Mural

These murals are *both* decorative *and* epistemic: genre-mediated sites of public reasoning where environmental data acquire meaning through place, color, and narrative. What students rehearse in the PBA—translating science into accessible, emotionally resonant, place-based forms—is structurally continuous with the work that professional communicators and community artists enact in the region. These murals do not serve as additional student data; they situate the PBA within a regional ecology of public science communication.

From the perspective of literate activity, these outcomes are not "soft"; they define the conditions under which knowledge circulates beyond the lab. Across projects, students learned three linked practices that everyday genres cultivate especially well. First, audience design as method: composing for specific audiences encouraged teams to define stakes, anticipate misconceptions, and select explanatory frames such as analogy, narrative arc, before-and-after visualization. This method is not "after the science"; it is how science travels, and in that traveling, changes what questions matter. Second, tuning tone for public uptake: students learned to wield tone, pacing, and image to invite concern without fatalism or catastrophe rhetoric. They discovered that a cut to black, a child's voice-over, or a hand-drawn hydrograph can carry more epistemic weight in public spaces than a paragraph of specialized terminology. Third, accountability through circulation: because these genres circulate, they answer back.

Peers comment, family members critique, community partners repost, and instructors must contend with those responses.

For students—especially first-generation students at HSIs who often feel invisible to disciplinary culture—public-facing genres can reposition them as credible participants in scientific discourse. Students experienced accountability not through grading alone but as public uptake, a felt obligation to be accurate, fair, and clear, as reflected in student feedback: "I feel like creative/storytelling techniques are the main way I am able to learn best so it is a great skill to be able to offer my community when I can talk about or teach about a scientific topic in a way that others might find easier to digest." The very literacies they bring from outside the classroom become recognized as scientific work when the goal is to move ideas across publics. That recognition matters because early, authentic success in making science meaningful to others can transform communication from a hurdle to an on-ramp.

In sum, the pathway is direct: representation enables circulation, circulation invites recognition, and recognition redistributes who can speak for science. This public distribution rests on composing as reasoning, the activation of students' home and community literacies, and the affective experiences that turn participation into science identities. Instructionally, the design moves are clear: build for authentic audiences, require low-barrier multimodality, and foreground recognition-forward feedback so students see their literate activity take hold beyond the classroom.

Implications: Designing Literate Ecologies for STEM Participation

Scientific reasoning is, at heart, a problem of design and participation. The PBA's central finding is that reasoning and belonging are not sequential achievements but co-emergent conditions of literate activity, and that the genre system of a classroom can be designed to make them so. The four dimensions we have traced interlock rather than stack: *composing-as-reasoning* establishes that scientific knowledge is made through representational labor, not after it; recognizing students' *literacies as epistemic assets* supplies the materials through which that labor takes place; *affect* organizes which problems become worth pursuing and which relationships become visible; and *public circulation* tests whether reasoning travels across audiences. We use *accessibility* throughout the article in a specific epistemic sense: the condition in which scientific reasoning can be reproduced, reinterpreted, and revised across audiences with different cultural, linguistic, and disciplinary repertoires. Accessibility in this sense is not a courtesy extended to non-experts; it is a property of knowledge that has become robust enough to circulate. This is not an argument against high-status genres, which

remain important sites of disciplinary reasoning. It is an argument against the institutional habit—sustained by the boundary-work the introduction named—of treating everyday genres as communication that happens *after* science. That habit defers both the reasoning and the belonging students can bring to the classroom from day one.

For writing studies, this article contributes a specific claim to the field's design turn (Shipka, 2011; Prior, 2018; Kalmár & Stenfert, 2020): literate activity can be intentionally designed to make reasoning and belonging co-emergent rather than sequential. Methodologically, this claim shifts literate activity research from analytic lens to design framework, from observing literacy in situ to building environments in which reasoning becomes visible across media and audiences. For STEM educators, the move is tractable but not trivial: rather than asking whether students are "ready" for scientific reasoning, ask whether the classroom's genre system has included literacies they can reason *through*. That question yields three transferable design principles. First, *authentic audiences*—composing for peers, faculty, invited guests, and community audiences—turn explanation into inquiry and make accountability felt rather than imposed. Second, *low-barrier multimodality* lets students enter reasoning through the representational practices they already command, rather than through genres that require them to sound credible before they can think carefully. Third, *recognition-forward feedback*—naming what students bring as scientific work—converts existing literacies into disciplinary confidence. These principles work only where institutional conditions support them: in classrooms still policing genre hierarchies, "tractable" gives way to resistance, and the design move is harder won. For public science, the implication runs through circulation: trust depends on genres that make reasoning visible and revisable, and the literate ecology in which the PBA participates already exists in our region. The Hill Country Alliance's science storyteller, the Texas Water Foundation's mural collaborations in San Antonio's South Side, Kerrville, and Junction are not adjacent illustrations but evidence that the classroom is one node in a system of public reasoning that operates at scale. What students rehearse in the PBA, professional communicators and community artists are already doing in the region; the design problem is to build the connections.

