Additionally, these relationships are narrativized (storied) both through youths' development of performances and youths' discussions of their experiences during interviews. The following questions guided this inquiry:

1. What are youths' perceptions of the transdisciplinary thinking practices common to performing arts, science, and engineering? What shifts occur, and why?
2. How do these perceptions relate to their lived and storied relationships with science?

Although there are hopeful conversations about the potential of transdisciplinary art-science education to expand opportunities for youth, this approach is still relatively new (Quigley & Herro, 2016). As such, empirical studies are limited, particularly regarding youths' perspectives on their experiences in these environments (Finch et al., in press). This study takes up this gap in the research and explores if/how long-term immersion in a transdisciplinary art-science program supports participants' relationships with science.

Conceptual framework

Two areas of research informed this study, including transdisciplinary art-science education and identity construction. Scholarship in these areas guided the design and enactment of the program under study as well as the research methodology utilized in this inquiry.

Transdisciplinary art-science education

Transdisciplinarity is characterized by convergence, transcendence, and emergence. In terms of convergence, transdisciplinary education highlights the value that each discipline contributes while viewing these disciplines in light of their commonalities (Marshall, 2014). For example, in art and science disciplines, participants engage in common thinking practices, such as observing, imagining, empathizing, and critiquing (Mishra, Koehler, & Henriksen, 2011). When youth engage in these transdisciplinary thinking practices to address a problem, their learning transcends the component disciplines as well as traditional academic achievements (Peppler & Wohlwend, 2018). In such a space, youth no longer readily distinguish their learning along disciplinary boundaries, blurring the distinctions between when they are "doing art" and "doing science" (Mishra et al., 2011). As a result of this transcendence, new epistemologies, methods, and practices emerge, supporting youth to reimagine what practices and identities are legitimate in the learning environment (Mishra et al., 2011). Henriksen and colleagues' (2015) metaphor of a *mash-up* in music is particularly helpful in understanding the ideas of transcendence and emergence in transdisciplinary learning. A good mash-up entails the layering of voices and tempos from multiple songs, which fundamentally transforms and transcends the original material, resulting in a new experience for the listener (Henriksen, DeSchryver, & Mishra, 2015). Similarly, synthesizing perspectives and practices in art and science fields supports participants' engagement in new practices and epistemologies. For example, in transdisciplinary art-science education spaces, practices such as metaphorical, embodied, and aesthetic thinking, which might have been deemed unnecessary, or even inappropriate, in science, might become celebrated as essential to learning (Mishra et al., 2011). Epistemologies developed through transdisciplinary learning experiences entail new perspectives of academic information that are both personal and embodied, which have the potential to deepen and transform learning and participation (Henriksen et al., 2015).

To distinguish from the variety of approaches to STEAM education (e.g., multidisciplinary, interdisciplinary), the term *transdisciplinary art-science* is used to describe Converge Art and Science, the program that is central to this study. Converge leveraged the commonalities of performing arts, science, and engineering to engage youth in an iterative process of engagement and reflection around transdisciplinary thinking practices that are relevant to these disciplines and life in general (Quigley & Herro, 2016).

Identity: Lived and storied relationships with science

Transdisciplinary art-science education may be a particularly promising approach for supporting the identity construction of youth who have developed distanced relationships with science (Peppler & Wohlwend, 2018). Importantly, identity categories are not owned by or inherent to individuals; rather, they are performed and narrated through social practices in specific contexts over time (Holland, Lachicotte, Skinner, & Cain, 1998). The "subject in process" performs various aspects of their identity constellation depending on the discourses and communities in which they are participating as gendered, raced, and classed bodies (Gutiérrez, 2013). Because identity is constructed and distributed, it is influenced by the relationships among the individual, the participants in the setting who interact with the individual, and the cultural artifacts and tools through which participants interact (Holland et al., 1998). In STEM learning environments, youth develop identities with science based on these dynamic relationships. The middle school grades represent a crucial period for identity construction. Yet, many youth—particularly females who identify as Black, Latina, or Native American—show a declining interest in STEM during this time (Calabrese Barton et al., 2013). Given this finding, research to understand the

longitudinal experiences of middle-school-aged Black and Latinx female youth in contexts that aim to support their relationships with STEM disciplines is necessary to support youth and advance the field.

