

# “I. Am. a. Star.”: exploring moments of muchness in children’s digital compositional play and embodied science learning

Exploring  
moments of  
muchness

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## Abstract

**Purpose** – The purpose of this study is to examine playful practices in the science video composition of a fourth-grader.

**Design/methodology/approach** – With an analytic interest in “chasing the theory of muchness” (Thiel, 2015a) that describes distinctive moments of affective energies in playful learning, the authors explored a child’s video in which a food chain is dramatized.

**Findings** – The authors identified how muchness manifested in/through her compositional play.

**Originality/value** – The potential of playful composing and dramatizing to support meaning-making across contexts and disciplines is discussed.

**Keywords** Science, Writing, Play, Embodiment, Digital Literacy, Dramatization

**Paper type** Research paper

The importance of play for children’s joy and development is well documented in early childhood learning (Bulunuz, 2013). However, there is a current global trend to replace unstructured and playful time in schools with formal academic activities, particularly where families face economic challenges and in rural areas (Yogman *et al.*, 2018). Literacy researchers have called for intentionally resisting the restriction of play in schools and acknowledging that “play is a necessary tool in moving towards educational justice and equity” (Thiel and Wohlwend, 2021, p. 1).



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Addressing this call that play is an equity issue, this study is part of a larger interdisciplinary partnership at the intersection of science, theatre and literacy called Project STAGE (Science Theatre for Advancing Generative Engagement) to design and explore how *embodied performances* provide opportunities for minoritized students to create knowledge and position themselves as science experts. Before the COVID-19 pandemic, children participating in Project STAGE worked together in their classrooms “to perform, dramatize, or act out science concepts, processes, ideas and phenomena” (Varelas *et al.*, 2022, p. 496), such as a food chain, states of matter or climate change. Play was abundant during these enactments; children laughed and moved their whole bodies as they engaged in collective meaning-making, revised their understandings, learned about science phenomena and extended their repertoires of possible identities.

When instruction moved online in 2020–2021 because of the pandemic, the project teachers pivoted to embodying science online in various ways, such as asking children to record themselves dramatizing science concepts and phenomena at home. These digital compositions often involved parents and siblings, stuffed animals and a variety of other objects; made references to popular culture and social media genres; allowed opportunities for role-playing and perspective-taking; and let children experiment with audio, text and filters. Particularly because children’s access to digital tools tends to be limited in schools (Wartella *et al.*, 2013) and because they have more opportunities to consume than to produce media (Rowse *et al.*, 2017), these compositions offered a unique opportunity to consider children’s play at the intersection of digital composition, embodied activity and science learning.

In this study, we examined one fourth-grader’s playful science composing via multimodal videos during online instruction. We focused on how she demonstrated what Thiel (2015a) calls *muchness* in/through her playful learning:

An embodied, intellectual fullness that manifests through an internal compulsion to be engaged in an activity that one has a particular affinity for or curiosity about, unstopped by challenges or frustrations [...] during play events (p. 41).

We asked: How does muchness manifest during children’s digital compositional play and embodied science learning?

### **Perspective: attuning to muchness in/through children’s play**

Understanding literacies as “diverse ways we make meaning, in cooperation with others, often coordinating multifunctional tools, across networks and global sites” (p. 2), Wohlwend (2011) and others have positioned play as a literacy that crosses physical materials and digital tools. Conceptualizing play as a literacy, we draw from Thiel’s (2015a; 2016, 2018) attention to how children find and experience muchness, an intellectual and embodied fullness in/through playful learning. Thiel notes four interconnected ways that muchness manifests, through:

- (1) “Affect (embodied and emotional engagements);
- (2) Objects (everyday materials and things);
- (3) Composition (exercising creativity); and
- (4) Spatiality (the production of social, cultural, and material conditions)” (2015a p. 42).

Thiel (2015a) has extensively considered “the conditions where muchness has the potential to unfold” (p. 42), documenting how children find muchness through play with a variety of objects and materials, including costumes (Thiel, 2015a), fabric remnants (Thiel, 2015b) and paper (Wohlwend and Thiel, 2019). Children also find muchness through creative acts, including composing stories, paintings, sculptures and superheroes (Thiel, 2015b).

