

**Towards Liberating Methods:
Ethnodance as an Embodied Narrative of Black Students' Science Identity**

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THESIS

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SUMMARY

Various structures in science and science education spaces have historically maintained exclusion, oppression, inequities, alienation, and injustices for youth of color, and specifically for Black youth, in the US. Though studies have explored the production of self in science education spaces for Black students, researchers studying identities as narratives have mostly relied on written and oral language to co-construct identity depictions. Giving that dance is a significant aspect of social life for some Black youth, this study explored how *ethnodance*, a dance-based narrative of identities (Chappell & Varelas, 2020), afforded five Black high school students, for whom dance was a part of life and school, ways to make sense of their experiences in science classes and construct and narrate their science identities.

The study is framed on constructs from various bodies of literature to compose a conceptual framework that allowed me to study how ethnodance offered ways to construct and communicate identities of Black students in science classrooms. Arts-based approaches to learning, thinking, and research (Barone & Eisner, 2012), linked with the theory of multimodality (Jewitt, 2009a; Kress, 2009), provided the framing for considering dance as a valuable form of construction and expression of who people are and who they are becoming (Carlone & Johnson, 2007; Kane, 2012; Olitsky, 2007; Rahm & Moore, 2016; Tan & Calabrese Barton, 2008; Varelas et al., 2011). To elevate the significance of dance in the lives, experiences, and stories of Black youth, the construct of Black Dance (Gittens, 2012) is used to articulate the power of dance, and to ground it as an embodied construction and representation of one's identities in narrative (McAdams & Mclean, 2013).

The goal of the arts-based narrative inquiry research design was to investigate how students used the semiotic resources available in ethnodance to construct, narrate, and convey interpretations of their experiences in science classrooms, as well as construct their science

SUMMARY (continued)

identities. Narrative inquiry (Clandinin, 2013; Clandinin & Connelly, 2000) and arts-based practices (Barone & Eisner, 2012; Leavy, 2009; 2017) coupled with Tinker's (Latz, 2017) method of photo-elicitation analysis were used. Marked by their own representation and exploration, this analysis illuminated aspects of young people's ways of being in the world, thus, giving voice to, and calling attention to the voice of, these students.

The Black students used ethnodance to convey their identity authoring as science students and their own sense-making of their science experiences in unique ways. Each student used a particular choreography and music genre to represent salient affective, social, and cognitive and dimensions of their science identities affiliated with aspects of identity authoring, encompassing interactions among teachers and peers, insider/outsider status, recognition, emotions, engagement in science practices and competence. With its particular features and the arrangement of several genres in one dance performance, the nature of each dance genre offered the young people moments to dive deep into their experiences and communicate what these experiences meant with respect to who they were becoming in science.

The semiotic choices that the students made by the dance genres they chose to perform conveyed the disconnection or connection between science and their selves, which they had been experiencing at different moments along their journey. The Black students in the study narrated the construction and authoring of their science identities through a dance performance in creative and critical ways regarding the context of their experiences. Ethnodance offered students with intersecting dancer-science identities a medium to construct, narrate, convey, and author who they saw themselves as in science in ways that was often challenging in written and oral communication.

SUMMARY (continued)

Students used similar moves or sequencing of choreography to represent similar and contrasting elements of their experience(s) via their ethnodances. Some used signature moves that were deeply connected to aspects of their dancer self to metaphorically author their experience(s), while others used those same moves as iconic representations of their experiences.

The young people used videography of their ethnodances to expand or extend their narratives of their experiences in high school science by mapping new or more elaborate meanings to planned and unplanned choreography. Aspects of their science identity authoring that were not intentional choreographic decisions were unearthed and interpreted. Through these more elaborate meanings, they continued to construct and reconstruct who they saw themselves as in the various science time-spaces, or chronotopes (Bakhtin, 1981) they had experienced and continued to experience.

Students ethnodances offered them opportunities to transduce the affective and emotional dimensions of their experiences in ways that their written narrations of their experiences in science could not represent. Students noted particular features of their dance performance that pertained to the emotions that were central to their ways of being in science. They used slow-tempo music to establish the emotional state for challenging or frustrating experiences, and upbeat, fast-tempo music or dance mixes to represent moments of triumph, perseverance, or affirming shifts in how they saw themselves in science.

Additionally, students' sense making with and of their ethnodance emphasized aspects of the structure-agency dialectic (Varelas et al., 2015) in their identity narratives. They noted specific school-based structures that hindered or impacted their academic progress or

SUMMARY (continued)

engagement in science, and highlighted ways in which their agency enabled them to push against or maneuver around these structures.

Lastly, the Black students in the study used majorette and hip-hop to represent salient moments of their experiences, positioning their ethnodances as sites of solidarity and cultural expressivity. However, the students utilized contemporary or lyrical choreography to illustrate experiences that challenged or nuanced their position within science.

The findings revealed that ethnodance offered Black youth with dance identities a tool to narrate their developing science identities and communicate salient affective and interactional dimensions of their identities, and also to further build them as reified artifacts of their engagement in science classroom communities. Thus, this study suggests that future research should continue to explore the ways in which ethnodance can capture, narrate, convey, extend, and expand students' science selves for those with and without dancer identities. Given the potential of ethnodance to engage Black students in sophisticated contemplations of their interactions and relations with science in science classrooms, and of creating a place for themselves in challenging classroom spaces, such as physics, and strengthening their sense of belonging in such classroom spaces, ethnodance could also be used as a teaching tool. Engaging students, and specifically Black students, in systematic and periodic examination of the construction of their science identity in classes by fostering their performance and orchestration of an ethnodance would provide student dancers, and those who do not identify as dancers, space to utilize their bodies to process how they see themselves being and becoming in science classrooms and advance these conceptions along the way. In this way, Black youth will be not only allowed but also supported in working toward liberation, freeing themselves from the

narratives of underperformance, deficiency, and despair, and cultivating venues to reshape their world lived experiences and the world around them.

1. INTRODUCTION

1.1. Science Education and Black Youth

Despite calls for culturally responsive teaching and culturally relevant learning spaces, the current educational challenges that today's Black students experience in schools across the US are not much different than what was happening in Mississippi in 1964 (Howard & Jackson, 2014) in general and more specifically in science. According to Charles Cobb, a SNCC field secretary at the time, Mississippi schools were a place of institutional oppression and “social paralysis” which worked to maintain the white supremacist ideologies of the state (Cobb, 2008, p. 71). There were vast educational disparities and economic inequities between Black and White students at the time (Moore Clemons, 2014). Although progress has been made over the last few decades, for many Black people, schools remain sites of social and racial inequalities instead of spaces where they actualize “academic success...develop and/or maintain cultural competence...and develop a critical consciousness through which they challenge the status quo of the current social order” (Ladson-Billings, 1995, p. 160). More specifically, science spaces and places within the larger institution of schools continue to be sites of racial inequalities, unjust, and oppressive experiences for Black, indigenous, and youth of color (Brown et al., 2013; Mutegi, 2011; Parsons, 2008; Parsons et al., 2009).

Eurocentric ideologies embedded within curriculum (Aikenhead, 1994; Carter, 2004) and neoliberal, market-oriented practices such as standards-based testing and “racial capitalism” (Morales-Doyle & Gustein, 2019, p. 527) proliferate racial and economic inequities among students in science and science education (Strong et al., 2016). In other words, engagement in Westernized curriculum and instruction that positions Eurocentric ways of knowing and being in science and science education as the “standard” by which to measure one's self leads to farther

oppression and exclusion of youth of color, especially Black youth. Coupled with structures that restrict access to various resources, these ideologies and practices work to historically maintain conditions of racial inequalities and oppressive, exclusionary experiences for many Black youth in today's schools in the US. Thus, research that seeks to understand the experiences of youth of color, especially Black youth, and their social, cultural, and historic context within science education is critical in order to transform structures that work to maintain such inequitable, unjust, oppressive, and othering experiences (Mutegi, 2011).

Focusing on experiences of youth of color and more specifically Black youth as an area of exploration in science education necessitates questioning who can engage in research focused on Black, indigenous, and youth of color (Milner, 2007; Tillman, 2002), as well as the potential harm versus benefit of such work regardless of intent in science education and education in general (Smith, 1999). To avoid perpetuating the ways that Black, indigenous, and youth of color have been “misrepresented, exploited, silenced, and taken for granted in education research” (Milner, 2007, p 1), I need to share my positionality as it will be an inextricable fiber of all aspects of this research study (Ladson-Billings, 2000; Milner, 2007; Stanley, 2007).

1.2 Researcher Positionality and Black Youth's Experiences

As a Black female doctoral student in science education and a science teacher, I am committed to principles of academic access and excellence, civic responsibility, and teaching for equity and social justice. My reasons for teaching and conducting research with and about Black youth are rooted in who I am, and principles of intergenerational servant leadership acquired during my time with Freedom Schools (Howard, 2016). Specifically, I choose to move the experiences of those of us who live in the margins to the center (hooks, 2000). I “choose to study [the experiences of] people marginalized by society”, such as Black youth, as a member of the

margins, a form of resistance, and a rally cry that those of us who exist within the margins lives matter (Smith, 2012, pg. 204).

As an undergraduate student, I was frequently met with stereotypical assumptions about students who attended East. St. Louis Sr. High School and speculations about our potential trajectories from individuals who were visitors (worked at the school) or had no connection to our community. This taught me to be my own voice regarding my experiences and potential success. I carry this belief into my teaching and research practice. Thus, my research aims to explore the authentic voices of Black youth in the recounting of their lived experiences and declarations of being and existing within the discourse of science education.

Throughout my educational coursework I engaged in varied literature on the experiences of youth of color, and specifically Black youth, in school and specifically science education. Some of this literature presents deficit narratives—achievement gaps, master narratives, poverty discourse (Burchinal et al, 2011; Clark, 2014; Jenson, 2009) and other liberating and empowering narratives—counternarratives, re-seeing, critical narratives (Emdin, 2011; Howard; 2010; King & Pringle, 2019; Ladson-Billings, 1995; Porterfield, 2017). In keeping with the belief that those who came before us should have learned somethings along the way to make the steps of those coming after us a little easier, my research seeks to align with the latter body of research that I have engaged with in my educational studies. In other words, I seek to contribute scholarship that offers liberating narrations of the experiences of Black youth by illuminating structures that maintain oppressive and detrimental experiences for students and reaffirm racist, culturally inappropriate, and unjust masternarratives. This requires being intentional about highlighting ways in which students resist these structural impingements (Duncan-Andrade & Morrell, 2008) and carve out space to be their agentic selves (Varelas et al., 2015) Thus, my

research focuses on creating and studying ways in which Black students' identities are authentically captured considering the dialectical relationship between structure and agency in context of science education (Varelas, 2018; Varelas et al., 2015).

1.3 Identity Research and Science Education

Studies focused on identity in science education have explored identities in practice in various settings that are constructed in narrations that people create of their experiences in those settings (Chappell & Varelas, 2020). Such studies have explored the experiences of learners, teachers, and practitioners of science (Avraamidou, 2016; Calabrese Barton et al., 2013; Childers & Jones, 2017; Kane, 2016; Lee, 2012; Roth & Tobin, 2007; Varelas, Kane et al., 2012). Such research has focused on the exploration of identity authoring with regards to how one authors their positioning with respect to how one is positioned by others and science from a historical lens. Within this body of research, identity construction is considered part of one's production of self in conjunction with knowledge production, views, actions, and emotions, as one engages with others in spaces such as science. Structures (physical symbolic, cultural, sociopolitical) within numerous spaces where people learn, and one's agency to push against said structures working to transforming or maintaining them, are integral aspects of identity construction (Bruna & Vann, 2007; Gutierrez & Calabrese Barton, 2015; Varelas et al., 2015).

The existence of certain structures in science education and science classes has historically maintained unjust, inequitable, and othering experiences for youth of color, and in general for minoritized youth associated with their socioeconomic standing, language, gender, ethnicity, and/or race. More particularly, scholars have noted such experiences as Black youth in the US interact with and within science (Brown et al., 2013; Mutegi, 2011; Parsons, 2008; Parsons et al., 2009) and other aspects of schooling (Hope et al., 2014; Lewis & Diamond, 2015).

Thus, research that explores Black students' production of self in science education spaces and places is vital as it could facilitate pathways to liberating and empowering experiences or perpetuate alienation and oppression.

1.4 Arts-based Approaches and Identity Research

The study of the production of self necessitates consideration of various facets of the context—cultural, social, and historical. Though science education research focused on the study of identities has made considerable progress, the creation of such research is worth interrogating. Researchers in science education who have explored identities as narratives have heavily utilized written and oral language for co-creating identity representations with some exceptions (Mensah & Fleshman, 2017; Tucker-Raymond et al., 2007) and a few that are connected to the maker movement (Calabrese Barton & Tan, 2010). The exploration of arts-based practices such as an embodied representation of one's identities as narratives remain unsubstantially studied in science education, even with the increasing attention to arts-based methods that Sullivan (2010) characterized as “creative and critical processes at the core of research practice so as to fully investigate the contexts that shape complex human thoughts and actions” (p. 58). According to multimodality researchers, though historically dominant, language as a mode of communication offers both affordances and limitations for expressing and constructing meanings (Jewitt, 2009a; Kress et al., 2001). Other modes of communication such as gaze, visual images, movement of the body, music, and ensembles (dance or theater) have their own semiotic systems for making meaning, and different “epistemological commitments” (Bezemer & Kress, 2008), and, thus, provide different opportunities for making meaning.

As science education researchers have noted, written and oral narrations have cultivated space for the construction of powerful and meaningful identity stories of young people, and more

specifically people from marginalized groups, within science and science education (Kane, 2016; Tan et al., 2013; Varelas, Martin et al., 2012) However, “additional modes of expression by those who have historically embraced such modes may provide additional insights into identity stories” (Chappell & Varelas, 2020, p. 194). As the exploration of identity work expands within science education, there is a need for more studies that speak to the methods employed for capturing, constructing, representing, and embodying one’s identity with all of its trials, tribulations, triumphs, emotions, and affective dimensions in addition to and outside of oral and written narrations.

1.5 Social Dance and Black Youth

As a meaningful aspect of social life, some Black youth frequently engage in dance, in community with others, using dance as a tool to express their selves, cope with pain, remember salient moments, heal, and as means to build solidarity with others as they collective stand up for their freedom (Gittens, 2012; Gottschild, 2003). Additionally, improvisational dance performances have been used to situate the everyday lived experiences of Black bodies within the racialized context of their neighborhoods giving space for Black bodies to be their complete expressive selves outside of imposed Eurocentric dance discourse (Bragin, 2014).

In doing so, these dance performances become embodied narrations of their lived experiences (Bochner & Ellis, 2003) told in their chosen mode of communication, rendering their embodied narratives as sites of solidarity (Daniel, 1991) and cultural expression that is often overlooked, dismissed, or seemingly invisible (Bragin, 2014, Sutherland, 2019). Such dances transcend the aura of performative acts to become liberating survival tools (Delgado, 1989) for storying Black people’s experiences and communicating their ways of “being and becoming in sociocultural contexts, where they have been minoritized, discriminated against, and stereotyped

as deficient” (Chappell & Varelas, 2020, p. 197). The dances challenge dominant perceptions and motivate the transformation of beliefs (Solórzano & Yosso, 2001). Thus, such narratives conveyed in liberating and authentic ways provide affordances for capturing students’ conceptions, feelings, and experiences regarding their evolving science identities interwoven with their racial, social, and other identities.

1.6 Researcher Positionality and Dance as an Identity Construction Tool

Until about two years ago, my passions have lived in seemingly divergent spheres. Academically, I have been engrossed by scientific investigation ever since I was able to use the “Making Saltwater” lab from my 5th grade science class with Mr. Keys to explain to my very-old-school, “you-do-not-question-or-talk-back-to-me” grandma why it is better to make Kool-Aid with hot water instead of cold water. Something about being able to prove to my cousins and grandma that I was ‘right’ using my knowledge from school was invigorating. While my desire to engage in and with science grew throughout my experiences with schooling, a love of dance rapped on my heart like the beat to one’s favorite song. Socially, I have been in love with dance for as long as I can remember. No matter where I am and what is happening around me, when the beat drops my soul yearns to twerk, two-step, bounce, bop, sway, spin, and move to the rhythm. On my best and worst days, dance allows me to express myself in a crowded or empty room. Though vital aspects of how I engage with and in the world, science and dance were positioned as separate entities, with science taking a privileged position because “smart” people do mathematics and science and “big-girls” do not dance.

Dance and science remained in their separate silos until I took a multimodality course my second year of doctoral coursework. As a Black woman who have been negotiating my Black, dance, and science identities as a high school science teacher, dance coach, and more recently as

a doctoral candidate, arts-based and multimodality centered research has allowed me to construct, explore, and express the ways in which my lived experiences and identities are constructed and reconstructed through dance. My research focus began to consider the affordances of modes of communicating other than written and spoken language. Specifically, I began to think about the potential of dance as a mode of communicating and narrating students' identities within the practice of science. Emerging from my intersecting science and dance identities, my research agenda focuses on studying how dance as an arts-based research practice informs the study of Black students' science identity authoring and construction.

1.7 Research Goal

The purpose of this narrative inquiry (Clandinin, 2013) is to study how *ethnodance* as an arts-based practice informs the study of one's science identity. I apply arts-based research methods (Leavy, 2017) to understand empirically and theoretically how a dance performance, could capture, narrate, and portray the science identity authoring and construction process for Black science students in the US with inside and outside of school dancer identities. Thus, the research question guiding this study is: How does ethnodance offer Black students, for whom dance has been a part of life inside and outside of school, ways to create, capture, narrate, and portray analysis of their experiences in science classes and the tensions, triumphs, contours, meanings, and emotions, of crafting their science identities?

2. THEORETICAL FRAMING

The study is framed on constructs from various bodies of literature to compose a conceptual framework that allows me to study how dance, and what I define below as ethnodance, offers ways to construct and communicate identities of Black students in science classrooms. Arts-based approaches to learning, thinking, and research, linked with the theory of multimodality, provide the framing for considering dance as a valuable form of construction and expression of who people are and who they are becoming. To elevate the significance of dance in the lives, experiences, and stories of Black youth, the construct of Black Dance is used to articulate the critical expressive nature of dance, and to ground it as an embodied construction and representation of one's identities in narrative. All these constructs come together in my definition of ethnodance as a dance-based narrative of identities.