Methodology

A longitudinal ethnographic approach was utilized to explore two youths' evolving relationships with science over two years of participation in Converge . This paper includes findings from the first 13 months of the two-year study, which will conclude in May of 2020. I (first author) assumed a participatory ethnographic approach in this inquiry. Participant observation not only supports a deep understanding of the research setting, participants, and their behavior but also fosters the development of trusting relationships with participants (Glesne, 2015).

In ethnographic studies such as this one, it is crucial to recognize that the researcher's identity and position in relation to the individuals around them influences how they experience and interpret events. My experience working with female youth of color in STEM learning environments over the past eight years as a public-school teacher, researcher, and teacher educator has profoundly shaped my understanding of equity and my interest in this research. With that said, it is essential to note that I identify with sociohistorical categories that differ systematically from the individuals from whom I am learning as a white, middle class, college-educated, privileged female working in an institution of higher education. Because these identifiers influence in which discourses one participates, and how, my positionality informed the development of researcher-participant relationships in this ethnographic study. Thus, my positionality, experience with science learning environments, and understanding of identity construction in the context of transdisciplinary learning spaces situated me and informed the research described here.

Program context and participants

The Converge Art and Science program was created by a multidisciplinary design team comprised of a children's theater director, science education researchers, graduate student researchers, and science and theater educators. As a member of the design team, I collaboratively developed the curriculum with the science and theater teachers and researchers, engaged in the program sessions as a participant-observer, and shared research insights with the design team to support the program development. Converge served a population of students that was largely Latina/o/x (42%) and Black (35%), eligible for free or reduced lunch (70%), and multilingual (45%). Students participated in a three-week summer camp (56 hours) and 13 Saturday sessions (33 hours) during the school year.

Building on the research base described above, youth participants engaged in an iterative process of construction and critique to make meaning of locally relevant social and environmental justice issues through the design and production of performances. To create more possibilities for youth beyond staged theater, the design team embraced Halverson and Sheridan's definition of theater as "any art form designed to communicate a story: staged theater, creative writing, performance art, and (more recently) digital video/audionarratives" (2014, p. 626). Based on youths' interests, the design team also added poetry (spoken word), cartoons, and role-playing games to this list of potential products participants could create.

During their participation in the program, youth engaged in performing arts, science, engineering, and coding to develop narratives collectively, or stories, about a social and environmental justice topic (e.g., climate change, water access and control). Youth made sense of their focal issue through practices such as analyzing and interpreting data based on program-based investigations as well as their lived experiences, engaging in imaginative and creative thinking to generate a story about their focal issue, experimenting with different characters and perspectives for their stories, coding lighting for costumes and scenic design, engineering props, and collaborating and communicating with their peers and teachers. In addition, youth periodically engaged in a critical response process to receive feedback on their works-in-progress, which they could then address in subsequent revisions. At the end of the school year and summer sessions, youth presented their performances at a showcase event. These events provided youth with an opportunity to share their stories with a broader audience, including their family members, friends, peers, and teachers.

By centering youths' personal narratives in the process of their collective production of performances, this work sought to desettle the binary between subject/object in science education to support a more relational understanding. Historically, becoming a producer of knowledge in Western science has purported the necessity of distancing oneself (subject) from the phenomenon (object) of interest (Massey, 2005), which may lead youth to perceive science as disconnected from themselves and their lives (Calabrese Barton et al., 2013). Alternatively, recentering students and *their* stories supports a youth-centered approach to science education that differs from the science-centered approach that is prevalent in STEM education. Through this approach, the ultimate goal of Converge was to create and maintain space for youth to construct, negotiate, and redefine their relationships with science and art disciplines in expansive ways.

Research participants

Participant selection for this study was based on three criteria: gender (female), race/ethnicity (Black and/or Latina), and grade when entering the program (seventh). Youth in the youngest grade level were asked to participate in this study under the assumption that they would be a part of the program for the remainder of their middle-school years. As such, the two-year study from which this inquiry emanates includes youths' experiences in the program during seventh and eighth grades. Among the 16 youth participating in Converge at the beginning of this study, three met the inclusion criteria, two of whom identified as Latina and one of whom identified as Afro-Latina. Due to the attrition of one youth, this inquiry includes case studies for Jayda and Lara (pseudonyms).