There are many ways we might recognize muchness when we see it, through “bodies moving in big, less-inhibited ways” or “small, precise ways” or a visible “flicker in bodies (shaking, jumping, and giggling with excitement)” or when a child “stop[s] in their tracks to turn their gaze to one particular item, pick it up, and move it around in their hands in contemplation” (Thiel, 2015a, p. 42). We can also pay attention to children’s “affective energy,” which can seem to spill out while they are playing (Thiel, 2015b). Attention to muchness not only broadens conceptualizations of literacy practices (e.g. acknowledging fabric play and paper play as literacy practices) but also repositions children as “creative intellectuals at work” (Thiel, 2015b, p. 128) and attunes educators and researchers to what matters to children as they learn.

## Literature review

Project STAGE brings together focus on science, theatre and literacy through pedagogies that support embodied performances that include dramatizing and movement. It is situated in a growing body of literature on how arts in STEM can support creativity, collaboration and intellectual stimulation (Halverson and Sawyer, 2022). Drawing from theories of social semiotics and multimodality, we see dramatizing as an:

Ensemble of modes where language has no more potential than other modes to contribute to meaning-making (Jewitt, 2011) [...] [and a] unique kind of semiotic tool where meaning is expressed and developed simultaneously in visual, spatial, kinesthetic, musical, and linguistic modes of communication (Varelas *et al.*, 2022, p. 497).

Furthermore, dramatizing is an inherently creative and playful compositional act. As children imagine, try out and revise enactments, there are many opportunities for muchness to manifest. Given Project STAGE’s focus and our interest in studying “muchy” learning, we explored two aspects of play that occur in this work:

- (1) play during children’s science learning, particularly through embodied activities; and
- (2) children’s compositional play.

## Children’s embodied science learning

Children have often been socialized to consider science as a difficult and effortful subject where play has no place, drawing “distinctions between play and science (the more fun it is, the less scientific, the more scientific, the less fun)” (Vossoughi and Bevan, 2014, pp. 33–34). Equity-oriented pedagogies point to the need for playful inquiry to be more visible and for more connections across contexts (Nasir *et al.*, 2006).

Drama and the performing arts support children’s connections between everyday life and science settings (Dorion, 2009; Kambouri and Michaelides, 2014; Overton and Chatzichristodoulou, 2010), helping to reconceptualize science education as improvisational, exploratory and playful (Edmiston, 2003) and offering multiple ways of seeing science phenomena. The performing arts:

Celebrate the body—and the ways in which bodies are sites of knowledge and identity exploration by shifting one’s perspective from objective to an embodied, first-person imagining and experiencing phenomena, events, and situations (Varelas *et al.*, 2022, p. 495).

This focus on embodied learning is aligned with recent literacy research on embodied literacies (Enriquez *et al.*, 2015; Jones, 2013; Johnson and Vasudevan, 2012) and work that considers embodiment as a valuable agency for engaging with learning (Hughes-Decatur, 2011; Perry and Medina, 2011). Moreover, Kotler (2020) showed that dramatizing supports students to construct science knowledge and strengthen their science identities, as well as

engage with social justice issues such as lead in water pipes and people protesting water contamination. Focusing on dance, [Solomon \*et al.\* \(2022\)](#) similarly highlighted that:

Embodied exploration of physics through dance supported sustained engagement, invited youth to engage in inquiry using multiple movement vocabularies, and offered Black girls opportunities to connect personally and culturally to physics concepts and ideas (p. 100).

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### Children's compositional play

The importance of play in children's composing practices has long been a focus in early childhood studies. For example, [Paley \(2009\)](#) documented the importance of fantasy play in helping children share their emotions and develop relationships, as well as develop their early literacies. [Dyson \(2003\)](#) and [Yoon \(2014\)](#) have both demonstrated ways children's interests and popular culture inform their writing and how peer interactions in play connect to their school reading and writing.