2.1 Arts-Based Approaches, Multimodality, and Dance

Arts-based research can be classified as transdisciplinary, in that the facets of artistic expression are used to construct and convey knowledge within the domain of research (Leavy, 2017). Barone and Eisner (2012) define arts-based research (ABR) as “an effort to utilize the forms of thinking and forms of representation that the arts provide as a means through which the world can be better understood” (p. xi). In doing so, arts-based representations such as music, theater, dance, painting, drama, and other artistic representational modes become avenues of empirical exploration. Researchers who use an arts-based approach, such as dance, seek to explore the potentialities of nondiscursive means of knowing, being, and creating to invite audience members into experiencing aspects of a world that might exist outside of their vantage point. For example, music expresses meanings using sound in ways that cannot be communicated to the same depth and breadth in nonmusical forms, just as performative pieces,

such as dance and theater, convey the emotional and affective dimensions of experiences in ways that is not equivalently translated in discursive forms (Barone & Eisner, 2012). Thus, arts-based research expands exploration of meanings in the world that moves beyond the limitations and constraints of discursive ways of communicating, such as written narratives or oral discourse, to embrace the affordances of nondiscursive communication.

Studies that focus on empirical and theoretical exploration through artistic representations employ arts-based practices not only as conceptual but also as methodological tools for data collection, analysis, and interpretation (Leavy, 2009). The use of artistic representations in educational contexts, merging “art + design practices to address problems rooted in educational discourse” (Leavy, 2017, p. 494) has been known as arts-based educational research (ABER). Additionally, ABER seeks to convey the experiences of people in humanizing ways that move beyond quantification and generalizability (Clough & Nutbrown, 2019). Participants are more than observable specimens whom we come to know and understand through quantifiable data and other statistical data sources. While “such research methods have given us a great deal, ...they are far from the whole story” (Barone & Eisner, 2012, p. 2). Therefore, the appeal of ABER lies in its ability to explore the more complex understandings of interactions and aspects of life that exist outside of generalizable or propositional claims and quantifiable assessments. In essence, the evocative nature of art offers the audience an opportunity to garner a deeper level of understanding of the experiences of others through empathic participation that might otherwise go unnoticed with formulaic or quantification practices.

ABR, as well as ABER, is “not a report of findings derived by other means” (Rose, 2016, p. 333) disseminated through the arts. Additionally, ABR does not attempt to replace or simply supplement other methods of conducting research. Arts-based approaches stand as more than a

buttress to language as a form of meaning making and communication, or an alternative in an academic debate on what communication tool is best for capturing the human experience. ABR moves beyond the bounds of conventional conceptualization of research to embrace and further investigate the capacity “of expressive forms to capture qualities of life” (Barone & Eisner, 2012, p. 5), artistic representations such as theatre, music, dance, poetry, and other forms of art. Thus, ABR extends the possibility of conceptualizing, interpreting, and conveying experiences (Culshaw, 2019; Hannigan et al., 2016; Zhang & Zuhong, 2018) and studying learning and development (Fierros, 2009; Gouzouasis et al., 2013; Pickard-Smith, 2018; Varga-Dobai, 2018; White, 2018) in education.

Arts-based approaches to interpreting and communicating human experience align with multimodality theory (Jewitt, 2009a; Kress, 2009; Varelas, Kane et al., 2012) and its tenets. Multimodality recognizes that language is not a central axis of communication. People utilize a range of semiotic systems to represent and communicate meanings, referred to as modes (Jewitt, 2009a). Modes are socially and culturally shaped representational and communicational resources organized to create and realize meaning.

“Multimodality...proceeds on the assumption that representation and communication always draw on a multiplicity of modes, all which equally have the potential to contribute to meaning” (Kress, 2009, p. 14). In other words, multimodality assumes that meaning is gathered, translated, constructed, and expressed through the utilization of a multitude of communicative methods such as language (speech and writing), image, gaze, gesture, body movement and posture, sound, and music. Furthermore, multimodality also assumes that various communicative methods are not merely supportive tools for language. Consequently, non-language-based modes of communicating have their own capacity for making and translating meaning as “visual

communication, gesture, and action have evolved through their social usage into articulated or partially articulated semiotic systems in the same way as language” (Kress et al., 2001, p. 44).

Multimodality theory supports the necessity of research approaches that consider various modes of communication and meaning making like body movement, visual imagery, music, and ensembles such as dance (Bezemer & Kress, 2008). Just as the organization of a written document or the tone of one’s voice has their own ways of communicating meaning to a specific or general audience (Jewitt, 2009b), so does the intensity of a body movement or the tempo of a song in the modal ensemble of a dance performance. Additionally, when people utilize multiple semiotic systems to express and develop ideas, they strengthen their meaning making process via transduction (Bezemer & Kress, 2008)—the linking of meanings over various semiotic systems. Thus, dance as a modal ensemble, an ensemble consisting of several modes including body movement and posture, facial expressions, gaze, music, and sound, has the potential to enhance “meaning making for the artist and the audience in ways that are absent from language alone” (Chappell & Varelas, 2020, p. 194).

Each of the forms of semiotic representation, namely modes, in dance is a “network of interlocking resources for making signs” (Jewitt, 2009b, p. 44). Every mode (e.g., body movement, music, image, language, dance, and theatre ensembles) has its own grammar, configurations, rules of engagement, and resources, which makeup what Halliday (1978) referred to as the “textual” metafunction of a mode (referring only to language). Furthermore, a mode has affordances and provides opportunities for orchestration of meaning, knowledge production, and the construction of reality, defined by Halliday as the “ideational” metafunction of a mode. Additionally, Halliday’s “interpersonal” metafunction of a mode captures the distinct manner in which a mode allows one to engage their multiple interpersonal relations.

The ideational metafunction is also related to the ways people are positioned or position themselves within the context of a specific discourse (Jewitt, 2009a). In the figured worlds that people create, ideas and meanings are also shaped by the “active, passive, and reactive” (p. 24) roles of participants. Thus, the interpersonal metafunction that captures the social relation of interactions within a given discourse is intertwined with the ideational; there is an intricate relationship between the sign (medium being used to convey meaning), sign maker (individual making the sign), and the audience (recipients / interpreters of the sign). Furthermore, both ideational and interpersonal metafunctions of a mode are contingent upon the organization of the semiotic resources of the mode, its textual metafunction. In the case of dance, the organization of the semiotic resources of different genres of dance and the meanings they convey shape the interpersonal and ideational meanings communicated. These meanings have the potential to illustrate students’ experiences within the social context of a disciplinary discourse, as well as how students are positioned and position themselves within the discourse of a discipline, such as science.

Each mode, as well as its metafunctions (textual, interpersonal, and ideational), has been molded by historical, cultural, and social contexts. Modes are socially constructed, developed by people as they share life within a particular community. Modes have also developed to include a variety of genres that use certain semiotic networks of resources to portray ideas, including conceptions, emotions, and social interactions. In dance, the body and its relation to the environment are important:

Drawing from Massumi (2002), who in turn draws from Deleuze and Guattari (1987), we conceptualize the body as always in relation to an ever-changing environment. This body is both material and incorporeal. Materially, we move within time and space as bodies.

As bodies, we perceive and register, consciously or unconsciously, some of the infinite patterns and variations in our environment. It is in the body that we locate the affective sensations of those registrations that are available to our consciousness, often making meaning of them by giving them form and significance as emotion, physical sensation, response, or energy. (Leander & Boldt, 2012, p. 29)

For dancers, the body is central to who they are in relation to particular communities, and the social, cultural, and historical roots of particular dance genres offer them a crucial vehicle of expression and making meaning. Thus, dance as a modal ensemble may offer dancers a fruitful arts-based axis of inquiry into their experiences in various sociocultural activities, including engaging in science.

2.2 Black Dance

Dances rooted in one's culture "have often functioned as means for emotional, psychological, physical, and spiritual survival, as well as for individual and communal empowerment, even when subaltern dance practices have been negated, rejected, exoticized, or commodified within the dominant society" (Darder & Cronin, 2018, p. 27). As a form of art, dance has been a consistent avenue of expressivity (Perillo, 2017) and means of cultural solidarity (Daniel, 1991) and construction of cultural understanding (Bragin, 2014; Sutherland, 2019) for Black bodies against oppression and injustice. People of color and more specifically Black people have used dance as medium to express the emotionality of their lived experiences, confront political and social conditions, relieve frustration, and persevere. Moreover, dance has served as a medium for Black people to unify as a culture by building a collective understanding of the "ways in which social life is constructed through the ideas and feelings that people have about it, and the practices that flow from" (Rose, 2016, p. 2), their experiences, and ways of

making sense of the world. Thus, dance as a representational form has the potential to be an archival decolonizing praxis, “opening archives to modes of cultural expression that might otherwise be rendered invisible” (Sutherland, 2019).

Through these cultural expressions, dance makes visible the embodied resilience and fight of Black bodies without clenched fist, tattered flesh, and spoken words (Gittens, 2012). As a Black person, dancer, and choreographer in the US, Dr. Pearl Primus stated that dance is my medicine.

It is the scream which eases for a while the terrible frustrations common to all human beings who because of race, creed, or color, are invisible. Dance is the fist with which I fight the sickening ignorance of prejudice. It is the veil of contempt I feel for those who patronized with false smiles, handouts, empty promises, and insincere compliments.

Instead of growing twisted like a gnarled tree inside myself, I am able to dance out my anger and my tears. (p. 50)

Much like the explicit decisions of Black choreographers such as Katherine Dunham, Author Mitchell, and Pearl Primus, Black youth continue to make conscious choices about engaging in dance genres rooted in Black culture, a collective semiotic way that people of a group use for interpreting, making sense of, and living in the world (Hall, 1997). Through these choices a “Black female dancer can (symbolically) free herself from the constraints of mainstream dance industry boundaries” (Gittens, 2012, p. 62). This can be seen in the preferences that dancers make with regards to different dance genres and the articulation of the semiotic resources of a dance genre to narrate an experience. As the semiotic resources of dance are available to all dancers regardless of gender identity (DeFrantz, 2016), I extend the concept of freedom through choice to all dancers.

The construct of ‘Black Dance’ refers to genres of dance that have emerged out of African diasporic dance and “gave way to fresh and unique movement migrations and combinations that transcend notions of ‘traditional,’ contemporary, and vernacular dance styles” (Gittens, 2012, p. 56). The mere presence of Black dancers dancing does not constitute that the dance is Black Dance (Long, 1989). Black Dance is a “unified cultural aesthetic” of Black culture throughout the African Diaspora (Amin, 2011, p. 9). In this way, Black Dance as a construct becomes an interconnected reflection of the philosophical values and chosen ways of being and expressing for people across the African Diaspora. Additionally, Black Dance is constantly evolving, while staying connected to the African diasporic dance, resisting the business as usual status quo in the industry of dance and empowering dancers to take up dance and body movements that are rooted in Black culture (Chappell & Varelas, 2020). Dance genres that arose from Black culture and are classified as Black Dance (Long, 1989) include but are not limited to hip hop (Durden, 2019), the “hood dance” art known as turfing (Bragin, 2014, p. 101), krumping and clowning (Ohmer, 2019), and majorette (as seen on Lifetime’s popular TV show *Bring It*). This is not to say that all other forms of dance are non-Black. Black Dance recognizes that some styles of dance, or dance genres, arose directly from Black cultural practices and social interactions, while simultaneously acknowledging the influence of Black dancers and choreographers in other genres of dance.

Conversely, Black Dance is also “a construction that exists within a broader (white, heterosexual, patriarchal, capitalist) superstructure [and in this way] the historical label for empowerment becomes a political battleground for the engagement of identity politics through notions of race and gender” (Craighead, 2006, p. 29). Thus, on the one hand, the construct of ‘Black Dance’ could maintain alienation or othering for Black people and position their

engagement in the arts as separate and different from White people's while at the same time perpetuating oppressive ideologies that created the term within White culture. Then again, the construct of 'Black Dance' "also pays homage to the Black dancers and choreographers who cultivated a space for body movement derived from African diasporic traditions" (Chappell & Varelas, 2020, p. 196). Moreover, the persistent othering of Black people in the face of white supremacy necessitates that terms such as Black Dance remain a consistent part of dialogue in this postmodern age, in order to continually elevate the voices and experiences of Black people within academic and other settings (Amin, 2011). Using the term Black Dance helps situate the experiences and resilience of Black people within the racialized context of their existence in scholarly and non-academic work, thereby recognizing their stories and empowering society as a whole to "confront the biases of dominant culture and status quo inside [structures such as] the dance industry" (Gittens, 2012, p. 61). Thus, I use the term Black Dance to move the experiences of Black people who express themselves through engagement in Black cultural dance from the margins to the center of dialogue in academia, aligning with Gottschild's (2003) viewpoint:

Furthermore, I recognize with love and gratitude, the vast riches that people of African descent have brought to American dance, culture and life...Until racism and white skin-privilege are no longer an everyday issue in American life, I believe there is a good reason to use a terminology of difference (black dance; black dancing body) that allows us to honor these contributions. (p.14)

Moreover, choreography in Black Dance has been used to tell stories, narrate experiences, convey emotions, illustrate resistance, overcoming, and persistence, and provide counter-narratives to the master narrative, in the "authentic voices of people of color" (Ladson-Billings & Tate, 1995, p. 58). For Black people and other people of color, expression via

artistically presented stories of their lived experiences have historically been an important form of culture sharing, building, and individual and collective empowerment which continues today. “Oppressed groups have known instinctively that stories are an essential tool to their own survival and liberation” (Delgado, 1989, p. 2436). As Black people story their experiences and convey their self-determined sense making of being and becoming who they are within cultural and social contexts, which have cultivated discriminatory experiences and narratives of deficiency, they stand against prevailing perceptions while shifting and transforming belief systems (Solórzano & Yosso, 2010).

For Black young people for whom dance acts as a means of expressivity to portray emotions and experiences (Gittens, 2012), developing narratives about their experiences and lives as an embodied dance nurtures their agency. Flowing through their body movements, they speak the triumph and frustration not completely captured in their words. As dance is a mode of artistic expression with multi-dimensional possibilities for expanding narrative inquiry, a dance performance offers people a unique tool to construct embodied representations of their narrated past, future, and present selves (Bochner & Ellis, 2003). Thereby, dance might cultivate a space to make “art and words” that are more than a buttress or portrait of one another but are “interconnected and woven through each other to create additional meanings” (Springgay et al., 2005, p. 899). Dance is an embodied representation of how dancers are positioned and position themselves within the social context of their lived experiences. Thus, the semiotic resources of dance become tools to convey embodied representations of their “figured worlds” to an audience, providing revelations of how dancers’ identities are shaped by their experiences within a specific sociocultural domain.

2.3 **Identity Construction and Science Learning**

Who people are and who are becoming constitute their identities. Identity is a multidimensional and multifaceted construct (Varelas, 2012) that has been employed in varied ways in science education research (Lee, 2012). Using a sociological approach Stets and Burke (2003) define identity as positioning. An identity is an “internalized positional designation” (Stryker, 1980, p. 60), the meanings one has about the self that are linked to certain relational roles people have within membership groups. Stets and Burke call these meanings the “content” of an identity. Thus, the different positions one holds in society, shape and define intricate parts of one’s self. From an identity theory perspective, the meanings given to these intricate parts of self are referred to as identities (Stets & Burke, 2014). As members and role holders of several groups in life, people have multiple identities, and “their multiple identities interact with each other, shaping each other’s content” (Chappell & Varelas, 2020, p. 197). The meanings and expectations contributed to a role establish a set of standards that guide ways of being and how one positions themselves within a particular role within a particular group (Stets & Burke, 2000).

From the perspective of social identity theory, what is salient in identity construction is group affiliation that one ascribes to, or self-identifies with, a community of others who share a common social identification. The expectations (self or others’) for membership in a group guide how people see themselves as belonging to that group and not belonging to others. When individuals act to fulfill the role expectations within a particular group, their identity is shaped by the resources and schemas (i.e., structures) available to them and interactions with others (Stets & Burke, 2000).

Furthermore, identities are sculpted by the dialectical relationship between structure and agency (Varelas et al., 2015). Structures (e.g., symbolic, cultural, social, pedagogical, curricular,

physical, political, etc.) permit or hinder certain roles, but agency (human and non-human) may foster the development of new or transformed roles. These structures influence the development of knowledge and participation, as well as the emotions and actions tied to them through inclusionary or exclusionary practices. “As learners find themselves in, or intentionally become part of these structures, they come to develop...identity capital” (Varelas, 2012, p. 4) This identity capital refers to the resources available to an individual with which they define themselves and are defined by others (Cote & Levine, 2002). Thus, the resources available to a learner can lead to the shaping of an inclusive or exclusive identification within a particular structure depending on how they are positioned by self and others. Moreover, learners enact agency in “their actions and meaning-making, e.g., when they perform certain identities, make decisions, and value judgments, and decide future courses of action” (Carlone et al., 2015). Actors craft identity performances that conform to and/or resist the prevailing structures, sometimes intentionally, but sometimes unconsciously.

Using the structure-agency dialectic as a lens offers opportunities to explore the multifaceted, interwoven, reciprocal, interconnected relationship between structural aspects of learning, discourses, and spaces and student and teacher agency (Rodriguez, 2015; Varelas et al., 2015). The structure-agency dialectic provides an avenue to explore structural impediments to learning and engagement as well as ways teachers can circumvent or dismantle these impediments to support student agency and identity development. Thus, exploring “the structure–agency dialectic may enhance efforts to theorize about pedagogical practices, curricular approaches, and educational policies based on a more enriched understanding of structural affordances and hindrances vis-a-vis actors’ agency, choices, thoughts, and actions” (Varelas et al., 2015, p. 440), which is essential in identity construction.

Research exploring identity research has included a focus on identities-in-narratives (Sfard & Prusak, 2005) that science education scholars describe as the narratives people construct as they recount who they see themselves being and becoming and who they see others recognizing them to be in science spaces (Carlone & Johnson, 2007; Kane, 2012; Olitsky, 2007; Rahm & Moore, 2016; Tan & Calabrese Barton, 2008; Varelas et al., 2011). As people recount their lived experiences, “they convey to themselves and to others who they are now, how they came to be, and where they think their lives may be going in the future” (McAdams & Mclean, 2013). Identities-in-narratives have the potential to reveal students’ agentic power to disrupt normative science ideologies and carve a place for themselves in science. Additionally, the role of teacher agency and other trusted figures, in helping students construct, deconstruct, and reconstruct their science identity is illuminated in this body of literature.