Data generation

Data was generated during program sessions during three learning cycles including a three-week summer session in 2018 (learning cycle 1, 12 sessions, 56 hours), Saturday sessions during the 2018-2019 academic year (learning cycle 2, 13 sessions, 33 hours), and another three-week summer session in 2019 (learning cycle 3, 12 sessions, 56 hours), for a total of 145.5 program hours. Data include field notes from participant observation during program sessions, drafts of youths' products for three showcase events at the end of each learning cycle (summer 2018, 2018-2019 school year, and summer 2019), informal ethnographic interviews based on participant observations, and six rounds of formal semi-structured interviews (20-40 minutes) with each youth, which took place at the beginning and end of each learning cycle. Field notes were based on participant observations and informal ethnographic interviews. Youth-generated artifacts included pictures of drafts of their final products (e.g., poems, scripts, games, costumes). When developing protocols for the semi-structured interviews, I drew on graphic elicitation, specifically in the form of a relational map, in combination with interview questions on youths' feelings toward and perceptions about transdisciplinary thinking practices found in science and performing arts. Post-summer and post-school-year interviews also included questions on youth's final product.

Data analysis

Data analysis was an iterative process. Throughout the study, I (first author) re-read my field notes, interview transcripts, and drafts of youths' performances (e.g., scripts, cartoons). I wrote analytic memos to document emergent insights and potential relationships between themes and theory. As data generation occurred, audio recordings of formal interviews were transcribed. Data (i.e., field notes, interviews, and youths' final products) were analyzed through two cycles of coding using a mixed deductive and inductive approach. Salient themes from extant literature on identity and transdisciplinary art-science education informed deductive codes (e.g., interest, self-efficacy, creating, imagining, empathizing) (e.g., Calabrese Barton et al., 2013; Mishra et al., 2011). Inductive codes were generated through descriptive coding (e.g., hard work, self-expression). The second round of codes focused on discerning salient themes in terms of practices and perspectives that emerged for each youth in the space of Converge, and how these practices and perspectives related to youth's relationships with science.

Initial case summaries for each youth were developed and shared with the research team, including a research team member who was also present for all program sessions, to ensure that observations, analysis, and findings were representative of the events unfolding in the program. After engaging in discussion and critique with the research team, I shared a summary of preliminary findings with the corresponding research participant as well as with the Converge teachers. The sharing of preliminary findings with the focal youth participants and the program design team, including both educators and researchers, supports data analysis by providing space for alternative explanations, checks for researcher biases, and questions to explore further. Codes and case summaries were refined in response to emergent findings. Then, I engaged in a thematic analysis to identify patterns within each case. Patterns were converged across data sources (interviews, observations, youth-generated products) to corroborate initial findings within each case summary. Next, I analyzed the two unique cases to look for convergent and divergent insights across cases. This iterative process resulted in two individual cases of youth participants, each of which is organized by themes.

Findings

Data analysis yielded two themes for Jayda and Lara (pseudonyms). These themes were generated in light of research on transdisciplinary art-science learning spaces, which have been lauded for fostering emergent practices and perspectives and, in turn, a transformation of learning and participation (e.g., Mishra et al., 2011). As such, the theme for each youth corresponds to salient emergent practices and perspectives, which were demonstrated by the youth during Converge program sessions, as well as corresponding shifts in her participation.

Jayda: Leveraging her creative identity to negotiate a space for self-expression

In terms of practices and perspectives that manifested in the transdisciplinary space of Converge, Jayda engaged in the emergent practice of *expressing herself* and developed a new perspective on the transdisciplinary thinking practices of *imagining* and *creating*. Importantly, the practice of expressing herself through engagement in imaginative and creative thinking was not new to all spaces of Jayda's life. For example, imagination and creativity had always been important in her life at home. She explained, "I just like making my own stuff, so I feel, like, as a kid you could be imaginative and creative" (mid-cycle two). Specifically, she discussed an interest in drawing, fashion design, and making designs by mixing nail polish with water. At the same time, she recognized that her assets in imagining and creating were not traditionally recognized in science spaces, stating, "[Y]ou don't imagine in science, you *do* in science" (mid-cycle two). In this statement, Jayda implied that science is a discipline that relies on concrete practices, rather than more abstract practices like imagining.

However, there was a shift in her perspective on the transdisciplinary thinking practices of imagining and creating during the second learning cycle. Jayda explained that creating and imagining were important in science "[b]ecause when you're trying to make stuff in science, it's okay that you add, you know, like, your touch. It don't have to be, like, plain" (end of cycle two). She implicitly linked creativity and imagination with self-expression and explicitly noted the value of self-expression when describing the program: "It's [Converge], like, a way to express yourself. So, if you wanted to express yourself, you should probably do that. Because in theater you express yourself and, I guess, in science as well but, mostly in theater."