Many young children are limited in accessing digital devices in schools ([Wartella \*et al.\*, 2013](#)) and how they use them ([Rowse \*et al.\*, 2017](#)), but research on children's digital play is expanding. [Brownell \(2021\)](#) explored the ways children blur worlds of online and offline play through their composing (e.g. bringing together Minecraft and school writing). [Ellison and Solomon \(2018\)](#) documented the importance of digital play (e.g. digital gaming and digital storytelling) for African American boys as "purposeful and productive literacies" (p. 495) that help them to learn, create, foster agency and cultivate identities. [Wargo \(2019\)](#) detailed how young children use digital composing, including audio modes, to respond to social issues, such as ecological crises. Across research, it is clear that play is inexorably wrapped up in many children's composing practices, despite the contemporary push in many schools to restrict play.

### Methods

The study occurred in Mr M's fourth-grade science class at a public elementary school in a large midwestern US city. The instructional units were broken into four topics:

- (1) Environments;
- (2) Energy;
- (3) Renewable energy; and
- (4) Landforms.

During the pandemic, Mr M's classes were held virtually, but Mr M maintained his commitment to embodied and multimodal learning through his use of Flip, a video creation and sharing platform designed for schools. Within a private Flip room, teachers post assignments and students create and share video responses. Flip camera features include filters, digital borders and stickers and basic video editing (i.e. trimming and stitching). One way Mr M used this platform was for formative assessments, where he chose a science idea and invited students to create their own videos exploring, describing or explaining that idea, often with directions to "be creative and have fun." These videos provided children opportunities to showcase their meaning making and Mr M to check for understanding.

### Participants

Mr M teaches in a school serves students from pre-K through eighth grade. Students in the school are racially and ethnically diverse, with 47.4% identifying as Asian, 26.8% as Hispanic, 13.7% as Black and 10.9% as white, with 58.8% who are "English Learners" and

92.5% whose families are designated low-income. The school is located at the intersection of two of the most culturally diverse neighborhoods in the city and is home to many immigrants from Eastern Europe, Asia and Africa, with over 40 languages reported to be in frequent use in the community.

For this study, we focused on one focal student, Audre (a pseudonym), a Black girl whose first language is French. Audre immigrated with her family from Gabon during the previous school year. Audre stood out among student composers because of her excitement for embodied learning and the notable muchness exhibited across the majority of her Flip assignments. In a conversation, Mr M asked the class how it felt to move their bodies and act out science ideas, and Audre volunteered: “it makes me feel good because I like using my body [. . .] And it helps me to feel confident about myself when I move my body [. . .] it helps me remember when there is a test.” For Audre, there was a strong connection between how she embodied science and her confidence in her science knowledge.

### Data sources and analysis

During the school year, Mr M created 12 assignments in Flip (Table 1), totaling 169 submissions from consenting students. Some assignments received multiple submissions from individual students: some were done in parts, some were distinct videos and some were here redos. Before identifying Audre as the focal student for this study, one of our research team members (Amanda) viewed each video from consenting students and wrote a brief summary. This descriptive coding (Saldaña, 2013) captured two categories: *ways of sharing scientific understanding* (e.g. reading aloud from a text, using a diagram, performing a skit, etc.) and *types of play* (e.g. genre play, embodied play and idea play).

Next, we focused on children’s play in/through their video compositions. Although our methodology differs from Thiel’s “thinking with theory” (2015b) used to develop the “muchness” constructs, we used Thiel’s theorization of muchness as a frame to explore children’s science engagement and to describe and make sense of the rich ways they playfully constructed their science compositions. We applied Thiel’s (2015a) definition of muchness to identify videos where muchness was displayed ( $n = 81$ ). Of the 22 consented students, 16 submitted videos displaying muchness. Over half of these submissions ( $n = 57$ ) came from five students. With an analytic interest in “chasing the theory of muchness” (Thiel, 2015a), we narrowed our focus to these five students – all female students of color who had submitted multiple “muchy” Flip videos.

Audre submitted 15 Flip videos in response to the assignments which range in length from 54 s to 6 min and 42 s; 11 of these were identified as “muchy” (Table 1). Audre stood out as someone who embraced the opportunity to embody science concepts and engage in playful composition, and focusing on her work offered an illustrative case that is well-suited to better understand muchness.