Structures (sociopolitical, physical, symbolic, conceptual, cultural) that exist in and define the varied spaces and places where one learns, and one’s agency to interpret and act relative to these structures, preserving or reshaping them, are an inherent part of one’s construction of identities-in-narratives and identities-in-practice (Bruna & Vann, 2007; Gutierrez & Calabrese Barton, 2015; Varelas et al., 2015). According to Archer and colleagues (2017), “classroom norms and teachers play an important part in shaping the extent to which students can perform themselves scientifically, learn science, and are encouraged, or discouraged, from pursuing a science trajectory” (Archer et al., 2017, p. 742). Consequently, transforming school science spaces and places into liberating science practices necessitates “us to first identify and then deconstruct hidden power structures” (Strong et al., 2016, p. 228) to strengthen students’ positive identification in science. Exploring students’ identities-in-narratives can also shed light

on how structural aspects of science position some students outside of science and on the normative science ideologies that are responsible for such positioning.

Moreover, emotions are “one of the central mediators of our identities, or ways of being in the world” (Maulucci, 2012, p. 125) and, thus, play a vital role in the process of identity construction. Emotions are the commentaries regarding what people care about and to what extent, (Archer, 2004), and hence, windows into what people count as significant and defining for them. The prominence of an identity is based on one’s commitment to both affective and interactional dimensions of such an identity (Owens et al., 2010). When people’s experience of membership within a group include emotionally satisfying interactions and relationships with others that affirm their identity, that identity is boosted. For a science identity, this dialectical way means that a student’s science identity both boosts and is boosted by both the affective and interactional dimensions of their being in science contexts, including classrooms (Chappell & Varelas, 2020).

When students’ experiences with and in the disciplinary practices and discourses of science create opportunities for students to see themselves as doers, knowers, and likers of science, they experience a sense of competence, a competence that is socially shaped in and by interactions and experiences in a science classroom (Chappell & Varelas, 2020; Gresalfi et al., 2008), and their science identity is constructed and boosted. Insider status within a community, coupled with a feeling of competence that is also recognized by members of a given community fosters opportunities to nourish that identity.

Varelas, Martin, et al. (2012) maintained that learning of a subject matter includes both building knowledge of the practices, concepts, and nature of the field of study, and building a buoyant identity with regards to that field. Thus, opportunities for learning are strengthened

when attention to both knowledge construction and identity construction is given during the learning process. Varelas et al. write:

An explicit, in-depth, and extended processing of identity work will enable students to understand their self and the subject matter they are learning in unison, using one to leverage the other. We argue that this is particularly important for African American students, many of whom are surrounded by rhetoric at micro-, meso-, and macrolevel contexts filled with negative stereotypes and innuendo about Black competence (Nasir & Shah, 2011), emphasis on the achievement gap, and often limited framings of who they are and who they can become. (p. 336)

Providing opportunities for students to narrate their experiences in science classrooms and process who they were and who they are becoming emboldens them to engage with the process of identity construction, and, thus, intertwine the learning of content with identity construction (Chappell & Varelas, 2020).

As science education spaces and places continue to be sites of exclusionary, oppressive experiences for youth of color, especially Black youth, exploration of these persisting racial inequities through multimodal ways of gathering students' identities in narratives has the potential to illuminate aspects of students' experience that are not widely visible. As many Black youth use artistic expression as a way of coping with everyday lived-experiences, conveying joy, critiquing social issues, and building solidarity in and out of school, there is a need for studies that explore arts-based research approaches to studying the experiences of Black youth in science education through their chosen mode of expression. Exploration of students' identities through arts-based, embodied narratives such a dance performance, has the potential to offer students liberating and affirming ways of sharing who they are and who they can be in science

classrooms. Thus, arts-based research approaches like dance have the potential to expand the methodological tools available to researchers' exploration of students' science identities.

2.4 **Ethnodance**

In cultural studies, Denzin (1997) proclaimed that, a shift towards studies that uplift performance would be a defining moment in the 21st century, which extends far beyond the 20th century turns to interpretive and narrative studies. Performance is “a site where memory, emotion, fantasy, and desire interact with one another” (Denzin, 2003a, p. 12). Embracing Goffman's symbolic interactionism, Denzin conceived of a performance as a “mimesis,” an imitation of the real world (Denzin, 2003b). As lived experiences are reconstructed in performances, a performance becomes a tool to shift reality in the social world. As artistic representations, dance and theatrical performances represent both everyday life experiences and the real world in which these experiences occurred. They provide dynamic “breaking and remaking” of experience (Conquergood, 1998, p. 32) and, thus, in cultural studies, drawing from performances provide a medium to understand “process, change, improvisation, and struggle” (p. 31) within interacting and experiencing reality.

Theater and drama as artistic representations of social life are focal points of what Saldaña (2005) coined as ethnotheatre and ethnodrama and. I have extended Saldaña's framing with what I call “ethnodance,” an artistic representation through dance that comprises data and interpretation in studies of identity and identity construction (Chappell & Varelas, 2020). In keeping with Saldana's framing of ethnodrama and ethnotheatre, the prefix “ethno” refers to the ethnographic nature of the arts-based research approach. However, acknowledging the harm or trauma that the framing “ethnic dance” has the potential to evoke within indigenous cultures, it is

important to note that ethnodance is not, nor will it be in the future, a reference or abbreviation for ethnic dance in the context of my research.

Like a theatrical performance, dance interprets and captures lived experience, and helps to “more closely examine how we and others experience life, and to shape those moments into new aesthetic forms that bring us closer to notions of what is real and what is true as we individually and collectively construct them” (Saldaña, 2005, p. 213). Similar to Saldaña, I consider that ethnodance is “aesthetically sound, intellectually rich and emotionally evocative” (p. 14). Ethnodance as a performance portrays “the unscriptedness in human experience, which is rife with conflicts, ambiguity, questions, and idiosyncrasies” (Rolling, 2010, p. 107). Thus, ethnodance has the potential to shed light on authoring one’s self in relation to the resources and the schemas of the structures existing in the communities in which people live, work, and learn, and the roles they play in them (Varelas, Kane et al., 2012; Calabrese Barton et al., 2008; Carlone et al., 2015). Thus, ethnodance can be a generative representation of one’s science identity authoring.

Saldaña (2011) framed ethnodrama, and ethnotheater, as an “art form [that] has this ability, this power, to heighten the representation and presentation of social life” (p. 5). As the dance performance is assembled, students “recover, yet interrogate the meanings of lived experience” (Denzin, 1997, p. 95) in science and, thus, deeply engage with who they are and are becoming in these experiences. Through re-embodying the storying of their own experiences, more and deeper intricacies of these experiences emerge (Chappell & Varelas, 2020). As dancers perform, create, and share meanings via an ethnodance, they embody Bakhtin’s (1981) chronotopes, or in other words, the time and space dimensions of their experiences in the figured worlds (Holland et al., 1998) they constructed and performed via their dance. These time-space

relationships “allows us to see not how the human experience is constructed in the person’s mind, but how it is constructed as it is recounted in text” (Varelas, Kane et al., 2012, p. 571). Students’ narratives capture and reflect the relationship between the social and material aspects of life. Through their narratives, students construct their identities via the roles and practices they enact within the spatial and temporal dimensions of their narratives. These time-space dimensions of their narratives are defined by the ways in which people included in the narratives come to exist in these narratives, and also define the narratives themselves and what the narratives communicate about the people involved. Thus, the ethnodance (embodied representation) stands as a form of semiotic representation, a “network of interlocking resources for making signs” (Jewitt, 2009b p. 44) with affordances in terms of the orchestration of meaning, knowledge production, and construction of reality, embedded in students’ narratives. As a tool for studying identity as performative work of the self, ethnodance has the potential to present one’s identity authoring process and represent one’s narrated experiences.

Ethnodance offers dancers a creative opportunity to develop self-reflexivity as they narrate their acting, feeling, perceiving, and thinking both in the sensemaking process that leads to the dance and the dance itself (Chappell & Varelas, 2020). The orchestration of the ethnodance through the interplay of dancers’ engagement with the semiotic resources of dance genres and each other, cultivates stories of dancers’ realities that could provide robust revelations (Harrop & Njaradi, 2013). Through the movement of their bodies and orchestration of choreography, dancers construct visual imagery that might not be partially or completely captured in spoken words alone (Leavy, 2009; Marshall & Rossman, 2016). Additionally, videography of an ethnodance offers space for continued reflection that may lead to expansion or

extension of narratives, as well as sensemaking for both the audience and the dancer (Chappell & Varelas, 2020).

“The inseparability of space and time” (Bakhtin, 1981, p. 84) is actualized via students’ ethnodance of their lived experiences, through which students create their figured worlds of science, where they “construct and reconstruct the sense of their science self. This sense of self is embedded in the space–time relationships (i.e., chronotopes) that underlie their experiences with science. However, this sense of self is constructed and reconstructed as students tell stories about their experiences” (Varelas, Kane et al., 2012, p. 571). Through ethnodance students construct and narrate embodied stories of who they see themselves as in the science classes they experienced, and continue to experience, which are comprised of the chronotopes that “stand as monuments to the community itself, as symbols of it, as forces operating to shape its members’ images of themselves” (Bakhtin, 1981, p. 84).

With this study, I aim to capture the semiotic choices that Black students, who engage in dance as a vital aspect of their lives, make to further construct and express science identities via dance performances. The focus is on students’ choreographic mix of music and dance genres, which intertwines embodied identity artifacts with narrative inquiry, to construct empirical evidence of the ways in which ethnodance could be beneficial in science identity studies.

3. METHOD

This study was a narrative inquiry of Black students' science identities via dance as an arts-based approach to research. My teacher, coach, and researcher roles were closely intertwined in this study, which used a variety of data sources, namely, videography of students' ethnodances, written narratives, oral conversations, student selected photo artifacts, and my ethnographic knowledge as a teacher and dance coach. Analytical techniques of the data included memoing on the emergent ideas while watching students' ethnodances, coding and thematizing oral conversations, identifying choreographic features of the students' ethnodances and relating them to students' identities in narrative, and visual analysis of students' ethnodances and photo artifacts alongside their written narratives and oral conversations.

3.1 Study Design

The study employed an interpretive lens to examine how students author their science identities through ethnodance, an embodied representation focused on dance for creating narratives of their science identities. Interpretive approaches to research are culturally and socially embedded and are especially useful for studying constructs that are not sensory observable, yet present and relevant (Bredo & Feinberg, 1982). An interpretive approach is particularly relevant for capturing and understanding the ways in which students interpret science experiences and classroom interactions to construct their science identities (Calabrese Barton et al., 2013). Interpretive research can shed light into the ways in which students make sense of the values, principles, ideologies, and practices that teachers bring to class, as well as of the types of interactions that affirm, nuance, or contest students' science identities. Qualitative, interpretive research is more applicable than positivistic approaches to studying social experiences which are deeply connected to complex social phenomena. However, interpretive approaches to

educational research tend to be dismissed due to their lack of generalizability, testable hypothesis, and / or driving theory, which is, nevertheless, contested– “This narrow conception does an injustice to the variety of contributions that qualitative research can make” (Peshkin, 1993, p. 23). Moreover, moving away from claims of objectivity, interpretive research explores “disciplined subjectivity,” the ways in which the positionality of the researcher informs the research (Carr & Kemmis, 1990). Thus, explicit presentation of my positionality as a teacher-coach-researcher as well as critical analysis of my ethnographic knowledge were crucial to maintain the “disciplined subjectivity” throughout this study and are detailed in the Context section of this chapter.

The study focused on the way students used *dance*, a form of art, specifically what I call *ethnodance*, to *narrate* experiences in science spaces, classrooms and schools, and convey dimensions of their science *identities*. It was built on the consideration that, for students for whom a salient aspect of social life involves body movement and dance, social dances which are embraced within a culture sharing group, are a means to cultivate solidarity with others, heal, remember, deal with pain, express their sense of self and creativity, and communicate their readiness to stand for freedom (Gittens, 2012; Gottschild, 2003). Thus, students’ choreographed dance performances have the potential to become embodied representations of their experiences and narrated identities. Through such arts-based narratives choreographed by students who had been involved in dancing, I sought to explore their science identities and identity authoring. Thus, this study was based on the combination of narrative inquiry (Clandinin, 2013; Clandinin & Connelly, 2000; Holstein & Gubrium, 2000) and arts-based research (Barone & Eisner, 2012; Leavy, 2009; 2017) to investigate how the arts-based practice that I define as *ethnodance* informs the exploration of science identity as narrative.

A narrative inquiry approach to research seeks to shed light into the ways in which people make meaning regarding their experiences in life through narratives (Hannigan, 2014). According to Clandinin (2013), “the focus of narrative inquiry is not only valorizing individuals’ experience but is also an explanation of the social cultural, familial, linguistic, and institutional narratives within which individuals experiences were and are, constituted, shaped, expressed and enacted” (p. 18). In other words, narrative inquiry seeks to present an explanation of the context in which individual narratives were formed, constructed and storied, as well as honor and value individuals’ experiences. Thus, narratives are accounts of lived experiences, histories, and revelations of the imagination constructed and storied in the present, past, and future (Daiute, 2014).

A narrative embodies the physical and psychological ways of knowing and making meaning (Bruner, 1986). Narratives contain actors (human and nonhuman) and a sense of self conveyed through the inseparable temporal and spatial (time and space) context of the meaning making process that students undergo when they story (share, construct, or recount) their experiences in science (Varelas, Kane et al., 2012). Moreover, narrative inquiry can shed light into the “micro-narratives” that people construct regarding their lived experiences that challenge or contradict stereotypical or societal “meta-narratives” in science discourse (Hannigan, 2014, p. 4). In doing so, narrative inquiry elevates the often excluded or disregarded voice of marginalized people in broader dialogue (Daiute, 2014). To be able to represent these voices in honorable and uplifting ways through narrative inquiry, I extended the interpretative requirement for making explicit my positionality to include reflexivity, which goes beyond what I know and believe, to include what I do with such knowledge throughout this study (Butler-Kisber, 2010). I detail the

role of my ethnographic teacher-dance coach knowledge in the Data Sources section of this chapter.

Embracing a sociological perspective of narrative inquiry, I sought to explore “the narrative practices by which storytellers make use of available resources to construct recognizable selves” (Chase, 2005, p. 68) in science. Dance as a form of art presents ample opportunities for narrative inquiry. Dance affords possibilities to create visual representations of one’s future, present, and past self (Bochner & Ellis, 2003). The semiotic resources of different genres of dances allow dancers to foreground different emotions associated with experiences. The intersection of time and space allows powerful revelations to be communicated throughout the story of the dance (Harrop, Njaradi, & Ebrary, 2013), including how dancers position themselves throughout the story. Thus, dance can be an embodied representation of one’s narrative, providing an opportunity for a person to be heard without talking. Dance can create visual imagery for emotions associated with experiences, which sometimes cannot be constructed and expressed with spoken words (Leavy, 2009; Marshall & Rossman, 2016). Thus, ethnodances, the embodied, via dance, representations of ones’ identities in narratives, stand as a fruitful site of inquiry into ones’ identities.

Daiute (2014) suggested that one of the appeals of narratives lies within one’s expression of personal experiences in their authentic voice regarding their ways of being in and experiencing the world. Daiute’s suggestion is in line with Clandinin and Connelly’s (2000) argument that narrative inquiry is a collaborative endeavor with participants, a means of understanding one’s experience with respect to their social context. However, they also identify tensions or challenges pertaining to the researcher’s role and power dynamics in narrative inquiry. The researcher’s political, ideological, and personal background may impact how they

capture, re-story, and interpret narratives, as well as raise questions regarding ownership of the story and the authenticity of participants' voice in the narrative report (Creswell & Poth, 2018). Without careful attention and explicit steps to protect authenticity, the narrative may shift from capturing a participant's voice and experience to reflecting the researcher's voice and perspective. Thus, in this study I employed several techniques (described below) to reduce the impact of my role as a researcher such as explicit check-ins with participants regarding my interpretations, elicitation of embedded meanings using photovoice and videography of students' ethnodances, collaboration with participants, and critical examination on my positionality throughout the research process. Moreover, visual narrative inquiry, such as ethnodance and photovoice, is "[a]n emerging area of promise for attaining more complex understandings" (Creswell & Poth, 2018, p. 74). In other words, visual narrative methodologies create space for researchers and participants to reflect on the social, cultural, historical, and racial aspects of life in the world embedded within the narratives. Such reflection took place throughout the study, including data analysis, findings' presentation, and discussion of the study's conclusions.

3.2 Context

For several years, I, a Black woman in the US, have been negotiating my Black, dance, and science identities in my professional life as a science high school teacher and more recently as a doctoral student. I had been teaching science at a neighborhood high school in a large US city, a school predominantly comprised of Latinx students and a small percent (15%) of Black students for 5 years at the time of the study. When I joined this school, I was asked by Black students to sponsor a Dance Club specifically dedicated to majorette, a genre of dance that is

“often referred to as the band’s danceline at some Historically Black Colleges and Universities (HBCUs)” (Chappell & Varelas, 2020, p. 199).

During the years of this study, the Dance Club consisted of six members in Year 1 (four self-identified as female and two as males), 10 members in Year 2 (8 self-identified as female and two as males), and 14 members, all of whom self-identified as female, in Year 3. The difference in membership from Year 1 to Year 2 was due to four members graduating in Year 1 and eight new members joining in Year 2. Three members graduated at the end of Year 2, one transferred, and 6 members continued into Year 3, in which 8 new members joined the Dance Club. Participant selection was limited to Dance Club members who studied two or more years of high school science and had participated in some dance setting for at least one year prior to becoming study participants. This was necessary for having available ethnographic data regarding their dance genre preferences, level of dance technique, and for ensuring they had experiences in science classes to draw connections and comparisons.

The Dance Club met for two hours twice a week throughout the school year and four hours a day (20 hours total) during a one-week intensive summer conditioning workshop. Both current and alumni members attended summer conditioning. Though the Dance Club practiced various dance genres, the student members and school community referred to the club as a Majorette Dance Team. The choreography in the Dance Club was not separated based on gender. In other words, all members performed the same dance moves and routines. Fostering non-gender or sexual orientation bound choreography within the Dance Club is consistent with the view that “Black social dance, one example of which is majorette, engages *queer potentiality* [italics in original] as an achievement of virtuosity, resistance, and social flexibility...pushing

forward expansive physical possibilities for expressing Black social life regardless of sexual or gender identity” (DeFrantz, 2016, p. 73).