"Expressing herself" became an emergent practice for Jayda during the second and third cycles of her participation in Converge. In the first cycle (summer 2018), this practice was not yet evident in Jayda's work on her group's project. During this learning cycle, Jayda and her partner Lara created a public service announcement in the form of a poster with facts and images about the local impact of climate change, most of which she and Lara found on the internet. This project, which was similar to projects that one might find in traditional science classrooms, left little room for Jayda to build on her creative identity. In the second and third cycles, however, Jayda was able to create space to express herself by adding her own "touch" to her group's projects, including a board game about water access and control (cycle two) and a play about climate change (cycle three). In both of these group projects, Jayda's participation shifted in that she took on a leadership role. For example, when creating a play about climate change with four of her peers, she led her group in conceptualizing the plotline and characters. She also voluntarily worked on the project at home, including writing the script, sketching the characters' costumes, and sewing the costumes. Jayda's initiative and interest displayed in the program incited her teachers to present her with the "Butterfly" award at an end-of-summer symposium (cycle three) to recognize her metaphorical metamorphosis into a program leader. By "expressing herself" (emergent practice), Jayda not only came to recognize the value of the transdisciplinary thinking practices of imagining and creating in science (emergent perspective) but she was also able to leverage her creative identity and, in turn, position herself as a leader in her group's projects and in the Converge program in general (shift in participation).

While these findings suggest that her participation in Converge was expansive and transformative for her relationship with science, Jayda's utterances suggested otherwise. Although she expressed interest in the "costume part" in Converge, she described doing science, in general, as "boring," and specifically associated it with doing "paperwork" and watching "videos" (end of cycle 3). She also added that she did not "get" (understand) coding. Further, when describing Converge as a "way to express yourself" at the end of cycle two, she grappled with whether or not self-expression was permissible in science and, in the end, associated this practice more with performing arts or theater (i.e., "Because in theater you express yourself") Despite narrating a distanced relationship with science after extended participation in Converge, Jayda expressed that she wanted to pursue a career as a doctor both when she first joined Converge (cycle 1) and again after participating in the program for over a year (cycle 3). Jayda's utterances, coupled with her enactment of expressing herself through creative thinking and taking on a leadership role in the program, demonstrate the complexities of Jayda's evolving lived and storied relationships with science and art and her perspectives of these fields.

These findings echo those of previous studies, namely, supporting youths' identity construction with science is a complex and challenging territory with a wide range of historical and contextual factors coming into play, including youths' lived experiences with science at home, in school, in out-of-school programs, and in their communities (e.g., Calabrese Barton et al., 2013). While Jayda did not express a more expansive relationship with science during her participation in Converge, the results of this study nonetheless indicate the value of transdisciplinary art-science learning environments in supporting students like Jayda. Jayda's creative identity, and particularly her interest in "making" and fashion design, would likely go unnoticed in most science classrooms, where there is little room for imaginative, creative, and artistic thinking (Kafai et al., 2014). Jayda's engagement in expressing herself through creative and imaginative thinking is similar to what Kafai and colleagues (2014) refer to as "aesthetic thinking." In their study, Kafai et al. (2014) found that when students prioritized "artistic and attractive elements" of their e-textile projects, they experienced more ownership of their

work as well as deeper learning. By encouraging youth to bring their personal identities into their projects through personal expression and customization, integrated art-science projects better support youth like Jayda, who might otherwise slowly "opt-out" of STEM learning contexts, in coming to understand that adding one's "touch" in science is permissible (Kafai et al., 2014).

Lara: Engaging in creative collaboration by building on her interest in coding

Lara's emergent practices and perspectives during her participation in Converge were both similar to and different from Jayda's. Lara expressed new perspectives on *imagining, creating, and collaborating*, eventually coming to view these transdisciplinary thinking practices as valuable in science as well as in her personal life. She cultivated these new understandings through a unique trajectory in which she capitalized on her personal interest in coding. Earlier in the program, Lara described creativity and imagination as unimportant in science: "[Y]ou're not going to imagine. If you have a solution to a problem, you're not going to keep imagining it. You [are] gonna want to make something, prove some point. How [are] you gonna be creative" (mid-cycle-two). Implicitly, Lara's utterances acknowledge the role of creativity and imagination in science. For example, one could "create a project" or "make something." She also stated that "if you have a solution to a problem, you're not going to *keep* imagining it" (italics added), which implies that one must initially imagine a solution. At the same time, however, she explicitly rejects the notion that science involves creating and imagining ("why [are] you gonna imagine," "how [are] you gonna be creative"). Similar to Jayda, Lara implicitly associates science with concrete practices (i.e., "make something, prove some point").