To present the findings, we focus on one of Audre’s Flip videos (Video 10) that illustrates multiple aspects of muchness, one of the two videos she submitted on food chains. It is 5 min and 3 s long and involves Audre taking on roles of different characters to explain food chains.

First, we describe Audre’s video in detail. Then, we examine how muchness manifested in/through Audre’s compositional play, attending to Thiel’s (2015a) conceptualization of the ways it unfolds (i.e. through affect, objects, composition and spatiality). We also explore her playful perspective-taking while taking on roles of various characters.

### Audre’s “muchy” food chain video

Mr M prompted students to submit a Flip about food chains, instructing: “Act out a food chain. Tell us what is the main source of energy. What are the producer, consumer, and

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Science assignment name	Teacher prompt/assignment description (In addition to written direction Mr M embedded images, GIFs and videos)	Audre's submissions
Producers and consumers	What is a producer? What is a consumer? How are producers and consumers important in an ecosystem? Create a performance to explain both terms. You can make a song, create a presentation or act it out. Be creative! Have fun!	Video 1: Talks aloud about her understanding of producers and consumers Video 2: Acts out a plant growing and making its own energy and a lion eating a cheetah to get energy
Ecosystem drama	Describe what an ecosystem is. Create an ecosystem. ACT OUT the living and nonliving parts of your ecosystem. Have fun. Be creative with your video	Video 3: Acts out being different living and nonliving entities and explains the qualities of each
Ecosystem interaction	Create a video showing an ecosystem interaction. Show living and living or living and nonliving	Video 4: Takes on the role of two characters to pose and answer questions and reads from her notes Video 5: Mimes being different animals and picking out produce at the grocery store Video 6: Acts out different living and nonliving entities in an ecosystem (bird, water, fish, oxygen, plants, dirt, rain and human) and names their various roles in the ecosystem
Photosynthesis	How do plants get energy?	Video 7: Explains a diagram she has created illustrating the process of photosynthesis and reads from her science notebook Video 8: There is no sound, but we see Audre's body move; she also gestures and displays another diagram
Food chain drama	Act out a food chain. Tell us what is the main source of energy. What are the producer, consumer and decomposer? Be creative. Have fun. Can't wait to see it!	Video 9: With her little brother, acts out a food chain Video 10: Uses digital stickers to show a food chain. [Focal Video]
Food web	Create a food web of your choice. ACT IT OUT. Be creative	Video 11: Plays a video from YouTube that presents information about a food web. She reads slides from the video aloud. She also googles "food web" and reads these findings aloud Video 12: Uses filters and borders to show she is underwater and she acts out being two birds fighting for a fish
How fast does the Earth spin?	How fast does the Earth spin?	Video 13: With her brother, she acts out being a news anchor receiving a scientific report that the Earth rotates around the sun, and not the other way around. They travel to space to watch this phenomenon together and bring the information back to Earth
Why does the Earth have seasons?	Explain why the Earth has seasons. Include words like tilt, northern hemisphere, southern hemisphere and axis	Video 14: Audre's camera is broken, so she is not visible. She has created slides in Flip and explains her slides Video 15: Her second video is a screen recording of her making the first video

**Table 1.**  
Audre's flip videos

**Source:** Author's own creation/work

decomposer? Be creative. Have fun [. . .]” In her second submission, Audre plays a pair of sisters who act as narrators. Both narrators wear a hooded sweatshirt: to differentiate them, one has the hood down, and the other has the hood up. Audre also uses digital borders and stickers to represent the various characters, or trophic levels, in a food chain (e.g. a sun, plant, bunny, snake, tiger and insect). Audre ducks out of the frame to provide voice-overs for these characters and back in the frame when acting as Narrators 1 or 2 (Figure 1). In the narrator role, she asks questions and shares amazement at how energy is transferred in a food chain (Figure 1).

The video starts with Audre in front of a white wall, with a digital border of flowers surrounding her. Audre, acting as Narrator 1, smiles widely. Her arms are outstretched. She hums an upbeat tune, waves exuberantly and says “Hiiiiii! Welcome back to the nature videos.” She puts her hands on her face and leans into the camera. Her arms quickly dart around and she animatedly moves her body while explaining, “Today we are going to be learning about something that’s aw-awwesome! I cannot go on, I need to show you this video [. . .] It’s so amazing [. . .]”