Being one the five Black teachers amongst more than 60 teachers, and the faculty advisor for the Black History Coalition, I often checked-in with current and former students who were in my chemistry or biology classes in the school. Thus, informal settings such as after-school activities including the Dance Club, lunchtime, and passing periods, became moments for me to engage with students regarding their experiences in all their classes, their performance, daily triumphs and struggles, and their overall wellbeing. These check-ins fostered the cultivation of a trusting relationship and a strong rapport with many students within the school. Through these relationships and informal check-ins, I was able to start paying close attention to the ebb and flow of students’ science identities from when some of them where in science classes with me. Often, many of our Black students began to speak about their science selves in ways that positioned them as “outsiders” to the discourse of science. Wanting to explore the aspects of their experiences that were causing these shifts in their identity stories in a manner that better aligned with who they are holistically as young people, I turned to dance. Thus, the six Black students with intersecting science student and dancer identities who participated in the school’s Dance Club and studied science for at least two years constituted the participants of this narrative study (Creswell & Poth, 2018).

3.3 Participants

The five Black students who participated in the study are: Tiffany, Jasmine, Fara, Lawson, and Devon (all pseudonyms), with four of them identifying as female and one (Lawson) as male. During Year 1 of the study, Tiffany, Jasmine, Devon, and Lawson were taking an elective school-based dance class. Additionally, Tiffany and Jasmine performed with the

school's cheer squad for one year prior to joining the Dance Club. Also, both Jasmine and Tiffany both participated in an arts-based after-school program that fostered partnerships between artists and teachers across varied subject areas and genres of art, and that club is where they first learned that we shared dancer identities with me. During Year 2 of the study, Tiffany, Jasmine, and Fara participated as alumni members. Lawson and Devon were enrolled in an elective dance class and Lawson was a member of the school's cheer squad. During Year 3 of the study, all participants were alumni members of the Dance Club. This information is summarized in Table I.

Around the school, Jasmine was recognized for her ability to “twerk,” a dance move that consists of quick movement of the derriere and hips to the beat of a song, often while in a squatting position (Stevenson, 2010; Toth, 2017). Twerking has been linked with sexual provocation, which, however, has been interrogated in the literature as argue in Toth (2017) based on the Sosa and Poncin (2015) documentary on twerking. Nonetheless, the school's cheer coach often positioned twerking as an inappropriate or unacceptable genre of dance. Jasmine, Devon, and Lawson's first formal introduction to various dance genres occurred in the Dance Club. In middle school, Tiffany was a member of a community-based dance team, and crafted YouTube videos of dance performances that she choreographed for fun.

During dance performances, Tiffany illustrated emotionality through gestures and facial features, more than other members of the Dance Club. Additionally, Tiffany's persistent requests for a Dance Club were the driving force that inspired me to develop one. Fara studied ballet during ages 5–9. Though the Dance Club was Lawson's first formal introduction to dance, though he self-taught himself some majorette type moves prior to joining the dance team. Additionally, Lawson frequently helped co-choreograph segments of team performances.

TABLE I**STUDY PARTICIPANTS' INVOLVEMENT AND EXPERIENCE WITHIN SCHOOL-BASED DANCE**

Study Participant	Year 1			Year 2			Year 3		
	Dance Club	Elective Dance Class	Cheer Squad	Dance Club	Elective Dance Class	Cheer Squad	Dance Club	Elective Dance Class	Cheer Squad
Tiffany	3 rd year	2 nd year	2 nd year	Alumni	-	Not a member	Alumni	-	Not a member
Jasmine	3 rd year	2 nd year	2 nd year	Alumni	-	Not a member	Alumni	-	Not a member
Fara	3 rd year	Not Enrolled	Not a member	Alumni	-	Not a member	Alumni	-	Not a member
Lawson	2 nd year	1 st year	Not a member	3 rd year	2 nd year	1 st year	Alumni	-	Not a member
Devon	2 nd year	1 st year	Not a member	3 rd year	2 nd year	Not a member	Alumni	-	Not a member

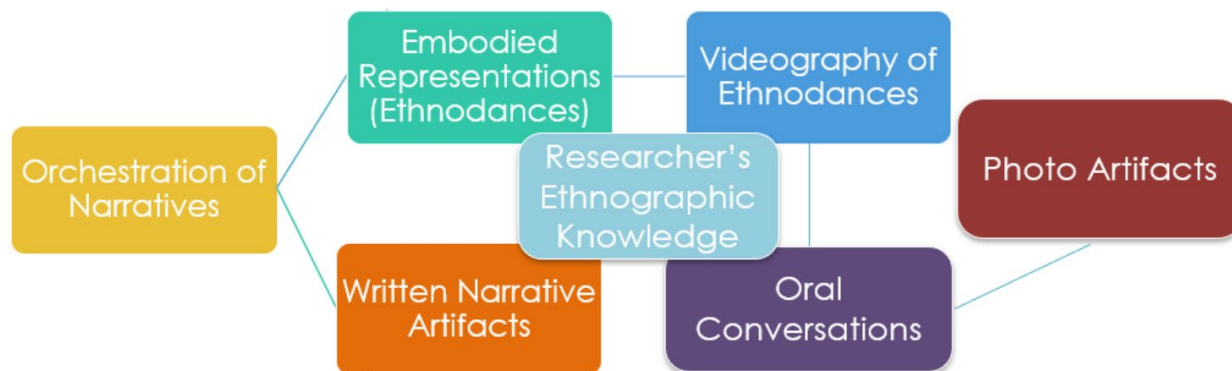
Note: “—” denotes an exemption due to graduation, and “Alumni” denotes participants who maintained active participation (attending practice/choreographing/performing as alumni) with the club/team after graduation.

Devon was the only participant who engaged in sports/extracurricular activities outside of Spirit (Dance and/or Cheer).

Prior to this study, Lawson and Devon had taken honors chemistry with me. Tiffany, Jasmine, and Fara had taken environmental science, biology, and physics as a result of a shift in the school's science course sequence, which was formerly biology, chemistry, and physics. Tiffany and Jasmine had taken regular biology with me, and Fara took honors biology with a different teacher. Fara and Tiffany had taken honors physics with the same teacher, whereas Jasmine had taken regular physics with another teacher. In Year 1, Tiffany transferred to a neighboring school during second semester but continued to participate in the Dance Club with administrative approval. Lawson and Devon both took honors physics with the same teacher. Tiffany and Jasmine did not take a science course during year 1, while Fara was selected for AP Physics, but withdrew for second semester due to course difficulty and a longer morning commute because of moving farther away from the school. In Year 2, both Lawson and Devon were enrolled in a science class. Lawson was enrolled in AP Physics and Devon was enrolled in Dual-Credit Environmental Geology. In Year 3, Tiffany, Fara, Jasmine, Lawson, and Devon were alumni members of the dance club. Alumni members frequently attended rehearsals, participated in conditioning, and performed at the annual showcase.

3.4 Data Sources

The data sources (Figure 1) for the narratives of this study included students' written narrative artifacts, embodied representations (ethnodances) and video recordings of them, oral conversations with students, my ethnographic knowledge of them as dancers and students, and students' self-selected photo artifacts (Figure 1).

Figure 1*Summary of Data Sources*

3.4.1 Written Narrative Artifacts

To make space to reflect on, and story, their experiences in and with science, students were asked to respond to the following prompt in writing.

What has been your experience with and in the practice of science throughout your journey? Are there moments throughout your journey in/with science that stand out for you? If so, what are they and why do they resonate with you the most?

They were not given limits or parameters for the length or level of detail provided in their written narratives. Participants were provided with a range of paper sizes and writing instruments and 45 minutes of independent writing time. Participants' written narratives varied in length from 4 to 10 sentences.

3.4.2 Videography of Ethnodances

During the Dance Club's annual showcase, club members were asked to create a solo that is representative of their experiences related to the yearly theme. In Year 2 of the study, the showcase theme was a 'High School Dancial: Life at Westwood High' (the school's name is a

pseudonym). All the Dance Club's group or duet performances were related to interactions and experiences at Westwood in general. However, for the solo performances, they were asked to choreograph a dance representative of their experiences with and in science using the following prompt.

Using the genres of dance and music, choreograph a dance to represent your experience(s) with/in science. Let the dance speak for you. Tell us your experience through the dance.

To capture students' embodied representations of their selves in and with science, students were asked to video record their ethnodances, which ranged from 60 seconds to 130 seconds. Additionally, students were asked to take photo snippets from their ethnodances, which represent salient moments of their science experiences. Students selected from 3 to 10 photo artifacts from their ethnodances.

The location of the ethnodance (home, school, stage, dance studio, indoors, or outside) was determined by the participant. Tiffany chose to record her ethnodance at home because that is where she felt most comfortable. Tiffany's ethnodance was performed in her kitchen and self-recorded via her cellular phone. Lawson and Fara chose to record the performance of their ethnodance on stage during the Dance Club's annual showcase. Thus, their ethnodances were recorded by the Dance Club's videographer on a camcorder. Jasmine chose to record her ethnodance during a summer conditioning on the school's auditorium stage. Jasmine's ethnodance was recorded on her phone by another Dance Club member. Devon chose to record her ethnodance in the school's dance studio during her Dance Club's solo practice time. Devon's ethnodance was recorded by another member of the Dance Club. Given the variety of recording devices used, the resolution of some ethnodance recordings was lower than others.

3.4.3 **Photo Artifacts**

According to Clandinin and Connelly (2000), “narrative inquiry is a way of understanding experience; it is collaboration between research and participants, over time, in a place or series of places, and in social interactions with milieus” (p. 17). To make space for participants’ voices and their own sense making of their science experiences and science identity authoring, and to attend to the collaborative nature of narrative inquiry, I employed Photovoice to collect and analyze photo artifacts.

Photovoice is a methodological approach that is based on “feminism; Paulo Freire’s notion of critical consciousness; and participatory documentary photography” (Latz, 2017, p. 27). Photovoice intends to encourage participant documentation of their own everyday lived experiences and use critical dialogue to expand or extend participants’ critical consciousness. Additionally, Latz (2017) argues that,

Photovoice enables individuals of various social statuses to document the most salient aspects of their lives. This approach decentralizes the role of the researcher and honors the authenticity of participants’ vantage points. As authors of their own experiences, photovoice positions participants as active instead of passive subjects of other people’s intentions and images. (p. 43)

Photovoice involves asking participants to respond to a set of prompts or questions using photos that were selected or captured by the participants during the narration stage. This prompting/questioning phase is known as photo elicitation; the use of photos “to elicit responses from and excavate memories of participants” (Latz, 2017, p. 74). Participants are asked to narrate the content present in the photos during a conversation, sharing the meaning of their images.

In this study, participants were asked to select still images from the video of their ethnodances that represented salient moments in their experiences with and in science. In individual oral conversations, participants were asked to narrate the content of their image(s) and the relationship to their experiences with and in science using a modified version of Tinkler's photo elicitation technique entitled 'PHOTO' (Latz, 2017). Thus, Photovoice offered space for participants to extend their embodied narrations (ethnodances) and continue to author their science identities as they made additional sense of their represented experiences.

3.4.4 Oral Conversations

After recording and sharing their ethnodances, participants participated in a one-on-one conversation with me that gave them an opportunity to reflect on their own sense making and gave me an opportunity to check with them the meanings I was deriving from their ethnodances. Participants were first asked to talk about their experiences while watching their ethnodance. As participants narrated their ethnodances, I asked questions such as:

Choreographic Features

1. Why did you choose the song or music genre present in your ethnodance?
2. What genres of dance are present in your ethnodance and why?

Meaning Making

1. Describe what your ethnodance tells us about your experiences with/in science?
2. Why did you choose [genre of dance] to represent [the experience described above]?
3. Why did you choose a [specific reference to a dance move] to represent this experience?
4. What aspect of your ethnodance speaks to the emotions you felt during this experience?

After participants talked about their ethnodance, I used still images from the video of their ethnodance to elicit additional meaning making regarding their experiences with and in science, and capture still visuals of the meanings, emotions, or interactions expressed in a particular segment of their dance performance. A modified version of Tinkler's PHOTO technique (Figure 2) was used to capture students' interpretations of their still images from their ethnodances (Latz, 2017). The technique was modified to include specific references to the dance and the recounting of experiences in the selected portions of their ethnodances.

Figure 2

Modified PHOTO technique

- | | |
|----------|--------------------------------------------------------------------------------------------------------|
| P | What P icture would capture the meaning you just described? |
| H | How would you title this picture? |
| O | What does this picture convey O f this move or segment of the dance performance? |
| T | What does this T ell us about your science experience? |
| O | How can this picture provide O pportunities for you to narrate your experiences within science? |

3.4.5 Researcher's Ethnographic Knowledge

As a science teacher and the participants' dance coach, I have amassed ethnographic knowledge for the participants at various degrees. As a science teacher at their school, I have taught four of the participants. Thus, I have knowledge regarding their ways of being in science class and expressions regarding engaging in and with science that may be in line with or stand in contrast to how they position themselves in their ethnodances. Additionally, due to the size of the science department, I know which teacher each participant had for all their science classes throughout high school. As their colleague, I have observed all of the other science teachers during informal peer walkthroughs. This information had shaped my understanding of the

participants' ethnodances. Thus, it was crucial for me to verify and validate my interpretations during the oral conversations that were used as ways to conduct member checking in interpreting their ethnodances.

As the participants' dance coach, I am aware of their preferences regarding different genres of dance. I am aware of their ways of being (facial expressions, intensity of movements, and performative energy) during dance performances. Additionally, as all Dance Club members create an ethnodance regardless of their participation in the research study, they sometimes ask me to help them choreograph a move to represent a specific emotion (joy, excitement, sadness, pain, etc.) when the Dance Club has designated time for solo assistance during rehearsals. I use this knowledge to ascribe meanings and emotions to particular moves or combinations of moves. To ensure that I keep my dance coach interpretations in check, I asked participants to describe the meanings embodied within the choreographic features of their ethnodance (dance genres, music genres, body moves, facial expressions, tempo, etc.) without sharing my interpretations.

3.5 Data Analysis

The analysis was informed by arts-based practices and narrative inquiry coupled with Tinker's method of photo-elicitation analysis (as outlined by Latz). These illuminated dimensions of the ways of being in the world, evident by one's own representation and exploration, thus, giving voice to, and illuminating the voice of, people themselves (Latz, 2017; Leavy, 2009). Participants' meaning making with regards to who they were, and were becoming, in science, which they were communicating via their ethnodances and the photos they captured as snapshots of their dance performances was the analytical focus. I analyzed both (a) aspects of the participants' science identities and (b) features of their ethnodances and photos that allow me a window into their science identities. Thus, I captured the participants' meaning making by

paying attention to how the students labeled, identified, and classified ideas about themselves and science and how they represented and authored these in their ethnodances.

As Rolling (2010) noted, “there is no one set of criteria for judging the artistic quality of a work of arts-based research just as there is no one paradigm for the beauty of a work of art; for some, the beauty of a work of art is in the esthetics of its forms and the mastery of its techniques, for others, it is in the authenticity and expressiveness of voice, and for still others, in the incisiveness of its social critique” (p. 105). First, I watched and re-watched several times each dance performance. I first identified broadly choreographic features such as the music genre, tempo of the song, tone or mood of song, genre(s) of dance chosen to convey an experience or experiences, dance counts, the intensity of body movements, facial features, and pace of the dance. These features were then examined for the identity meanings they communicated.

Table II provides a sample of salient aspects of the participants’ ethnodances that became important in analysis: (a) dance genre; (b) selected song to accompany the dance; (c) salient choreographic features of the dance performed by the student in relation to an experience represented; (d) experience represented by the dance and the primary illuminated meanings of the experience; and (e) mood of that element of the dance performance that captures the interpretation of the experience by the student and the experience itself along with its representation via the dance.

I described in detail and categorized the features of the dance genre(s) utilized in each participant’s ethnodance. My personal engagement in dance, both as a dancer and the Dance Club coach, informed how I defined various moves and distinguished characteristics amid dance genres.

TABLE II
SAMPLE OF SALIENT ASPECTS OF PARTICIPANTS' ETHNODANCES

Dance Genre	Song	Choreography Features	Experience and Meanings	Mood
Tiffany's Solo Dance Performance				
Contemporary (Slow)	HER: Changes (R&B)	Began with music interlude into forward-facing moves. Changed direction to side facing moves then back front. She moved into squatting rotations with a tongue flick and direction change and ended with an arch back on "now I just want you to save me."	Evolving through the up and downs of relationships and interactions with others (challenging / shifting/flourishing)	<p>"When I drop down to beat my hip, it was meant to represent my outbreak and how I became a beast at dancing and how it brought out the best in me."</p> <p>"At that part of the dance...it was my beast mode...letting people know that I'm not afraid basically."</p>
Jasmine's Solo Dance Performance				
Majorette (Upbeat)	Snappy Jit: Beast Mode (Dance-Mix)	Began with low-technique sequences and transition to high-technique sequences. Moved into a low buck and struggled with timing and ending moves.	Struggling in Physics due to "math-heavy" aspect of course moving to excelling by seeking support and studying (challenging/filled with doubt / doable)	"I got into my beast mode... grinding and making sure that I get an A so that I can...go to the college of my choice and just accomplishing something that I wanted."