Our findings come from one course context at one HSI, and the Spring 2025 survey captures students' reported perceptions rather than longitudinal outcomes. Future research should follow how students carry these literacies into later STEM coursework, public science projects, and professional contexts, and might examine how similar genre ecologies function across different institutional settings. Within those limits, the article's claim is durable: literate activity is not secondary to scientific

work, but one of the ways scientific work becomes thinkable, teachable, and accountable. Consider, again, Maria, Madison, Nallely, and Antonio, whose CEO-and-trees video did not communicate environmental science after the science had been done. The video was the site at which ecosystem services became reasonable to its makers, audible to its audience, and theirs to carry forward. The classroom cannot guarantee that movement, but it can be designed for it. Asking whether the classroom's genre system gives students literacies they can reason *through* is the practical form of that design—and the most consequential question this article means to leave with the field.

Table 1. Student Perceptions of the Picture Book Assignment (Spring 2025, n = 29)

Survey Item	% Strongly Agree / Agree	Representative Student Comment	Reasoning/Interpretive Insight
This project helped me understand scientific concepts more deeply than traditional assignments (such as exams or lab reports).	93 % (54 % strongly agree + 39 % agree)	"I had to learn how certain things functioned to draw them out appropriately. By drawing them accurately, I felt that I truly understood exactly what I was learning and attempting to teach my classmates."	Visualizing systems required identifying mechanisms
Creating and sharing a picture book project about a science topic improved my ability to communicate scientific ideas to non-experts.	90 % (54 % strongly agree + 36 % agree)	"Simplifying a complex topic for peers and children revealed how a small scientific effect can cause chain reactions."	Translating for audience prompted abstraction and clarity
Participating in this project helped me appreciate how skills such as storytelling, creativity, or visual design can contribute to scientific work.	89 % (68 % strongly agree + 21 % agree)	"This experience helped me comprehend and express my understanding of science in a different way… Science is everywhere and doesn't necessarily have to be boring—it can be creative."	Students reframed creativity as part of scientific practice

Appendix A: Picture Book Assignment Design

This appendix reproduces the Picture Book Assignment as distributed to students in BIOL 1410 (Environmental Science and Sustainability II) at OLLU, including the assignment overview, scaffolded timeline, proposal sub-assignment, and grading rubric. Materials are drawn from the most recently taught iteration; minor formatting adjustments have been made for presentation.

A.1 Assignment Overview and Rationale

The assignment was framed for students as follows: "A narrative I stress multiple times in teaching Environmental Science and Sustainability is that the themes discussed throughout the course contain information that should be general knowledge to the public. Unfortunately, due to a variety of barriers including education, equitable internet access, the spread of misinformation, etc., many are unaware of the critical issues facing our environment like pollution, biodiversity loss, climate change, environmental justice concerns, misuse of chemicals, and overwhelming waste production. *Your overall goal in this assignment is to create an informational product that will be used to communicate the main themes of a children's picture book to your peers.* We will reach this goal through a series of steps/smaller assignments."

A.2 Defining the "Informational Product"

Students were given latitude in selecting the genre of their final product, with the following framing: "In today's world, there is a seemingly unending supply of ways to communicate information. More traditional routes of information delivery include media such as television, newspaper, or magazines; however, these are not always the most effective means of communication. For this assignment, you are asked to communicate information to peers or family or a community of your choosing, so you will want to select a communication method that is accessible and interesting to someone of your age group or chosen community. This might include a blog post, infographic, Instagram reel, or other option of your choice (after it is approved by me)." No genre was prescribed; students proposed their own, drawing on the literacies they already brought to the work.

A.3 Required Components of the Final Product

Final products were evaluated on four substantive dimensions (described to students as follows) plus visual quality: "The specific topic or theme being addressed, and the background material needed to understand the topic; The environmental problem

associated with the topic; Why the topic is important and should be known by the public; What can be done or is currently being done to address the problem, and a call to action to inspire others to act."