Audre snaps her fingers. She looks at the camera and snaps again (Frame 1). Between these two snaps, viewers see her transition from Narrator 1 (hood up) to Narrator 2 (hood down). A digital sticker of the sun appears above Audre’s left shoulder, and in front of her – resting on the digital floral border – is a digital sticker of a rabbit and a stalk of wheat. She claps once and announces excitedly, “Yes, I did it. My magic trick won!”

Audre instructs the viewer to “look over there” as she points to the sun and says, “It’s the sun. Hi, sun” while waving. Audre, still acting as Narrator 2, raises her arms in an exaggerated shrug and asks the sun, “How do you help with nature?” She tilts her head to the side and shifts her voice to a low tone and says, “I don’t know.”

Audre quickly ducks out of sight and takes on the perspectives of the Sun, saying, “I help the nature by giving them my energy, energy, energy.” She sings the word energy each time.

Popping back into view, Audre resumes the role of Narrator 2 and responds with “Cool. That’s so nice,” then gives a thumbs up and asks, “Bunny, how do you help the nature?”

Audre ducks down and, changing her voice for Bunny, says “You’ll see, you don’t need to know now.”

Narrator 2 pops up, addresses Bunny with an “OK” and turns her attention to the wheat stalk, asking “Plant, how do you help the nature?”

After darting out of the scene, Audre, in a new voice as Plant, says “When I grow enough then I give my energy. I make oxygen.”

Narrator 2 pops up and looks at the camera in an upbeat tone and sings, “We talking about plants” and adds, “I like plants.”

She moves out of sight and we hear “I like plants too, I’m Bunny.”

Narrator 2 slowly rises and asks accusingly “Bunny are you going to do what I think you’re going to do?” She rubs her chin; shrugs, waves and says goodbye to Bunny; and disappears.

Bunny moves across the screen closer to the plant, and the top of Audre’s head can be seen bobbing up and down as she manipulates the digital sticker (Frame 2). Bunny says “I think she’s right. I’m going to go enjoy this plant.”

Narrator 2 jumps up and exclaims while pointing a finger at the rabbit, “I knew it Bunny! You were going to eat the plant!”

Audre quickly ducks down to give voice to the Plant, who eagerly says, “Who wants to eat me? I’m a plant. Yeah, of course. Somebody’s finally going to eat me!”

Narrator 2 returns and asks confused “You want someone to eat you?”

Audre lowers down and as Plant responds “Yeah, it’s a food chain we’re making.”





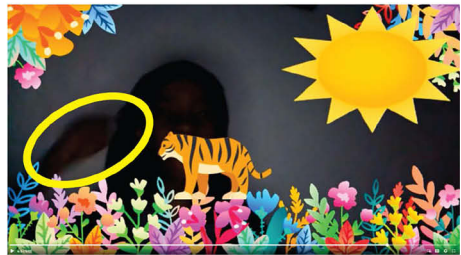
1 Audre snaps to make a sun, plant, and bunny appear.



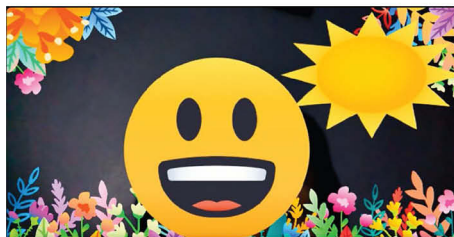
2 Narrator 2 ducks down to provide voice over for Bunny.



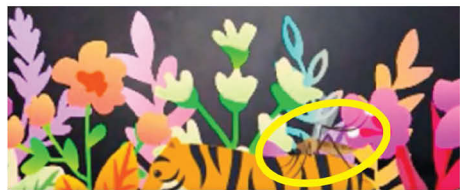
3 Narrator 1 returns to find plant gone and Snake has appeared. Audre is wearing a hood to indicate she is a new character.



4 Narrator 1 punches the air to emphasize that animals eat each other to spread "energy to energy."



5 A smiley face narrates the passage of time.



6 A close up of an insect feeding off a dead tiger.

**Figure 1.**  
A series of still images from Audre's video

Source: Author's own creation/work

Then Bunny adds "Yeah, a food chain."