Lara noted that imagining and creating were also unimportant in her life, stating, "I don't really like being creative. Theater is not my thing or storytelling. I don't like either of them. But, imagining stuff. Nah. I'm only imagining stuff when I'm reading a book" (mid-cycle two). While rejecting the value of these transdisciplinary practices in her personal life, Lara simultaneously associates imagining and creating with performing arts or theater, rather than science (i.e., "Theater is not my thing or storytelling.").

In a similar vein, during my informal interactions with her in the sessions as well as during the semi-structured interviews, Lara suggested that she enjoyed close-ended, procedural activities more so than open-ended ones that required imaginative and creative thinking. For example, during the first learning cycle (summer 2018), she reflected on her experience thus far doing two climate change learning activities in Converge, stating,

> The activity we did, like, what's a solution to [our] city and how it is gonna be flooded. How [are] we supposed to do that. But when we did the activity [to measure the effect of carbon dioxide on water temperature], I was like, okay, I can do that. Easy. (early-cycle one)

Here she expressed preference for a close-ended experiment rather than an open-ended design challenge.

Lara's self-reported disinterest in imagining and creating, as further evidenced by her preference for close-ended activities, was entangled with the practice of collaborating or "working as a team," another transdisciplinary thinking practice. Similar to creating and imagining, Lara expressed a disinterest in working as a team, specifically with her peers in school: "I don't really like working as a team because when I work alone, I get stuff completed faster. The only time I'll work in a group [is] if it's for a project. If it's mandatory, then yeah, sure" (mid-cycle two). This belief was enacted in group work during the first cycle of the program, specifically during investigations and the development of her group's final project, a public service announcement poster about the local effects of climate change, which she completed with Jayda. When discussing her role in group work that summer, she described herself as "carrying the team" because she was "the only one doing the work."

After participating in Converge for over a year, however, there was a shift in her thinking about the transdisciplinary thinking practices of imagining, creating, and collaborating. Lara's development of new perspectives of these thinking practices was primarily due to her ability to build on her interest in coding and, in turn, successfully collaborate with her group members on an open-ended project during the third learning cycle. For their final product that summer, Lara, Jayda, and three of their peers developed a play about climate change. In their play, an all-female "squad" of five adolescent-aged characters time-traveled to the future and saw the devastating effects of climate change on their local community. To produce this play, group members conceptualized the characters and the plotline, designed and created costumes for their characters, coded LED lights for the costumes, and cast and directed five Converge staff members to play the role of these characters, including myself (first author). In this project, Lara was able to build on her interest in coding by positioning herself as one of the two expert coders for the group. Lara reflected on her group's process, stating, "[O]ur group…I felt like we were more creative—a lot more creative this year. And we actually did science, theater, and coding." Lara's experience in this group project supported her in coming to recognize the value of the transdisciplinary thinking practices of creating and imagining in science. In contrast with a previous interview,

she explained that creating and imagining were important in science because "[Y]ou don't want to do, like, the same stuff as anybody else did. Then you wouldn't be your own person" (late-cycle three). This statement echoes a sentiment made by her peer, Jayda, specifically that "it's okay that you add…your touch" in science.

Yet, different from Jayda, Lara arrived at this new appreciation for imagination and creativity (emergent perspectives) based on her experience collaborating (emergent practice) with her peers to leverage performing arts, fashion design, coding, and science when developing their product. She explicitly linked creating and imagining to the affordances of collaborating or working with a team, stating,

> [If] you're working as a team, you don't want to do the same project someone else did. You want to do something different, something that'll get other people inspired. Honestly, [imagining or creating is the] same thing as working as a team…with more people in the group, we could have more ideas [about] what to do." (late-cycle-three)

In this statement, Lara highlighted how working as a team espoused imagination and creativity ("with more people…we could have more ideas"). This statement, coupled with an earlier one on the value of integrating theater with STEM disciplines to support creativity, demonstrates that Lara came to recognize the value of creating, imagining, and working as a team through experiencing success in an open-ended project that relied on the coordination and collaboration of individuals engaging with multiple disciplines.