Fara's Solo Dance Performance

Contemporary/ Lyrical (Slow)	Kiana Ledé: One of Them Days (R&B)	Began standing in chairs into a split on the chairs before rolling into a floor split. Moved into floor work before standing, dropping into a split, and rolling backward onto a chair. Ended with a direction change before walking off.	Feeling pressured to perform well in school/science and smile to using agentic power to resist pressure and make best-suited decisions. (non-conforming/pushback/self-advocacy)	"...that's kind of meant to be like, you know, it's one of those days, and you just gotta shake the nerves out. And it was a lot of those days in high school for me... but you know what breathe take a step back, you're going to get through it"
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Devon's Solo Dance Performance

Majorette (Upbeat)	Yellow Claw: DJ Turn It Up (Dance-Mix)	Began with a jump kick into a fast buck before sashaying into a side-facing timber. Moved into a side back kick into a buck sequence before sashaying forward. It dropped into a split, flipped over into a split & ended with a hinge up followed by a shoulder shrug.	Being "stress-free from schoolwork" and having nothing to worry about due to self-recognition as being "well-built for science" to a "breakthrough" when you finally get it (relief/affirming/doable /fun)	"you get a break from school, and you just want to turn up." A break from "all the schoolwork and everything like stress-free." "Like you free you? you wild. You can like, you know, // you ain't nothing to worry about."
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Lawson's Solo Dance Performance

Contemporary/Majorette (Slow to Upbeat)	Kelly Clarkson: I Don't Think About You to Cardi B: Bartier Cardi (Pop-HipHop Mesh-up)	Began with a slow walk on stage into a forward-facing, low intensity left leg side kick into a rolling back arch. Low intensity mellow dramatic movements continued into abrupt musical transition. Removed vast into high- technique sequences of flips, kicks, bucks, and rolls ending with signature death drop.	Struggling with exposing true self "the bottled in the hidden" to becoming "more open" to "we're confident" (working with belonging /unsureness/non-conforming/ flourishing)	"This is me. She's loud; she's a little bit ghetto. You know, this is what I do, and this is what I do best."
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I looked for what each ethnodance elicited as an aesthetic method of expression, the notable technical dimensions of the body positions and movements, how the ethnodance conveyed understandings associated with the students' science identities, and how the ethnodance meshed with the students intended meanings of their ethnodances that were expressed during their oral discourse.


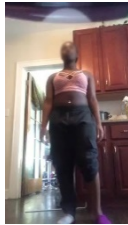

I looked at each segment of the dance performance and the meanings communicated (meanings intended by the dancers, and meanings developed by me, the researcher), to attend to the three metafunctions of any system of communication—ideational, interpersonal, and textual (Halliday, 1978; Jewitt & Kress, 2003; Kress & vanLeeuwen, 2006), and create code groups. I captured the ideas the participants expressed about the construction of their science identity and their science identity itself (ideational metafunction). I interpreted the relationships between participants and others communicated in their performed narratives (interpersonal metafunction). I analyzed how the participants organized and interacted with the semiotic resources available in the dance genre(s) they utilized in their choreography to reflexively develop meanings and perform the intended meanings related with their science identities (textual metafunction).



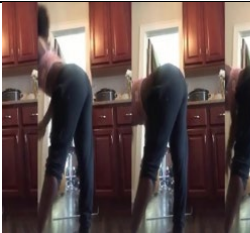
The recorded oral conversations enabled triangulation for the researcher's interpretations of the ways in which the participants' ethnodances capture their science identities. Additionally, the photo artifacts were used to help students recall emotions and specific details regarding their ways of being in science (Latz, 2017), thus deepening the recollection of experiences that their ethnodances were communicating.

Students' videography of their ethnodances, oral conversations and their written transcriptions, written narratives, and photo artifacts were all put into ATLAS.ti (. hpr 9) for coding, memoing, and identification of emergent themes across data sources. I then categorized

codes according to metafunctions. Table III shows all codes, and code families and their associated metafunction, along with an example of a discourse excerpt from a student's oral conversation and its corresponding student-selected photo artifact.

TABLE III
SUMMARY OF CODES

Code Group	Code	Metafunction	Discourse Excerpt	Photo Artifact
Agency	Self-Recognition Self-Affirmation Choice Advocacy Trusted Adult Intervention Pushback Non-Conforming	Ideational	“I got to the point where I would literally just go to physio and take a nap. Like honestly, it [AP Physics] was horrible to the point where he would have to pull me aside, like if you do not get such and such on this kind of project, you can’t graduate. And I was just like okay” Lawson.	
Location of Performance	Outside of School Auditorium Stage Dance Studio	Textual	“I purposefully...recorded the video in my own home and in my own comfortable clothes with my hair tied up to show that like, I am my own individual and I’m going to express myself in my most comfortable form” Tiffany.	
Features of Dance Performance	Emotionality of Experience Intensity: Connection to Science/Other Unplanned Choreography Shift in Performance Energy Signature Move Increased Intensity of Performance Increased Level of Technicality Change of Musicality	Textual	“I actually did it on accident, but it could... so basically I did the, um, I couldn’t remember the steps because it’s been so long. So that’s basically like I didn’t study or like, um, or I didn’t put my all into it. So, I couldn’t like, remember certain things. So that’s how that can relate to it [science]” Jasmine.	

Positionality Relative to Science	Inside of Science Positioning of Self (Know, Do, Like) Outside of Science Recognition by Others (Knower, Doer, Liker)	Interpersonal	“I want to say~hmm, well built or something...I’m well-built for science and science is well-built” Devon.	
Positionality Relative to Dancer Self	Recognition by Others in Dance Recognition by Others outside Dance Reference to Dancer Self	Interpersonal	“...the move is basically like my signature move because I can get down like really low and most people can’t so it’s like my signature move. That’s my power move...it just represents like what I’m good at. So, yea, that’s how it relates to science” Jasmine	
Structures	Social Outside of School Institution of School Science Discourse Physical	Ideational	“I started with environmental science... didn’t take chemistry. So, maybe that can relate to my dance moves and H.E.R. saying I’m the one to blame. If for me not, being the advocate or speaking out about why we didn’t take chemistry or ...why we weren’t taught as the kids... before us or after us” Jasmine.	

Note: Highlighted text denotes the specific codes presented in the discourse excerpt sample and photo artifact.

4. FINDINGS

Ethnodance offered the five young people an opportunity to convey their identity authoring as science students and their own sense-making of their science experiences in unique ways, some of which also shared similarities. Each student used a particular choreography and music genre to represent salient affective, social, and cognitive dimensions of their science identities related identity authoring, including interactions among teachers and peers, insider/outsider status, recognition, emotions, engagement in science practices, and competence. The combination of several dance genres in a single dance performance and the specific features of their performances provided the young people ways to dive further into their experiences and communicate, in manner that made sense to them, the meanings related to who they were becoming in science through these experiences.

To illustrate how ethnodances provided space for identity construction and authoring, I start with detailing the specific genres of dance the students chose and the features of their ethnodances along with the meanings conveyed related to identity construction. Then I articulate six themes that emerged from the analysis of the various data sources that aimed to shed light on the students' planned and unplanned choreography and its execution as an embodiment of their narrated science authoring. The themes are:

- *Ethnodance as a critical identity tool*: Narrating science identity through a dance performance promoted identity construction and authoring in creative and critical ways regarding the context of experiences (Sullivan, 2010).
- *Multiplicity of meanings in a dance move*: Choreographic movements allowed for meaning-making in similar and varied ways.

- *Expansion and extension of narrative*: Reflection and review of ethnodance videos created space for sense-making, which expanded or extended narratives of lived experiences.
- *Transduction of emotionality*: Embodied narration via a dance performance transduced the affective and emotional aspects of experiences in school and science.
- *Structure-agency dialectic*: School-based structures in and out of science supported, nuanced, or contested identity construction and agentic action.
- *Solidarity through Black dance*: Dance genres grounded in Black culture promoted solidarity for Black bodies and resistance of Eurocentric dance discourse (Bragin, 2014).

Prevalent throughout these themes are elements of who students saw themselves as and were becoming throughout their experiences and interactions in school and specifically science class-with a sociological perspective of positioning as the meanings one has about their science selves as a practitioner of science linked to how others recognize them in science. Following the presentation of each theme, multimodal discourse excerpts ground the theme through words and photo artifacts from their ethnodance. These multimodal discourse excerpts provide a visual representation of science identity construction and authoring through an embodied narration of experiences and interactions in school and science.

4.1 Features of Students' Individual Ethnodances and Relationships to Identities

The semiotic choices that the students rendered via the genres of dance they chose to perform represent the disconnection or connection between science and self that they were experiencing at varying points along their journey. In her ethnodance, Tiffany used contemporary dance to represent moving through experiences that challenged her position within the practice of science to a shift that deconstructed/reconstructed her position within science.

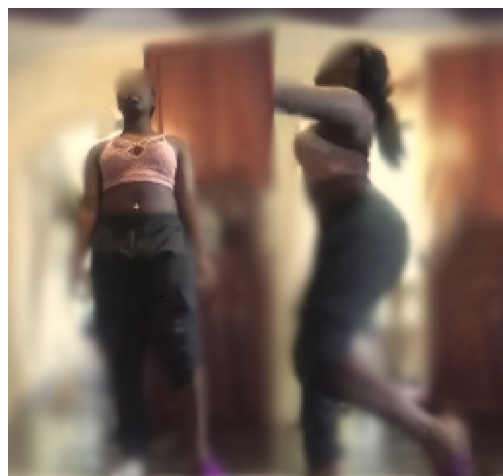
Jasmine used majorette dance to represent salient experiences that reconstructed her nuanced position within the practice of science. Fara meshed contemporary and lyrical dance to illustrate her agency not to conform to set or impressed expectations of a science person by allowing herself to have “One of Them Days.” Devon used majorette to illustrate her self-affirmed and recognized position as a knower, doer, and liker of science. Lawson used a mesh-up of contemporary and majorette dance to represent his recognized position as a great dancer, allowing him to show the school community who he was as a person, coupled with the tensions of relationships while navigating a nuanced experience within science.

4.1.1 Tiffany’s Ethnodance: Changing into Herself

The following multimodal discourse excerpt (transcription symbols key provided in the Appendix A) can be viewed as an embodied narration of Tiffany’s experiences within school and science. Throughout her dance performance, Tiffany used various dance moves, facial expressions, body movements, and the music’s tone to construct, author, and transduce the changes she had to make to succeed in school.

Chappell: ...what was your thought process when you decided to use the song “Changes” by HER to represent your experience?

Tiffany: So, when I choreographed my dance to “Changes” by HER...I could very much relate to HER and what her experiences were. ...when I uh, choreographed it [the dance], I was going through my own changes as well in high school. Becoming a young woman // It wasn’t a challenge, but you know, but growing and learning new things about myself and about the



world around me was very difficult at a point.

...

Chappell: You change directions...from a side facing to front-facing right before you like drop-down and beat your hip. Talk me through what that was meant to represent about your experience.

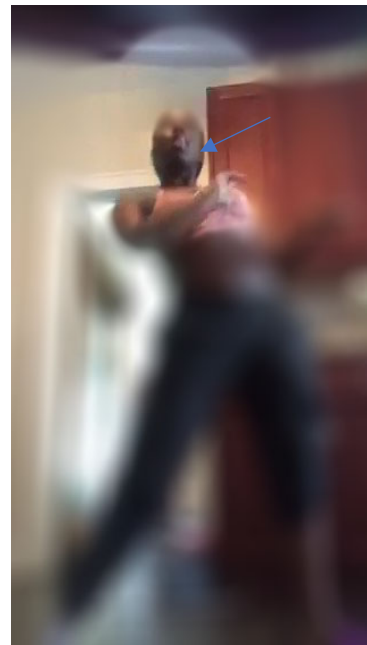
Tiffany: ... it was meant to represent the different changes that I experienced. ...And then, when I dropped down to beat by hip, repeatedly to the beat, it was meant to represent my outbreak and how I became a beast at dancing and how it brought out the best of me.



...

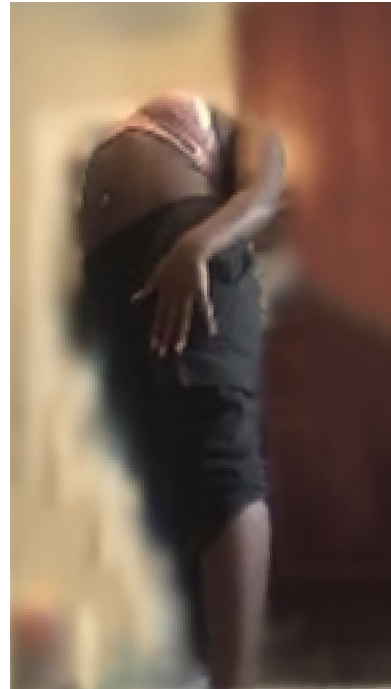
Chappell: There's one point in the dance... where your tongue comes out for the first time. Talk me through what that meant and how it relates to your experience in science. But just as you said in general, throughout your educational journey.

Tiffany: ...[I]t was basically what I call my beast mode. ...[I]n many of my dance choreography, I incorporate my personality, which is my sticking out of my tongue... whatever it may be for that tone of the song. Mainly it's about...letting people know that I'm not afraid.



Chappell: ... [W]hat were you trying to convey about your experience specifically at that ending?

Tiffany: At the ending, it was meant to portray the ease of the entire situation...the peace of it all.



H.E.R.'s slow tempo R&B song "Changes" offered Tiffany the chance to represent the "almost impossible to get a hold to academically" experience because of "the slow and gloomy tempo of the song [that] characterized the emotion I felt." Using the melancholy tone of the song, Tiffany narrated the reconstruction of her science self as she navigated school structures to create a space for her to achieve academically. Tiffany used the semiotic resources of contemporary dance, a slow to medium tempo style where the choreography is set to the lyrics of a song versus the beat, to connect the words of H.E.R.'s song changes to her experiences in school. The "not sad, but very embracing" tone of the song illustrated the mood of her ethnodance as she learned to embrace the changes she had to make to succeed and prevent her "growth [from] being stunted," such as letting go of unhealthy relationships, transferring schools to be in a healthier environment and her response to different situations. Lyrics such as "baby, I've been going through some changes" meshed with directional shifts and low intensity yet methodical

movement of her arms, legs, and hips represented her fragmented student identity. In addition to her choice of dance genre and song, Tiffany chose to perform her ethnodance in her home, own clothes, and with her hair tied back up to show that she is her “own individual and I’m going to express myself in my most comfortable” form. Evident throughout her ethnodance and discourse excerpts, this agentic choice as a dancer was deeply connected to the criticalness of choice and self-action to constructing a self-affirmed identity.

Using a mix of hip-hop and contemporary dance moves (highlighted dance moves with photo illustrations provided in Appendix B), Tiffany’s ethnodance started with facing forward before stepping forward and back while swiping in front of herself with a clenched fist, eventually pirouetting right to repeat the same move facing sideways to represent the “changes about how I react to certain situations and the changes I had to make to succeed.” Using her ability to physically change schools as a part of her identity capital, Tiffany transferred schools to position herself in a better space to achieve academically, away from peers and relationships that shifted her focus from school. Pivoting back to the front, she rocked from side to side while moving her hands across her chest before dropping into a rotating plié while lightly beating her left hip with her left fist because “sometimes I just get fed up with all the games.” Fed up with the negative interactions (mostly peer interactions) that shifted her focus, she acted (transferred schools) to redefine who she was and wanted to be as a person and within the school.

Known for her facial expressiveness within the Dance Club, Tiffany used this feature of a dance performance to convey aspects of her experience (s) throughout her ethnodance. She used a stoic facial expression at the beginning of the dance to represent her connection with the “pain I felt H.E.R. singing,” and the difficult time she had growing and learning about herself while navigating high school. The use of a stoic face versus the typical joyful expressions (smiles,

tongue sticking out, open mouth, pursed lips) she is known for in dance depicted the painfulness of interactions and experiences that seemed to create barriers to her success. Contrastingly, Tiffany smiled and stuck out her tongue as the performance continued to represent elements of her identity as an individual and a dancer, as well as her realization of “who [she] was...who [she] was meant to be, and who [she] wanted to be in the future.” Straightening her legs, she leaned forward and rotated her torso in a circular motion from left to right while pointing using alternating fingers and sticking out her tongue to illustrate her transition to beast mode to “[let] people know that I’m not afraid.” Tiffany sticking out her tongue, expressed her refusal to let interactions with others define who she was and who she wanted to be in school. This expression of her dancer identity represented a shift in the mood of her dance performance that was connected to a positive shift in Tiffany’s identity construction. As she transitioned into her beast mode and thrived in dance, Tiffany’s student identity shifted to a self-affirmed space.

Stepping to face right with her right foot, she lifted her right knee in a bent position before leaning over into flat back to wave her butt towards the camera to represent her being the one to blame for “not being the advocate or speaking out about why we didn’t take chemistry.” Though the decision for her class to not take chemistry was made before Tiffany enrolled (see section 4.6), reflection via the ethnodance provided space for her to realize she had agency to act on structures beyond transferring schools. Swinging her left arm down then up, Tiffany turned to face the opposite direction with her left knee raised in a bent leg position. Using this bent leg, she stepped down, crossing her left leg over her right and vice versa before she swung her right arm back then up as she pivoted back to the front and clasped her hands above her head. Rocking from side to side with her hands clasped above her head, dropped into a squat, stood up, stepped forward with her left leg, and slid her left hand down her thigh and arched backward with her

right arm to show “the ease of it all” after the changes. Tiffany’s commitment to changing to succeed academically despite challenges transitioned her fragmented identity to a self-affirmed, positioning her as an insider of school. For Tiffany, the several directional shifts she included in her dance represented the “changes I had to [make] to get to where I want to be,” showing her resilience, commitment, and agency to persist until she reemerged as the person she wanted to be as a young woman and within the school.

4.1.2 **Jasmine’s Ethnodance: The Science Me I Want to Be**

Evident in the multimodal excerpt below, Jasmine’s experiences within science and specifically physics were crucial to constructing her science identity. Throughout her dance performance, Jasmine used majorette choreography, her signature move, and the semiotic resources of her chosen song to narrate and farther construct her nuanced science identity as she transitioned from an outsider to and insider in physics through agentic action and teacher support.

Chappell: ...walk me through what the dance performance represents in regard to your science experience and your experiences in high school in general.

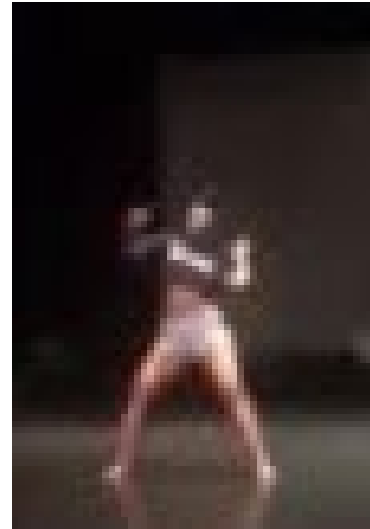
Jasmine: ...Physics was a struggle for me because I didn’t understand why math was, uh, such a big involvement with science. So, um, I used to try, like to ask him for extra credit cause I never could get an A or like ask him can I redo test or retake tests or like as for as, a better study guide or something like that. So, I can have, um, a better score on my test because I couldn’t never



get an A. It was either a C or a B. ...So towards the end of the semester ...I got an A because, um, I started trusting my gut and asking ...for tutoring~ so I can get a better feeling of physics with math.