Back in the scene Narrator 2 laughs and shrugs while adding "I don't know what's a food chain."

Audre lowers down again and slurping sounds are heard as Bunny says to himself, "I'll enjoy my meal." Viewers hear a computer click, the plant disappears and a green digital snake sticker appears.

Audre returns, this time as Narrator 1. Joyfully she notes, "Oh, I have a new friend" and puts her hands on her face (Frame 3). She then says she will call her sister, indicating that with her hood on she is now a new character and the sister of the previous character.

She moves out of view and provides the voice for Snake, who wants to eat the rabbit, and for Bunny, who is excited someone has "finally" arrived to eat him. This confuses Narrator 1 who exasperatedly asks why all the other animals are "excited for other animals to eat" them.

The snake hisses in response "Because it's a food chain," and eats Bunny while slurping and hissing.

Narrator 1 asks, with her palms up and a look of horror, "Snake, how could you eat the bunny?"



Snake explains “I am taking his energy that he took from the plant, don’t you know?” Snake demands that it be left alone to eat, and Narrator 1 tearfully complies.

A digital sticker of a tiger appears. Narrator 1 greets the animal, and the two briefly exchange pleasantries, before Snake realizes that a tiger is near and it “better run away.” But Tiger moves in and begins eating the snake.

Narrator 1 pops up, wide-eyed and gasps. She asks, “Is that a food chain? I still don’t know: what is a food chain?” She turns her frustration to Tiger, and while jumping around and with her arms bouncing by her sides and above her head, she shouts “Tiger, what did you eat? And what is a food chain?”

Tiger responds with an annoyed sigh and says “A food chain is what we’re doing.”

Narrator 1 responds “Animals each eating each other, and each other, eating each other.” This idea is emphasized with the movement of her arms, she first moves her right arm in front of her body horizontally with her palm facing down and then moves her left arm on top of it with the two briefly stacked before she cycles her right arm to the top. She adds “Spreading energy to energy to energy” and with each utterance of the word “energy,” she punches the air next to her, first on her left, then right, then left (Frame 4).

Seeming to understand the transfer of energy in the food chain, she asks, “What is [Tiger] going to eat next?” A yellow smiley face appears on screen (Frame 5), covering Audre and the tiger. In a deep voice, we hear, “Twenty years later.” The end of the last word is interrupted with croaking sounds. The smiley face disappears and Tiger moans “I ate too much. I didn’t eat for 20 years already.” The smiley face is removed and viewers see that Tiger has been lowered from the top of the floral border to rest closer to ground level, indicating its death. Narrator 1 jumps up and asks if Tiger’s death means “all of the energy of the plant and the bunny has disappeared?” She ducks down and an insect appears and notes that as there are no other insects or worms around, it can begin eating Tiger. The insect moves to Tiger (Frame 6) and we can hear Audre, off-screen, making slurping sounds and saying “Yummy, yummy. I’m eating this tiger because there are no worms.”

Audre abruptly jumps up and shouts, “Bye, I hope you liked it” while waving, and the video ends.

### **Manifestations of muchness in Audre’s embodied compositional play**

In Audre’s video composition, muchness was visible through multiple kinds of play: playful dramatizing, playful multimodal composing and playful science learning. Through each of these kinds of play, we saw Audre’s unstoppable “intellectual fullness” (Thiel, 2015a, p. 41) manifest in the interconnected ways Thiel describes: affect, objects, composition and spatiality, which we elaborate below.

#### **“I. Am. a. Star.”: playful dramatizing**

At multiple times throughout the year, Mr M asked students about moving their bodies in science. Once, mid-year, he prompted them to write a response to the question “What does it feel like to move your body and act out science?” Audre responded, “It feels like I. Am. a. Star.” For Audre, this feeling of being a “star” was evident across her video submissions from her wide repertoire that included moving her body in big and small ways, the use of facial expressions, changing her voice through accents, pitch and tone, singing, high-energy embodiments and quickly switching roles, all of which manifested muchness through affect and spatiality. For example, Narrator 2’s suspicions of Bunny were demonstrated through her movements of rubbing her chin and her accusatory tone. This turned to shock and horror when she later dramatically jumped back into the scene, this time with a denunciative finger point, to show her character’s disappointment. Audre also used her body to express

confusion through exaggerated shrugs and wide-eyed facial expressions, and excitement was conveyed with darting, unconstrained body movements, energetic waves of her arms, as well as through loud and fast-paced speech.