Conclusions and implications

There is growing attention to transdisciplinary art-science education in the United States, specifically around the potential of this approach to foster transdisciplinary thinking practices, such as communicating, collaborating, imagining, and creating (Finch et al., in press). There is limited empirical research, however, on how transdisciplinary art-science education supports the cultivation of these thinking practices (Quigley & Herro, 2016). This study contributes to the growing scholarship in this field, specifically on the converging thinking practices of performing arts and science and the ways in which youth leverage and negotiate these commonalities. By engaging in and recognizing the entanglement of these seemingly disparate domains, participants may challenge and reframe what is valued in science. This convergent space has the potential to disrupt sanctioned practices and identities in science, enabling youth and educators to develop and embrace expansive discourses and practices that better support youths' relationships with science and art (Henriksen et al., 2015). Integrating art and science may be particularly productive in supporting Black and Latinx females' relationships with science through engagement with scientific *and* artistic modes of communication and representation (e.g., narratives, e-textiles) that encourage personal expression (Kafai et al., 2014; Peppler & Wohlwend, 2018).

In this particular study, the transdisciplinary thinking practices of imagining, creating, and collaborating played a prominent role in Jayda's and Lara's trajectories. Jayda and Lara were able to cultivate new perspectives of these practices through their enactment of the emergent practices of expressing oneself (Jayda) and collaborative thinking (Lara). Encouraging imaginative, creative, and self-expressive thinking and recognizing these transdisciplinary thinking practices as valuable in science fields will better support youth like Jayda, in particular, whose creative identity might otherwise go unnoticed in traditional science learning spaces (Calabrese Barton et al., 2013). Because she was able to leverage and capitalize on her creative identity, Jayda was able to recognize the value of the transdisciplinary thinking practices of imagining and creating in science as well as position herself as a leader in the Converge Art and Science program.

For Lara, the emergent practice of collaborating was pivotal to her development of new perspectives on the transdisciplinary thinking practices of imagining, creating, and collaborating, which she viewed as entangled. Lara did not initially view these practices as important in her life, unlike Jayda. Lara's self-reported disinterest in these practices, coupled with her utterances and enacted practices during the program sessions, relates to her demonstration of practices of a "good student" identity, which are typically encouraged and praised in schooling (Archer et al., 2017). For example, Lara expressed an interest in maintaining straight A's, working hard and efficiently regardless of her interest in the task, and completing close-ended procedural tasks. These utterances and practices are likely crucial to Lara's development of self-efficacy in science (Aschbacher, Li, & Roth, 2010).

Given that students are often required to complete close-ended procedural tasks in science classrooms as efficiently as possible (Calabrese Barton et al., 2013), it is not surprising that youth like Lara find comfort and success with these types of tasks, which can often be done independently. Science and engineering processes in the field, however, are open-ended, messy, and collaborative (Ødegaard, 2003). Because of the nature of these endeavors, student engagement in transdisciplinary art-science projects can support youth like Lara in building self-efficacy with more open-ended activities, which are prevalent in science fields and life in general, as well as in recognizing the value of collaboration. Lara experienced success and enjoyment with an open-ended project

for the first time during her participation in Converge when her group was able to leverage fashion design, coding, and performing arts to create a play about the predicted effects of climate change on the local community (cycle three). Lara's experience of success and enjoyment in this particular open-ended project was due, in large part, to her ability to build on her interest in coding in her group's project.

Importantly, both Lara and Jayda were able to leverage their knowledge and resources in the context of Converge. Lara was able to build on her interest in coding and create a niche for herself as an expert coder when producing technology-enhanced costumes for her group's play (cycle three). Meanwhile, Jayda was able to embrace her creative identity in the design and development of her group's projects, including a board game (cycle two) and a play (cycle three). Previous scholarship demonstrates that youth are more likely to develop meaningful relationships with science when their practices and resources are valued in the learning environment (Calabrese Barton et al., 2013). Transdisciplinary spaces that leverage the commonalities of arts and science fields provide more opportunities for youth to embrace their practices and identities while simultaneously positioning themselves as meaningful contributors and doers of art and science. In such spaces, new practices and perspectives emerge, expanding what epistemologies and ontologies are valued (Finch et al., in press). This study highlights how a transdisciplinary performing arts and science program, and the thinking practices of imagining, creating, and collaborating, in particular, can support youth who might otherwise slowly "opt-out" of science.

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