A.4 The Role of the Picture Book

Students were explicitly told that the final product was *not* a remediation of the picture book itself: "The goal of the project is *not to recreate your picture book for an older audience*. Your final project does not need to reference your picture book at all. The goal of the picture book is to *understand the basic theme of your project* (i.e. marine pollution, climate change, etc.) and *to see how authors/illustrators used certain visual and written elements to communicate these to their chosen audience (children)*. Environmental concerns can be communicated to all audiences, no matter the age, culture, political, or educational differences." The picture book functioned as a model of audience-tailored science communication and a scaffold for theme selection, not as an object to be reproduced.

A.5 Scaffolded Timeline

The assignment unfolded in four stages across the spring semester, structured around weekly lab sessions with project work continuing between sessions:

Stage	Activity	Weight
Stage 1: Selection and Theme Identification	Group formation; picture book selection; reading and short discussion identifying main themes	—
Stage 2: Audience Selection and Project Planning	Decision on intended audience and informational product; brainstorming visual elements; in-class analysis of visual and thematic elements in chosen picture book; short written narrative of the analysis (1%); written project proposal (see A.6) submitted as the written milestone of this stage (2%)	3%
Stage 3: Drafting and Peer Feedback	In-class work session with instructor support, followed in a subsequent session by draft presentation to instructor and peer group with the same picture book; constructive peer and instructor feedback	2%
Stage 4: Public Presentation	Final presentation to the class and invited guests at the mini-symposium	10%

A.6 Proposal Sub-Assignment

Students submitted a written proposal at the project's midpoint, structured as follows:

i. **Cover Page (1 page).** Picture book title; group member names; chosen informational product (e.g., infographic, Instagram reel, blog post).

ii. **Introduction (~2 pages).** A narrative description of the picture book and how its themes are delivered through imagery and storytelling, drawing on the in-class analysis exercise; identification and justification of the chosen theme; background research on the theme (e.g., for a "climate change" theme, what climate change is, its causes, and its impacts).

iii. **Project Deliverable (1–2 pages).** Introduction of the informational product; explanation of how the team will translate the theme into a product that reaches its target audience.

iv. **Timeline & Assigned Tasks (1 page).** Outline of steps needed to complete the project, with group members identified for each task; identification of any outside help or materials needed. This section could take the form of a table listing tasks, completion dates, and assigned team members.

v. **Format.** Double-spaced, 12-point Times New Roman; format flexible (MLA, APA, or none); reference section in any consistent format, with 3–8 references expected; submitted as a .docx file.

A.7 Grading Rubric for the Final Product

Final products were graded across five categories worth 20 points each (100 total).

Category	0–10 pts	11–20 pts
Background Information	Background information is insufficient to understand the topic	The specific topic/theme is well addressed, and background information is sufficient to understand the topic
Environmental Problem	More is needed to appropriately explain the problem	The environmental problem associated with the topic is appropriately explained
Significance of the Problem	More is needed to understand the significance of the problem	The topic/problem that is important and should be known by the public is adequately described
Call to Action	More information or explanation of what can be done is needed	Details of what can be done or is currently being done to fix the problem, and a call to action to inspire others to act, are present

Category	0–10 pts	11–20 pts
Visuals and General Quality	Visuals were lacking, distracting, or confusing; project quality was low	Visuals are appropriate and enhance the project; quality is high

The rubric was applied at both the draft presentation and final symposium, with peer and instructor feedback at the draft stage providing students an opportunity to revise before final evaluation.

Appendix B: Picture Book Selections

Across three iterations of the PBA, student groups selected from the following children's picture books on environmental themes. Books were chosen to span a range of subjects (climate change, water protection, marine pollution, composting, environmental biography, environmental justice) and authorial perspectives, including Indigenous, African American, and other voices:

Diesen, D. (2019). *The Pout-Pout Fish Cleans Up the Ocean*. Illustrated by Dan Hanna.

King, H. T. (2021). *Saving American Beach: The Biography of African American Environmentalist MaVynee Betsch*. Illustrated by Ekua Holmes.

Lawlor, L. (2012). *Rachel Carson and Her Book That Changed the World*. Illustrated by Laura Beingessner.

Lindstrom, C. (2020). *We Are Water Protectors*. Illustrated by Michaela Goade.

Seuss, Dr. (1971). *The Lorax*.

Siddals, M. M. (2010). *Compost Stew: An A to Z Recipe for the Earth*. Illustrated by Ashley Wolff.

Tamura, M. (2021). *Penguins Don't Wear Sweaters!* Illustrated by Daniel Rieley.

Winter, J. (2019). *Our House Is on Fire: Greta Thunberg's Call to Save the Planet*.

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