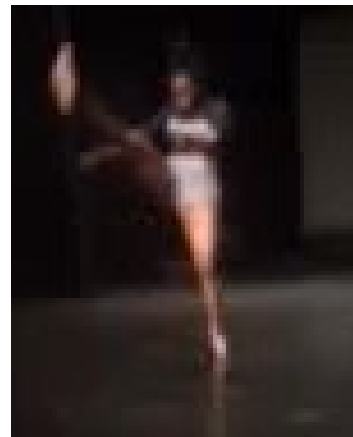
Chappell: ...So how do you tell that story through the dance? Can you walk me through that?

Jasmine: ...the song I danced to is beast mode. ...so, it's like that I got into my beast mode. Basically, I got into the mode...grinding and making sure that I can get an A so I can go to ...the college of my choice...accomplishing something that I wanted.



Chappell: Okay! Are there specific moves that you did in the dance that would speak to certain parts of your experience and science?

Jasmine: ...I wanna say the three kicks, because the three kicks that I did, I think I did it right before the death-drop. Um, it shows the power that I had or the courage that I had.



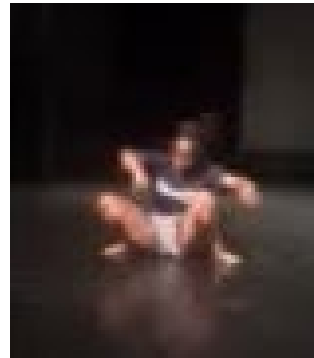
Chappell: ...Does the death drop itself represent anything about your experience?

...
Jasmine: Yea, it [death-drop] represents me kind of giving up, maybe? Yea!

Chappell: And so, after the death-drop though, you continue dancing. So, does that represent anything about your experience?



Jasmine: Um, I just kept pushing through, kept trying to get my A, and I succeeded.



Chappell: ...at the end of the dance, you do this like low ground grazing move, um, that everyone in your club says that you're known for. Like, can you describe what that move means to you and what it kind of represents about your science experience?

Jasmine: ...the move is basically like my signature move because I can get down like really low, and most people can't, so it's like my signature move. That's my power move, basically. ...it just represents what I'm good at. So, yea, that's how it relates to science [chuckling]

Chappell: ...what style of dance did you use, and why did you choose that style of dance?

Jasmine: I chose majorette because, majorette is, that's like a powerful dance. You got flips, death-drops, kicks, splits ...I love majorette. It's what I like to do, so that's why I picked it.

Snappy Jit's upbeat dance-mix song "Beast Mode" was chosen by Jasmine to represent her transition from "struggl[ing] to get an A...and...second-guessing herself" in physics to "[getting] into my beast mode so I can get an A and go to the college of my choice." Furthermore, she used the semiotic resources of majorette dance, a hard-hitting and powerful genre that merges elements of gymnastics, cheer, jazz, hip-hop, and other genres with the culture of Historically Black Colleges and Universities (HBCUs) drumlines and marching bands, to connect the emotional aspects of her experiences within physics to Snappy Jit's "Beast Mode." As the song title emphasizes, she transitioned into beast mode by using her agentic power to ask for teacher-support navigating elements of the discourse of physics like the "math-heavy" content to create an avenue for her to belong and achieve her idea of academic success. Lyrics such as "she going beast mode" were combined with fast-paced, high-intensity kicks, flips, rolls,

glides, jump splits, and death-drops to show how hard she had to work to navigate the barriers within the discourse of physics to earn her A, becoming the knower and doer that she wanted to be in science.

Entering for the stage right, Jasmine trotted forward, rocked side to side with her hips, transitioned to a high knee into a left leg fan kick before bending over and wagging her butt from side to side and dropping into a split. Stepping front facing with her left foot, she clasped her hands and swung her arms in a circular motion above her head as she dropped to a low squat before rolling backward over her right shoulder with bent legs. In a kneeling position, she rolls her hips from left to right before gliding forward with her left then right foot into a somersault, ending in a jazz split. Jasmine then hinged up into three quick jump kicks that “showed the power and courage that [she] had.” The moves in this fast-paced, high-intensity segment of her ethnodance represented her consistent struggle to break through the math-heavy context of physics to see herself as a knower. Though achieving a letter grade of a B or C in physics might position one as a knower and doer of science, the grading structure within school hindered her ability to see herself that way. While she positioned herself as a doer of science, she also positioned herself outside the realm of being a knower of science. To Jasmine, a knower of science and specifically physics, earned A’s. This nuanced positioning revealed that the discourse of physics coupled with the assumed meaning of letter grades were critical aspects of Jasmine’s science identity construction process.

Jasmine continued to dance after the subsequent death drop—a majorette move where a dancer jumps from a standing/squatting stance and catches themselves with their hands as they drop to the ground while fanning their legs up and around before laying down on the floor (Chappell & Varelas, 2020), showing that she “kept pushing through.” Continuing her dance

performance after the deathdrop represented her commitment to grappling with the barriers she faced to succeed in physics (achieve her A). Instead of continually trying to break through the barriers in science independently, Jasmine courageously asked for teacher support. Through the interplay of their student-teacher agency, they co-constructed a bridge into the discourse of physics that allowed Jasmine to see herself as a knower and doer of science, facilitating her transition from a fragmented to an affirmed science identity.

Like Tiffany, Jasmine used elements of her dancer-self to convey certain aspects of her experience in her ethnodance. She ended the dance with an extremely low (ground grazing) buck, her signature moves, a challenging move that she executed effortlessly, “my power move” that represented “what I’m good at.” She used her extremely low, ground grazing signature buck move—forward hip thrust simultaneously coupled with quick chest release/contractions while in a wide stance plié (Chappell & Varelas, 2020)—to illustrate what she was “good” at in physics; grinding, working hard, and asking for support to cross over the barriers in physics and earn her A. Thus, the use of her signature move in her ethnodance stood as a visual representation of her evolution throughout her experiences and physics and self-affirmed and recognized position as a “good” science person. Additionally, Jasmine chose to perform her ethnodance on the auditorium stage, where she thrived as a dancer. In doing so, Jasmine’s dancer identity served as a resource for her to construct and narrate how she carved out space for herself within the practice of science despite tribulations that nuanced or challenged her position.

4.1.3 Fara’s Ethnodance: It’s Okay to have One of Them Days

Fara’s experiences within school, science, and specifically AP physics contested her affirmed position as a knower, doer, and liker of science that emerged by the end of her experience in physics the previous year (see section 4.6). However, her agentic ability to push

against structures and not conform to expectations of being in school and science cultivated space for her to breathe through one of them days. Illustrated in the multimodal excerpt below, Fara used lyrical and contemporary dance moves, chair props, the title, and the song's melancholy tone to narrate her experiences in school and contested science identity.

Chappell: So, what about the first eight counts of your ethnodance? What was that meant to convey about your experience in high school and specifically your science experience?

Fara: ...that's kind of meant to be like, you know, it's one of those days, and you just gotta shake the nerves out. And it was a lot of those days in high school for me. So that was kind of portraying that like it's one of those days, but you know what breathe, take a step back, you're going to get through it.

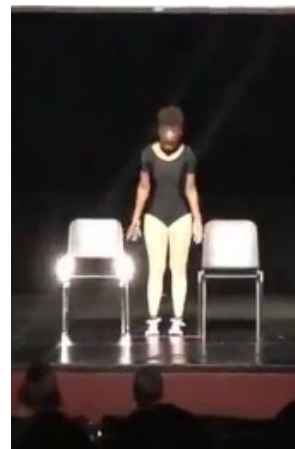
Chappell: One of those days like what? How could you describe it if you had to try to put it in words, meaning like one of those days?

Fara: One of those days was just a day where I wasn't as enthusiastic. I was more, you could say depressed, but you know, everyone has those days, whether it's more often than others or not. And you just have to kind of tell yourself it's going to be okay. We made it through the other day, so we will make it through this one.

Chappell: And so, if you had to take a snippet from this part to capture it being one of those...what part would you

say captures...that feeling of being in just one of those days?

Fara: I want to say um, right when I was about to start dancing, I feel like // I think it was a moment when I was on the chair, and my head was down.



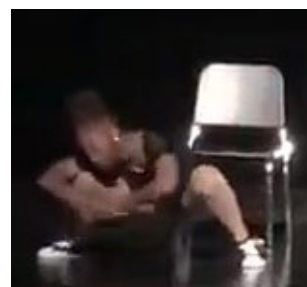
...
Chappell: ...on his part where it's like today, let me sit in my sorrow. And then, from there, you kind of hopped down into a split. What part of this whole, like little segment, really captures what you said in terms of, if I forget to smile, it's okay...?

Fara: ...the part where I went like this [motioning with arm] and kinda like put my arm back. I feel like those kinds of like brushing something off. So was like, if I forget to smile, it's okay. Like just brush it off, keep going. And then probably the part where I did kind of like do the squat, showing that you were kind of sitting the sorrow.



...
Chappell: So, when you say today, let me set in my sorrow. You're saying what?

Fara: Like sometimes it's okay to embrace the emotions. A lot of times, people who don't know how to express themselves kind of try to brush everything off and push it to the back burner. But it's like, no, sometimes it's okay to actually feel, accept everything. Like it's okay.



I'm feeling things. And I have to try to go through the emotions just so I don't explode.

...

Chappell: And so, what part of your experience with science do you feel like made you feel the emotions that you were feeling in this part of the dance?

Fara: I think it was a lack of motivation with AP Physics. ...And so, um, it was kind of like a shocker because my grade did eventually end up going down quite a bit, but it was kind of a shocker cause it's like, you know, what's going on, what's really going on with you that, you know, this...is very unlike me. And so, it was like, I haven't changed. It's just been kind of one of those days for a while now. ...I'm going to get it back together. But right now, I just have to kind of figure things out and go through the motions.

Fara chose the R&B song entitled “One of Them Days” by Kiana Ledé to represent days in high school where she had to remind herself to “breathe, take a step back; you’re going to get through it” as she progressed through days “where I wasn’t as enthusiastic” in high school. Her choice of the song represented the space she created for herself despite other expectations and the discourse of school and science. While her actions did not transform the structural struggles she experienced, she created space to exist within these structures by positioning not as being what others expected her to be as “okay.” Fara used the semiotic resources of contemporary (a free-flowing, expressive umbrella genre that meshes elements of ballet, jazz, and modern dance to tell stories) and lyrical (a flowy, fluid jazz-like genre of dance embedded with emotionally

evocative musicality inspired by song lyrics) dance to connect the words of Ledé's song "One of Them Days" to her experience (s) in school and science—being expected to smile all the time and be a perfect student nuanced how Fara saw herself within school and science. The pressure to be a good student (a smiling, happy, enthusiastic, and motivated person who earned high scores/grades) made it challenging to process her emotions while progressing through her experiences in school and science.

Fara used the tone of the song to illustrate the mood of her ethnodance as she learned to embrace days where she was not as motivated, excited, or enthusiastic about school and push against other's expectations for her demeanor and academic progress. Lyrics such as "today let me set in sorrows" and "the one that you loved hasn't changed; it's just one of them days" were meshed with emotionally evocative and low to medium intensity neck rows, leg extensions, kicks, splits, pliés and fluid movements to represent the pressure she felt from others to smile all the time, push-through, and succeed in classes that "look good for college" such as AP Physics.

Fara's ethnodance began with her standing facing forward with her feet in two separate chairs before rolling her neck in a circular motion and dropping her head to represent "one of those days [where] you just gotta shake the nerves out." Starting in a 'Wonder Woman' pose in the chairs, Fara pushed the chairs part with her feet as she dropped into a jazz split in the chairs, reminding herself that, like in science, people are watching you so "you can't mess this up." Fara used the in-the-moment pressure she felt not to mess up her dance performance to present the pressure she felt not to mess up or let others down in school and science. This revealed that how others saw and positioned her within school and science played a critical role in how she saw and positioned herself at times.

Placing both hands and her head on the floor while still in the chair split, she rolled over her right shoulder into a jazz split on the ground to represent moments in “high school [and] life in general [that] sometimes you just forget to smile, but it’s okay.” Arching backward with her head while in the split, Fara slid her left leg forward to meet her right leg before rolling onto her shoulders with both legs extended about sixty degrees in the air. Making circular rotates with lower right then left leg, she pushed onto her feet and faced forward while crossing her arms across her chest. Bending at the waist into a flat back, she extended her right arm behind with a flexed wrist before extending her right leg in a heel stretch and dropping into a rotating plie to represent “brushing something off” and taking space to sometimes “sit the sorrow...embrace emotions...[and] actually feel...so [you] don’t explode.” This segment of her ethnodance denoted her pushing against the discourse of a good student in school and science to author a sense of belonging for herself.

Placing both hands onto the floor, Fara dropped into a middle split before rolling over backward and pushing up into the chair behind her. Sitting in the chair, she extended her right leg about forty-five degrees to the front before rotating the leg to the right before placing it on the floor and standing up because “eventually you have to get up from the place you’re in mentally.” The meaning she assigned to this portion of her dance performance represented the criticality of her mental health to her identity construction and authoring. Fara had to create space for her to feel her emotions, process sad or not as enthusiastic days, and be okay so she would not break down due to the overwhelming pressure she felt navigating school and science.

Stepping away from the chair with her right foot, she kicked back with her left leg, fan kicked her right leg, swung her right leg forward, and jumped into a floor split. Bringing her legs into a bent-knee position with her hands on the floor, Fara crossed her right then left foot over

each other before pushing to her feet, walking towards the chair, and swiftly changing directions to walk off the stage because like her decision with AP Physics, sometimes the best thing to do for oneself is to “walk away from it.” The ending of her ethnodance represented her agentic ability to choose for herself what was best for her academic progress and mental health regardless of others’ expectations; an action that was necessary for her to persist in school and science though her decision was contested, questioned, and frowned upon by some of the trusted adults in her life.

Though Fara does not have a self-proclaimed or recognized signature move within the Dance Club, dancing and singing are her preferred methods to express herself and process life experiences. Thus, she used ethnodance to represent how she used the expressive nature of dance to create a space where she could “just let [her] mind go” and not worry about the pressures throughout her experiences. In doing so, the ethnodance offered Fara space to “just dance through [her experiences]” while reminding herself that it is okay not to smile or have emotional days; eventually, you get through them by deciding what is best for you regardless of other’s expectations.

4.1.4 Devon’s Ethnodance: Breaking through the Levels, Making Science “Make Sense”

Devon’s experiences within the practice of science affirmed her science identity. Not only did others (teachers and peers) see her as a knower, doer, and liker of science, she saw herself the same way. Conveyed in the multimodal excerpt below, Devon used majorette dance moves, rapid and intense movement, and an upbeat song to narrate and construct the experiences that helped shape her affirmed insider science identity.

Chappell: ...Just talk me through in general, what this dance was meant to represent about your science experiences and your experiences in high school in general.

...
Devon: Um, okay. This dance was my ... year, and this was about, like, you know how you get a break from school, and you just want to turn up?

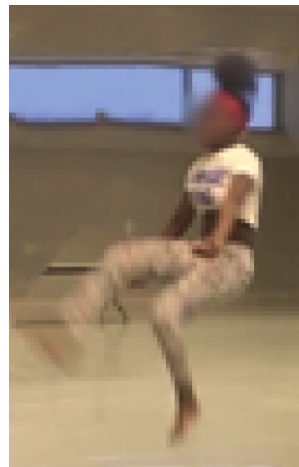
Chappell: Um-hum.

Devon: Yeah. So that's what this dance was about. A break from, you know, all the schoolwork and everything like stress-free.

Chappell: And so, the particular prompt was about like your experiences in science. So, what does this dance say about your experience in science up until this point?

Devon: It [ethnodance] says that first off, it's fun // science is very fun just like this dance was. And like, you can experiment. Like you can make up different types of stuff. I don't want to say stuff, but like different experiments.

...
Chappell: What was // like why did you start off with that intense jump kick? Like, what was that trying to // what were you trying to convey about your #experiences? #

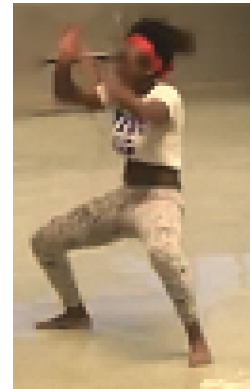


Devon: #like, um# say like, you're trying to find the answers or something, and it's just like, you can't get it, and you finally get that breakthrough, something like that.



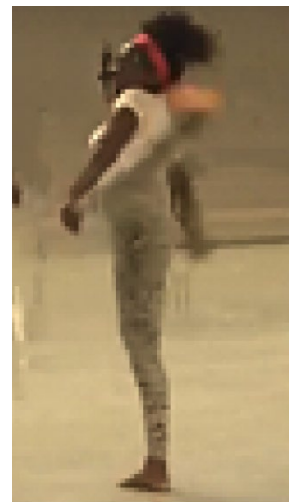
...
Chappell: ...So you kind of go right from [scrolling through video segment on pause] ~the kick and then right into a very intense, like low bucking. ...What was that trying to convey?

Devon: Like you free you? you wild. You can like, you know, // you ain't nothing to worry about.



...
Chappell: ...I think you were fixing your pants leg, but then out of nowhere comes, it's like this intense kick ... talk me through what that means.

Devon: It's kind of like // that's kind of like an explosion, you know when they do the science experiments (***) a volcano explode.



...

Chappell: ...it's like a lil buck series... you buck in the middle, then you drop low, and then you buck from side to side. What does that meant to convey? Talk me through that part.

Devon: That can mean like the ~different levels of science. Like how hard it is, is it easy, you know on a // basic like a scale.



...

Chappell: And so, what does that mean for you when you say the end...what does the end represent for you?

Devon: I done got through all the experiments...everything like dealing with science, like hypotheses, ~ the experimental, the objective ~all of those things dealing with // not even just what the experiment...just science period.

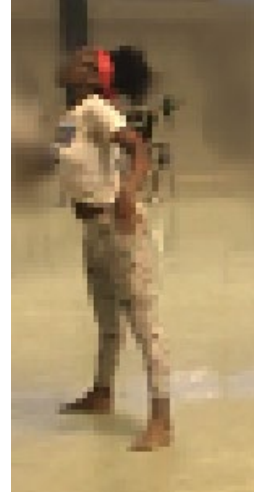


...