Frame 2 captures the way Audre moved her body in and out of the scene to take on the perspective of her digital characters. This perspective-taking was a key aspect of Audre's performance and a unique affordance of dramatic play. For Audre, perspective-taking went beyond the shifting of her body and included the application of her own understanding of the world to the characters and the scenarios in which they found themselves. In her perspective-taking, Audre also extended empathy to the digital characters. One example of this can be seen in Narrator 2's concern that Bunny is going to eat Plant. First, she jumped up to catch Bunny in the act as it moved toward Plant, something that she appeared to view as wrong. Taking the perspective of Plant, Audre articulated Plant's desire to be eaten and share their energy. As Audre continued to voice the various organisms' desires to take and share energy, the narrators moved from seeing snakes and tigers hunting prey as something vicious to a natural part of life. Audre was contemplating being in two worlds – the science world that she is dramatizing and the social world that she is living in. Like theatre actors, she portrayed metaxis (Varelas *et al.*, 2010), embodying these various roles, which is a unique affordance of dramatizing and one that allowed Audre to showcase her science knowledge, media composition and her affinity for creative acting.

### **“Yes, I did it”: playful multimodal composing**

The composition of multimodal videos allowed Audre to exercise creativity and experience muchness in her Flip videos in a way that would not have been possible in another compositional form. The final result was an amalgamation of creative educational programming – drawing from puppet shows, children's television shows and social media videos.

One of the most striking aspects of Audre's compositional play was her object play with her use of digital stickers. This layered compositional and object play resulted in Audre's video taking on a puppet-show like quality. And while Audre did not stay in the frame to provide voices for the characters, the way she played with accent and pitch as she moved in and out of view is akin to ventriloquism, as was the way Audre interacted with the digital stickers. These features are similar to children's educational programs where live-action characters interact with puppets (e.g. Sesame Street and Mr Rogers' Neighborhood) or animated characters (e.g. Blue's Clues). By using the use of a host who posed questions and summarized ideas, Audre's production further aligned with these shows. This feature also allowed Audre to interact with and pose questions to the other characters, a device that helped her in her science storytelling.

At the beginning of the video, aspects of social media content were evident. First, Audre's enthusiasm when she said “I cannot go on, I need to show you this video” is reminiscent of the strong hooks used by content creators. Her magic trick of snapping her fingers to change the scene is a staple of TikTok and Instagram, where creators have to use pithy tricks to engage viewers while adhering to the time constraints of the platforms. This moment, marked with a clap and exclamation of “Yes, I did it!”, revealed the joy of learning a new aspect of composition and Audre's investment in mastering this technique. And while this video did not include an ask for further engagement, it was not uncommon for Audre to end her videos by asking her classmates to like them or leave a comment, another staple of social media videos.

### **“Spreading energy to energy to energy”: playful science learning**

Audre’s “compulsion to be engaged in an activity that one has a particular affinity for or curiosity about” (Thiel, 2015a, p. 41), in this case, playful science learning, was revealed in her multiple Flip submissions where she often created skits, acted out ideas and used props and objects to demonstrate her science understandings. Muchness was evident in many of these videos, often through Audre’s use of affect and her perspective-taking. In the video presented, Audre used affect and perspective-taking to embody the roles of various organisms in a food chain, and she also demonstrated the perspective of a science learner. In her roles as the narrators, she moved through various phases of investigation and demonstrated the curiosity, confusion and meaning-making that are often part of a productive learning process.