Chappell: I think the next part, you just stand up. ~ [scrolling through video on pause] So when you do that little shrug forward, what part is that?

...

Devon: Everything! ...when it comes to science, you gotta think for real, it's not just going to be there. That's it's sometimes you might have to infer the answer, or you know, like imply something in order to make everything make sense.



Devon chose Yellow Claw's upbeat dance-mix song "DJ Turn It Up" to represent feeling "stress-free" and "want[ing] to turn up" ...when on a break from school, as well as science being "fun" due to opportunities to engage in experiments, critical thinking, and grappling that led to moments where you figured out an answer and "finally [got] that breakthrough." Devon used Yellow Claw's upbeat (fast tempo, feel-good, or evocation of happy) song DJ Turn it Up" to illustrate the mood of her ethnodance as she progressed through content breakthroughs, breaks from school, the different levels of science, showing-off science knowledge, and having fun in science. Unlike Jasmine, Fara, and Tiffany, Devon's entire ethnodance choreography was set to the beats of the music versus the song lyrics. The song's varied beats (tempo) and rhythm were meshed with fast-paced, high-intensity kicks, a limber, bucks, trotting like walks, and splits to represent Devon's positive experience with science. Devon excelled in science and found science classes as a "fun" space where she could show off because she was able to get through the content and understand concepts. These experiences shaped how Devon identified with science and the knower, doer, liker identity that she authored. The pleasure and fun she experienced in science were a vital aspect of positively identifying with science.

While Jasmine used majorette to represent her nuanced experience with science, Devon used the semiotic resources of majorette to convey the experiences which shaped her positive affinity to and membership within science. Devon's ethnodance started with a right leg jump kick that signified getting a breakthrough before she dropped into a four fast 180 bucks. She then walked forward in a bent-knee position with her hands on her hips and then turned right, prepped (lifts hand straight in the air above head), and executed a front limber (like a walkover expect the feet land together) to represent being well built for science. Being well-built for science meant being able to infer or figure out answers, perform well during experiments, "think for real," and enjoy breaks after successfully making it through science. Devon's construction of her well-built science-self confirmed that being competent in science and having positive affirming experiences were integral to her membership with the community of science.

Landing in a bridge (backbend with hands and feet firmly planted on the floor with fingers pointed towards the feet), she pushed up, adjusted her pants leg, and turned back to the front with a side kick right as the beat drops to represent an "explosion...when you do science experiments." Devon repeated the bent knee forward walk, dropped into a fast buck into a side-to-side rotating buck to convey "the different levels of science," and then dropped into a right-facing split before switching to a left-facing split before turning to the right in a seated position with her legs together on the ground. She then leaned back on to her hands and kicked both legs up into a "v" position, rolled over backward into a split to illustrating "getting through everything...dealing with science...something off your shoulders." Hinging up, she shrugged her shoulders while thrusting her chest forward on the final beat to represent the feeling of being able to "show-off [by] implying something to make everything make sense." Denoted in the description above, being able to get through science, show off her competency, and engage in

fun experiences such as experiments were central to Devon's construction of a favorable and affirmed position within science.

Devon included one of her signature moves, a handstand into a limber, and the move was not connected to a salient experience in science or school. Unlike Tiffany and Jasmine, who used their signature move to join their dancer-self to salient moments throughout their experiences, Devon "just did it" because that is what came to mind at that moment. Though she did not initially assign a specific meaning to her signature move, the inclusion of a technical move that she executes with ease could stand as a visual representation of the ease with which she navigated science; a space that was challenging and difficult for her peers.

4.1.5 Lawson's Ethnodance: When You See Me, I Show You Who I Am

Illustrated in the multimodal excerpt below, Lawson negotiated aspects of his identity while navigating school as he evolved as a dancer and student as he sought to find himself. Lawson meshed contemporary and majorette dance moves, track shifts, and slow and methodical to rapid and intense movement to narrate and construct emotional dimensions of his identity construction.

Chappell: ...[B]efore we get into specific parts of the video, can you just kind of walk me through in general what your ethnodance was meant to communicate about your experiences in science and in high school?

Lawson: Um, well, well basically from start to finish, basically given as we know the beginning of the dance, the slow part and which I hate so much, um, that was basically like, you know, me ... year, quiet. It's not that I didn't know myself. It was just that, you know, being gay in America, you don't want everybody else to know you. So it was, it was, you know, the bottled, the bottled in the hidden, the unseen very much. And, um,



transitioning from that, we get to end of ... year when I first met you guys, and I was like, we [referring to himself] still weren't like, you know, we still weren't comfortable, but we were more open. We were more out. ...year, it was basically like, yeah, I was like, we're here, we're confident...

Chappell: ...So for me, knowing you as a dancer, like you dance with so much power and so much conviction, but here [first 8-counts of dance], it almost seems as if you're trying to like, get into it, like get yourself into the dance. Is that true? And if so, what was that meant to connect with your experience?

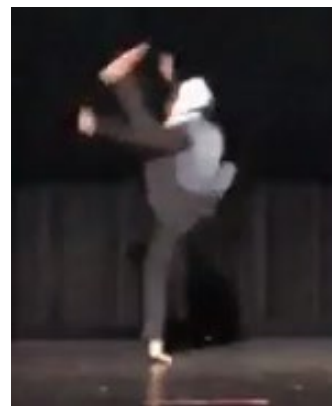
Lawson: Um, well, um, yeah, that was true only because I don't remember if I picked that song or if you picked that song, but that song I was connecting to a lot of people, like in my life in general, um, that song, I felt a strong connection to my father who left me at a young age. I felt a strong connection to [name of partner] who at the time, you know, we had already had our drama. So yeah, those lyrics in that song where were hitting hard in a lot of ways. And I hadn't really realized it because at first, you know, I didn't really want to do the slow part. ... it was times that I actually just listened to the full song and just cried. Cause I'm like, okay.

...

Chappell: ...So into that kick, right when she says, but honestly, I'll do it all again. It's like your intensity starts to pick up. Is that true? \And if so, what is that meant to convey?

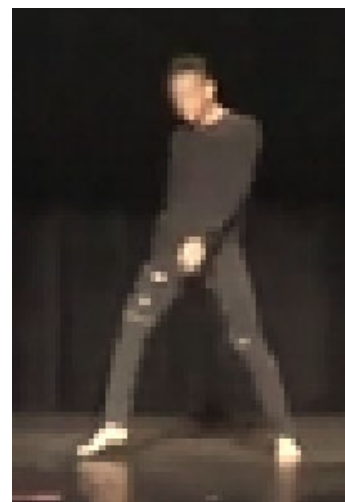
Lawson: Again, that song was hitting in a lot of different places, and I'm more so. I ain't gonna lie half//most of that entire first performance was based off my relationship... it was a lot happening. Everybody knew about it. ...it was like I was stuck in something that I not necessarily didn't want to be in, but though I shouldn't have been in...

...



Chappell: All right. So here...not only is it a transition to another song, it's like that [mimicking record scratching sound] like, to let you know that a transition is about to happen. What was that meant to convey about, uh, your experience in school? Um, specifically, if there's anything connected with, to like your science identity there. |

Lawson: ...I can say my personality because like, again, if people paid attention to me at school ...year, I was very much, you know, not quiet, but like I was, I kept to myself. ... year, I became loud, more well-spoken I was I felt like I found me in a way, like very much, not fully, because I'm still finding myself, but I feel like high school...I began to find myself on my own terms and not based on what everybody else had in mind for me.



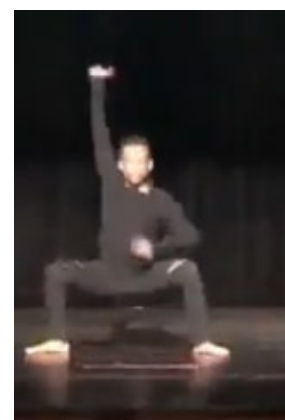
Chappell: ...you're saying that's what that like really like abrupt #transition in the music#|

Lawson: #Mhmm very much# like a hold on wait a minute [giggling] wait a minute|

...

Chappell: Talk me through like what you were trying to convey in that [transition to Bartier Cardi] part about your experience. Um==

Lawson: So, well, with that part of the dance, that was, um, that was the part I had been waiting to do with the whole dance. ...I didn't want to do the slow part. So, like first and foremost, I was just like, another thing with like transitioning to, I was like, this is me. She's [in reference to himself] loud. She's a little bit ghetto. You know, this is what I do, and this is what I do best.



Chappell: ... talk me through that part where you kind of did, like, it was literally like eight counts. Boom, boom, boom, boom. Until that like little crawling part. What was that...is it connected to any experience specifically in school or in science or just in general? What was it about?

Lawson: It was basically just another character with me; I'm loud, I'm ghetto, you know, she could be a little nasty. It was all ...that would just be if I could just describe me and put it into moves like=



Meshing contemporary and majorette dance genres, Lawson mixed Kelly Clarkson's pop song "I Don't Think About You" with Cardi B's hip hop song "Bartier Cardi" to represent struggling with not wanting others to know him due to avoid judgment and being "unseen" to becoming "confident" and "loud." He used the slow, melancholy tone of the song to illustrate the mood of his ethnodance, as he wrestled with allowing people to know who his true self while navigating challenging relationships. Lawson's fear of being judged due to his sexuality positioned him as a partial school community member. Being a full member meant not only being able to show who he was, it meant being accepted for who he was and was becoming. In addition to his choice of dance genres and song, Lawson chose to perform his ethnodance in the auditorium during the annual showcase because the audience's energy and cheering fueled his dance energy, representing where he was first seen, recognized, and uplifted in high school. Lawson's choice to perform his ethnodance in front of a live audience where he excelled as a dancer represented the intersection of who he was and was becoming as a dancer and who he was and was becoming as a student.

Lawson used the semiotic resources of contemporary dance to connect the emotionality of Clarkson's song "I Don't Think About You" to his experience (s) in school and life. Starting with contemporary choreography, Lawson walked onto the stage, faced the audience, and left leg

side kicked before turning backward into a circling back arch. Stepping into a left foot *elevé* (the ball of the foot), he *posséd* (triangular bend of one leg with the foot lined up with the knee of the other leg) his right leg before using a right leg side kick to turn and roll onto the floor to represent his connection to the pain expressed through the song lyrics. Standing up, he did a jump kick, turned, *chasséd* (gliding skip like move where one foot follows the other) across the stage into jump kick, and landed in a dip (a dramatic drop to the ground with a bent leg which emerged from *voguing*). Rolling over, Lawson pushed back onto the balls of his feet into a headstand before landing in a limber, hinging up, and walking across the stage. Dropping to the floor, he slid back into a right shoulder roll before hopping into a complete turn with his right leg in *possé*. Traveling across the stage with two additional turns, reached left then right before kicking to the front with his left leg and letting his body roll down as his foot touched the ground as the track abruptly changed to represent his transition from being unseen to confident. He used this entire choreographic segment to convey the emotional aspects of “being stuck” in an unhealthy relationship while still processing his father’s absence and coupled with trying to be himself within the school community. Using half of his *ethnodance* to represent the emotional toll of a relationship “I shouldn’t have been” denoted the crucial role that interactions with others played with how he positioned himself within the school.

Taking off his vest, Lawson twirled the garment a few times before thrown the item backstage. Lawson used Cardi’s song upbeat tempo “Bartier Cardi” to illustrate the mood of his *ethnodance* as he evolved as a person and became confident with himself. Engaging the audience, walked bounced/skipped around the stage as the intro to Bartier Cardi played, displaying a shift in performance energy. The abrupt track transition, removal of his vest, and change in performance energy stood as visual representations of his evolution from wanting to fit

into the school community to being who he was and doing what he did best. Lawson's positively affirmed dancer identity fostered space for him to thrive within the school.

As the first beat dropped, he hopped into a fast buck, jumped in the opposite direction, released his head down to meet his foot in a slight lean before bouncing back to front, kicking his lower legs up to show "this is me" and "this is what I do." Lawson meshed a series of the hard-hitting hip thrust, cat jumps (bent knee with feet pointing toward the glutes), turns, fist pumps, bucks, neck rolls, and sharp arm movements into 16 counts, dropped into a split, and crawled across the stage to showcase his evolving identity as a dancer and student. Hopping into a backflip, he executed a one-hand cartwheel into a limber before hinging up and traveling across the stage, moving his arms across his body into a T. Dropping into a squat with his hands clasped above his head, Lawson hopped from side to side, bucked, and did a 360 turn into a left leg kick. Continuing rapid movement of his arms up and down, bounced from side to side, thrusting his upper body forward, turned sideways, jump kicked, and dropped into a low squat before voguing (a genre of dance created by the Black and Latino LGBTQ communities in Harlem, NY) across the stage to embodied himself. Turning around, he cat jumped and landed into a somersault before standing and traveling across the stage into a dip to end the dance. Embodied in the fast-paced, hard-hitting, technical choreography outlined above, doing what he did best, Lawson used his dancer identity to construct and narrate how he saw himself and who he wanted to be seen as within the school.

4.2 Ethnodance as a Critical Identity Tool

Ethnodance emerged as a critical identity tool for students with intersecting dancer-science identities. Analysis of photo artifacts and oral conversations, in particular, revealed the affordances of ethnodance as a critical tool for constructing, narrating, conveying, and authoring

who the young people saw themselves as in science. During the oral conversations, students foregrounded the power of dance as a critical tool for them to construct and narrate their experiences in school and science with respect to choosing the mode of communication, the genre of dance, and the location of the performance. This agentic choice allowed them to express themselves in authentic and liberating ways (Delgado, 1989), which is often challenging in written and oral communication. Their ethnodances communicated emotions, interactions, and meanings, some of which were confirmed by the excerpts from their oral conversations.

During their oral conversations, Jasmine, Tiffany, Fara, and Lawson shared similar sentiments regarding dance as a critical tool by which they express themselves, while Devon illuminates the limitations of crossing between modes. More specifically, Jasmine noted the affordances of dance as a mode of communicating beyond spoken language. Tiffany highlighted the liberating benefit of choice (performance clothing/location) in authoring one's true self via ethnodance. Fara and Lawson stated the criticalness of dance as a method of expressivity for students with a dancer identity to construct and author other identities and process everyday life emotions and experiences, elements of their multiple identities that are so inextricably merged they are sometimes indistinguishable to them. Lastly, Devon foregrounded the limitation of transduction of meaning across modes and the significance of the ethnodance beyond linguistic meaning.

Jasmine explicitly mentioned how the dance allowed her to better express herself in a way that is challenging to do in writing. Dancing offered Jasmine a form of “express[ing] more” about her science identity, whereas in language, “trying to figure out the words” was not easy or possible. Illustrative in the discourse excerpt below, Jasmine struggled to find words to narrate her experiences in written form while the ethnodance allowed her an opportunity to convey

transitioning into her beast mode and pushing through her struggles in Physics. For her, the ethnodance was a space to illustrate who she was becoming in Physics, illuminating the interconnectedness between her dancer and science selves.

Chappell: What would you say about like your written narrative versus your performance of your science experience? What would you say about the difference between the two and your ability to express your experiences to others?

Jasmine: Um, I feel like I was able to express it [experiences in/with science] more in the dancing because it [ethnodance] basically shows that I went into beast mode and I kept going even though I had struggles, and when I was writing it [experiences in/with science], It was kind of like, I was trying to figure out, what words to, uh, put into it I was trying to say.

Additionally, the ability to choose her dance attire and where she performed and recorded her ethnodance fostered space for Tiffany's agentic dancer self to narrate who she was and was becoming in her "most comfortable form," consistent with notices of liberating methods. When asked if there was anything of significance that she wanted to share regarding specific features of her ethnodance, Tiffany noted her "purposeful" clothing selection and performance location.:

Chappell: Okay, is there anything else you feel like it's significant for me to know about your dance, about your experience? Anything like from the clothes you chose to wear to where you chose to perform your dance. Anything you feel like it's significant that I should know?

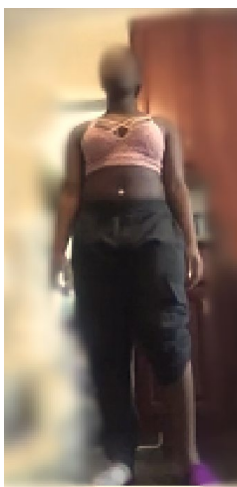
Tiffany: Yes, there is one thing. I purposefully, you know, recorded the video in my own home and in my own comfortable clothes with my hair tied up to show that like, I am my own individual, and I'm going to express myself in my most comfortable form.

Tiffany's explicit mentioning of her choice of clothing speaks to her resisting the structural limitations placed on her dancer self within the school building. Though I use my agency as their coach to create a space where they feel free to be their complete dancer selves in the Dance Club, I often have to negotiate between their dancing bodies, the school dress code policy, and limiting the oversexualization of majorette and twerking within the school context.

For example, I allowed them to wear cropped shirts when performing, though the school dress code policy does not permit cropped shirts. However, Tiffany would not have been able to perform in a bralette (Figure 3) at school, even though I consider them appropriate dance garments. Thus, Tiffany's construction and authoring of her experiences in school and science pushed beyond the imposed boundaries of school-based dance, highlighting the importance of fostering opportunities for students to be their complete selves.

Figure 3

Tiffany's Clothing and Performance Location



Additionally, Fara specifically referenced the video of her ethnodance in response to an inquiry about the intensity of her moves. Reflection on her ethnodance video uncovered elements of her dancer-self that was so inextricably woven into her performance, their presence was a “secret” even to Fara. The dance served as an outlet to process her emotions in the moment (during the dance performance) and in the past (experiences in school/science).

Chappell: ... talk through this part again, once you get up out the chair, um, some of the moves you're doing, like the there's an intensity, but then they are some of them where it's like, they're not as intense. Was that intentional? And if so, what was that meant to convey?

Fara: Um, at the time, I don't think it was intentional, but looking back at the video, I feel like it secretly was. Um, I was actually emotional during this dance, so I think that parts came off more intense than the others. Cause I was really feeling it more than other parts and dance is one of the ways I express myself. So, I was just kind of letting everything out in the dance.

Chappell: Okay. And when you say letting everything out, is there anything particular that you were letting out, um, or just, you feel like you were just letting out what you were experiencing?