A particularly “muchy” moment that was laden with affect was at the end when Audre was finally able to answer her question, “what is a food chain?” In this eureka moment, she shared with her audience what a food chain is and that it involved “animals each eating each other, and each other, eating each other” to spread “energy to energy to energy.” This meaningful science idea was emphasized in Audre’s verbal repetition and in her movements. First, she emphasized the cycle of animals eating one another by cycling the way her arms were positioned in front of her body. She continued to use her body to underscore science ideas when she punched the air while explaining that this process spreads “energy to energy to energy.” This movement underscored not just the science ideas that Audre had constructed and was sharing but also the enthusiasm Audre’s character, Narrator 1, had in her learning.

### **Discussion and implications: sites of muchness, creativity and connection**

Mr M’s ongoing invitations to his students to “be creative and have fun” as they created videos of themselves embodying science ideas supported joyful, playful and, indeed, “muchy” learning for Audre and some of her peers. What might educators learn from positioning play as a literacy that supports meaning-making, coordination and the use of multimodal tools? How might we better support “muchy” learning for children, particularly in school spaces and in disciplines like science, where play is often sidelined? How might we help them feel like “stars” and develop their disciplinary identities? Drawing from what we saw and learned from Audre and her peers, we discuss the potential of playful composing and dramatizing to support “muchy” learning and meaning-making across contexts and disciplines.

### **Playful composing**

For Audre, time and space to playfully compose supported “muchy” learning. However, children’s time for compositional play and production – particularly using technology like computers (Rowse, Morrell and Alvermann, 2017) – is often limited in schools. During the pandemic, when Audre and many students regularly attended school through personal computers, time and material resources for compositional play were often expanded. Each student had a personal computer and space to move. Mr M allotted time for them to film, revise and refilm as many times as they wanted. They could submit multiple videos to individual assignments to showcase their creativity and science knowledge. As they composed, they used a variety of objects/props, incorporated family members (i.e. siblings), moved their bodies freely and expansively and played with digital objects/tools to convey meaning (e.g. digital stickers and borders and sound). As in Brownell’s (2021) work, digital composing offered an opportunity for children to bring together their different worlds.

While it is likely impossible to recreate all these conditions in traditional school spaces, educators can intentionally cultivate opportunities for creative compositional play and “muchy” learning across disciplines, not just in the literacy block. Like Mr M, we can

regularly invite children to “be creative and have fun” as they compose, give them time and space to engage with composing and tools to support embodied, digital and tactile composing. We and their peers can also engage with their compositions, discussing both the learning that is demonstrated as well as their compositional choices. We can also consider the ways children’s digital composing fosters agency and nurtures multiple identities (Ellison and Solomon, 2018) and design opportunities to use composing to respond to social issues (Wargo, 2019). Furthermore, we can make sure that the ways we assess playful learning and composing do not undermine our intentions for such work. For example, our assessments of this kind of work needs to focus on meaning-making and engagement rather than wholly on accuracy and proficiency.

### **Dramatic interdisciplinary play**

This study also shows that opportunities to dramatize science phenomena were meaningful for Audre’s learning, highlighting the power of the performing arts to foster connections and construct science as playful. It also supports literacy and science education research about the potential of embodied learning for meaning-making (Perry and Medina, 2011; Woodard *et al.*, 2020; Varelas *et al.*, 2010, 2022). Audre’s movement across perspectives allowed her to shift scales to understand science phenomena (e.g. looking out as she embodies a snake and looking in as a narrator). The opportunity to chase muchness also supported her to engage with feelings and emotions as a natural and important aspect of science learning.

Like playful composition, dramatizing offers an important opportunity for children to experience creative, “muchy” learning. Elementary teachers can incorporate dramatizing and embodied performances both in science and across other disciplines. As children imagine and take multiple perspectives, they may also come to see their expressive body as an important site of knowledge construction and play as a natural and important part of science learning.

### **Conclusion**

At a time of uncertainty in schools and children’s lives, we saw meaningful learning occur in playful and joyous ways when students were invited to follow their “much” in ways that made them feel like a “star” in their embodied science performances and digital compositional play. Ultimately, Mr M’s class demonstrated the importance of play beyond early childhood and into disciplinary learning spaces as a resource for complex learning and meaning-making and one-way teachers can “cross boundaries and borders” of in- and out-of-school learning to provide more equitable learning experiences for children.

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### Further reading

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