Fara: I think I was just letting out what I was experiencing; it was some anger in there. It was just, you know, a little bit of, I was emotional that day. And so, it was like, okay, [Fara], you know, you have this now this is kind of what its [dance]here for, I think you taught us that most, like sometimes when you're going through things, you can just dance through it. Like, just let your mind go. Don't think about it and just dance.

Like Jasmine and Tiffany, ethnodance was a critical tool for Fara to narrate her experiences, interconnected with who she was as a dancer. Furthermore, the principles she learned from the Dance Club further constructed dance as a place where she could release her emotions and thoughts. Not only was her ethnodance a liberating form of expression, but her ethnodance was also a glimpse into who Fara was as a dancer inextricably linked to who she was authoring herself and becoming a student.

Moreover, Lawson described his intentional inclusion of moves and choreography that were meant just to show who he was as a person during the dance performance. Though he prefers the pronouns he/him/his during general conversation, Lawson often uses the pronoun she when referring to his dancer self. Furthermore, he explained the critical role that dance played for him to process the world and cope.

Chappell: So, like talk me through that part where you kind of did, like, it was literally like eight counts. Boom, boom, boom, boom. Until that like little crawling part. What was that? Um, is it connected to any one experience specifically in school or in science or just in general? What was it about?

Lawson: Um, I feel like in general, like that whole part, was it's just like [laughing] it was just like, I literally did it. I added a few things on purpose because like, I guess I

was a child, but she [referring to himself] was ...a little messed up. So, a lot of, um, things that whole ending part was basically just a description of me, the splits into the crawl, it's just like...you know... It was basically just another character with me, like okay I'm loud, I'm ghetto, you know, she could be a little nasty. It was all just little, little things that I was just like, what would just be, if I could just describe me and put it into moves like=

- Chappell: What about that part? Uh, when you were moving, walking, like what were you feeling experiencing thinking about for that part?
- Lawson: That part? Honestly, it was literally just like, I want to find a way to put a voguing in there [laughing]
- Chappell: #[Laughing] Okay, so it was one of those#|
- Lawson: # I was literally like I have to #|
- Chappell: #So it was one of those#|
- Lawson: Yeah. Like I had another one of those, it was just like from not being as vocal and out to what I am now. Like, I was literally like, I want to put voguing in it somehow. And I was like, none of the beats really fit until that part. I was like, that's perfect.
- Chappell: Okay. So, this is something critical to your identity as a dancer.
- Lawson: Mmhmm
- ...
- Chappell: ...Well is there anything else that you feel like you want to share about this experience, that dance or anything?
- Lawson: Honestly, I just miss dance. Like without dance, I am really like, you have no idea Ms. Chappell. Like I'm literally going through ...right now. #And I was like dance was able to help me hide that#|
- Chappell: #No I totally#|
- Lawson: And without that, it's like I don't have anything else to focus on, but what's going wrong with my life.

Similar to Fara, Lawson used ethnodance to author his experiences and convey who he was and was becoming as a dancer and a person. The ethnodance was a space for Lawson to be his whole, unapologetic self in school, revealing who he wanted people to see when they saw

him and his dance performance. In contrast, Lawson's excerpts also portray the devastating and seemingly debilitating feeling of not expressing oneself via dance for dancers, which speaks to the importance of one's chosen mode of expressivity to their identity construction authoring and life.

Conversely, Devon's oral conversation illuminates the difficulty of trying to transduce meaning from one mode to another, even with the ethnodance video serving as a reflective tool. Devon struggled to find the words to put her sense-making into context in trying to describe her choreographic intentions regarding a split/flip sequence (Figure 4).

Chappell: Okay. So, what about this [figure 4]? You dropped to a split and then you flip and go the other way. Um, what was that meant to convey?

Devon: Like, uh, um, how can I say this? Trying to get the words together. Okay. You know how we're like you, um, dang [patting legging]. I want to say like, uh, what's the word? What's the word it's right on my tongue. ~Like, I can't get the word. Um, ~ like switch // I'm saying what I'm actually doing, but that's not what I'm trying to say. Well say // Oh, I can't think of the word.

Chappell: Okay. Well, we can come back to that if you want to. So, what about this part...

The criticalness of ethnodance as an identical tool was nuanced for Devon. While she struggled to find words to communicate her sense-making using the video as a reflective source in the above excerpt, other times, she expanded or extended her narrative (see section 4.4) after watching segments of her dance performance. Devon's struggle to put in words the meanings she portrayed in her ethnodance underscores that transduction across modes is not always possible, affirming that other modes of communication, such as dance, are more than a buttress to written and spoken language. Like other modes of communication, Dance has its own set of resources for making meaning that cannot always be put in words. Hence, the story Devon tells with her

dancing body stands as a salient aspect of her experiences and sense-making even without the oral explanation as verification.

Figure 4

Devon's Right to Left Split Switch



When reviewing Figure 4, someone without a dancer's background or ethnographic knowledge of dance might deduce that Devon was simply trying to describe a switch or change in her experience due to the literal change of direction evident in her movement. However, the meanings associated with a sign, such as a choreographic move, may be complex and multiple (Rose, 2016). Moreover, the meanings a dancer or choreographer assigns to a specific dance move may be iconic, where there is direct alignment between a feature of the movement and its represented meaning or metaphorical, where the features of the movement do not literally capture the meaning. In other words, Devon's directional change could stand as a visual

representation of a shift, change, or transition in her experience or something else entirely different due to the multiplicity of meanings in a dance move. Considering then the dance as a whole, and not only its parts, is necessary for understanding the meanings that the dancer communicates.

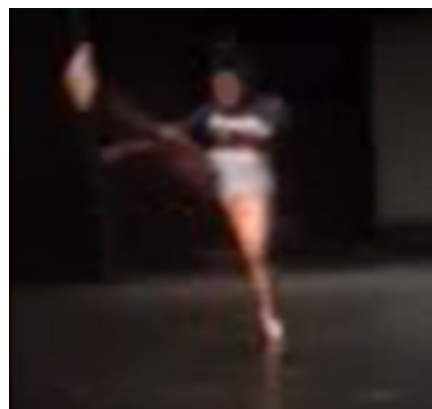
4.3 **Multiplicity of Meanings in a Dance Move**

Though set to a varied range of dance and music genres, students used similar moves or sequencing of choreography to represent similar and contrasting elements of their experiences (s) via their ethnodances. While some used signature moves that were deeply connected to aspects of their dancer self to metaphorically author their experience (s), others used those same moves as iconic representations of their experiences.

Illustrated in the excerpts below, Jasmine executed a right leg jump-kick, and Devon executed this same move in her ethnodance. Both students used this intensive move to convey aspects of their agentic selves in science. Jasmine used the move to convey the power and courage that she had to advocate for herself so she could get her A in physics. Devon used this move to articulate her self-perseverance to reach a breakthrough moment of “getting something” after trying and trying.

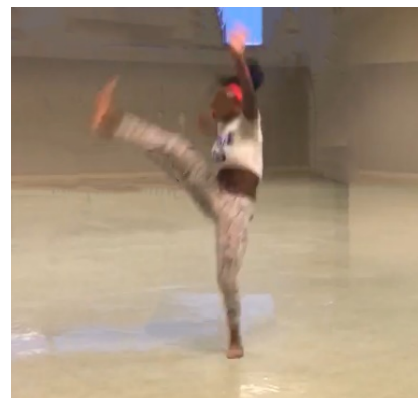
Chappell: Okay! Are there specific moves that you did in the dance that would speak to certain parts of your experience and science?

Jasmine: I wanna say the three kicks because the three kicks that I did // I think I did it right before the death-drop. Um, it shows the power that I had or the courage that I had.



Chappell: Getting into this first one, um, you kind of start off with a very intense move with this front leg kick right on the first beat. So, um, talk me through, what was that meant to mean about your experience in science and your experience in high school?

Devon: ...[L]ike, um say like, you're trying to find the answers or something and it's just like, you can't get it and you finally get that breakthrough, something like that.

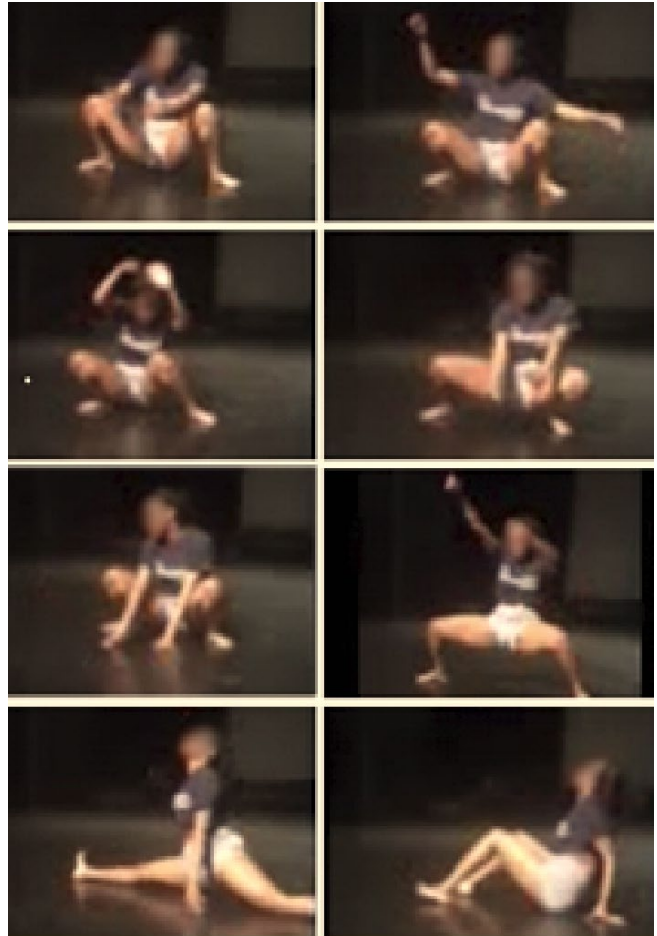


Jasmine's use of the jump kick was more metaphorical in that it was a representation of her power and courage, meanings that are not readily assigned to a kick. Devon's use of the jump kick was more iconic in that she used a jump kick to represent a breakthrough similar to kicking through or breaking through something. While Jasmine and Devon assigned different meanings to the same move, they both used this high-intensity move to author positive moments of their experiences.

Jasmine and Devon also used a similar sequence of moves to convey aspects of their experiences. Jasmine used a low ground grazing move into a drop split to illustrate what she is "good at in science." When performing, Jasmine makes this move look easy to perform, but that's not the case. This is a very challenging move to execute due to both feet being planted with the knees about 180 degrees apart while the back is erect. Moving this position requires significant hip flexibility, and Jasmine is the only one in the dance club that can get low to the ground. Thus, this is known as her signature move. Conveyed in the excerpt below, she used what she good at in dance, her signature move, to represent what she is good at in science. Jasmine used her affirmed/recognized dancer identity to the "good" part of her science identity.

Chappell: ...you do this like low ground grazing... buck...was that meant to represent any part of your science experience? |

Jasmine: The move is basically like my signature move like, the song I danced to is beast mode. So, it's like that I got into my beast mode because I can get down like really low and most people can't so its like my signature move. That's my power move basically. And ~it just represents like what I'm good at. So, yea, that's how it relates to science.



Devon used a parallel sequencing of choreographic moves to represent the different levels in science. To her, science was like a scale, sometimes hard and other times easy. Devon literally changed levels with her body to embody this meaning in her ethnodance. She moved up and down before dropping into a split as an iconic representation of this aspect of her experience within the practice of science. Here is an excerpt from her oral conversation:

Chappell: Okay. All right, so you kind of // it's like a lil buck series here so you do that walk forward thing again and then you buck in the middle, then you drop low and then you buck from side to side. What was that meant to convey? Talk me through that part.

Devon: That can mean like the ~different levels of science. Like how hard it is, is it easy you know on a // basic like a scale.



Devon's choreographic sequencing illustrates the semiotic resources available to construct meaning via a dance performance. As shown in the above snapshots from her ethnodance video, dance as a medium of expressivity allows the dancer to create iconic gestures with their body to convey specific meanings as visual representations. While Devon's use of this sequencing of moves was not deeply connected to her dancer identity like Jasmine's use of the same moves, Devon's excerpt shows that as a dancer, she intentionally used her body to "speak" for her.

However, the meaning Devon assigned to her signature move shifted her use of choreographic mediums toward the realm of metaphoric representations. Revealed in the excerpt below, Devon used a limber, one of her signature moves, to represent being well-built for science. Similar to Jasmine, Devon used a dance move that she executes with ease to embody her feeling of being well-built for science.

Devon: Um, what's another word I can use~don't want to say strong. I want to say~hmm, well built or something.

Chappell: So well built. So, do you felt like your science experience were well built or you were well-built= =

Devon: Both science and me.

...

Devon: I'm well-built and science is well-built.



Similarly, Lawson used a limber in his choreography as part of his visual description of himself. Though he executes flips and stunts with ease, Lawson's signature move is a jump kick into a dip (dramatic fall to the ground with one leg extend and one bent). However, he used a move that he executes with ease to help construct who he is and who he wanted others to see him as through the dance.

Chappell: Alright. So, like talk me through that part where you kind of did, like, it was literally like eight counts. Boom, boom, boom, boom [limber to walkover to handspring]. ...is it connected to any one experience specifically in school or in science or just in general? What was it about?

Lawson: Um, I feel like in general, like that whole part, was it's just like [laughing] it was just like, I literally did. I added a few things on purpose...basically just a description of me...



Though Devon and Lawson assigned varying meanings to a limber, they both used their athleticism, strength, and agility as a dancer to convey who they were in general and, more specifically, in science. Devon being well-built for science facilitated her academic success in

science throughout high school, while Lawson's flexibility, strength, power, and athleticism as a dancer facilitated the emergence of who he was as a person and the person he wanted everyone to see.

Conversely to others' inclusion of their signature move, Lawson did not assign specific meaning to his ending jump kick into a dip (dramatic fall to the ground with one leg bent from voguing). A signature move that "put me on the map" (positioned him as a great dancer within the school) his first year in the Dance Club. Though he did not assign a specific meaning to his signature move, the inclusion of the move denoted the interconnectedness between who he was and was becoming as a dancer and who he was and becoming within the school. Including his signature move was a necessity as it depicts who he is and what he is great at, which needed no explanation due to his positively affirmed dancer identity.

Chappell: ...All right. So, you end in a dip #and so what#|

Lawson: #Signature#

Chappell: Okay, signature move. #Let me go back and capture it#|

Lawson: #That was a signature# That's what put me on the map ... year. That was just a signature.



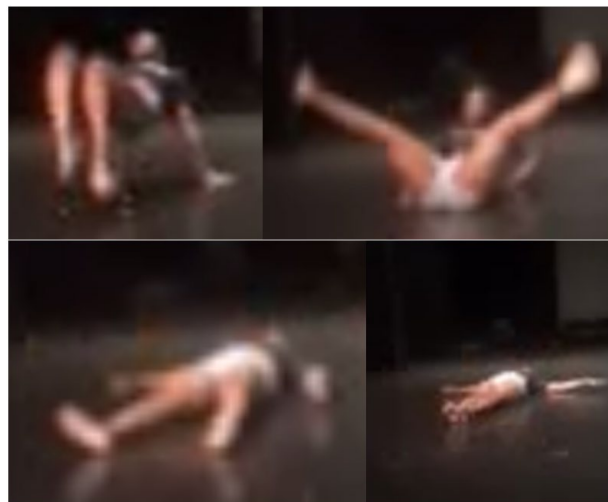
Similar to Lawson, Jasmine used a deathdrop (a dramatic jump and throw to the ground from majorette dance) in the middle segment of her ethnodance. She used this move to represent moments when she "kind of [gave] up" while striving to succeed in physics. Despite continuing and pushing through frustration with the math aspect of physics to get her A, Jasmine

acknowledged moments where she gave up along the way denoted the nuances of her experience as she tried to break through the discourse of physics and become who she wanted to be within science.

Chappell: ... Does the death drop itself represent anything about your experience? So, like if the kicks represent the power, does the #death-drop represent#|

Jasmine: #Yeah#|

Jasmine: Yea, it [death-drop] represents me kind of giving up, maybe? Yea!



4.4 Expansion and Extension of One's Narrative

As a form of visual elicitation, video artifacts “can transport us to a different place and time...help[ing] us recall feelings...and details” (Latz, 2017, p. 75) that give rise to nuances within one's story. The videography of students' ethnodances allowed for rewatching and reflection, which cultivated opportunities for students to expand or extend their narratives of their experiences in high school science by mapping new or more elaborate meanings to planned and unplanned choreography. Aspects of their science identity authoring that were not intentional choreographic decisions were unearthed and interpreted during the oral conversation. Through these more elaborate meanings, students continued to construct and reconstruct their science selves by the narration of their experiences in science (Varelas, Kane et al., 2012, p. 571). As embodied representations of their science identities, the students' ethnodances articulated who they saw themselves as in the various science time-spaces (i.e., “chronotopes” as Bakhtin called them) they had experienced, and continued to experience, which “stand as

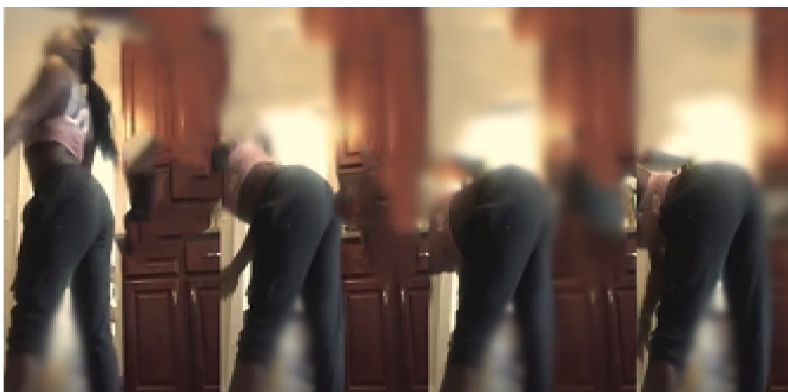
monuments to the community itself, as symbols of it, as forces operating to shape its members' images of themselves" (Bakhtin, 1981, p. 84).

Tiffany, Jasmine, Fara, and Lawson extended their narratives of their science selves by assigning meanings to unplanned or filler choreography (moves used to fill space, connect moves, or transition) at the moment. Tiffany specified a moment where she could have spoken out about her course sequencing. Jasmine used unplanned spoken commentary to explain the impact of studying on her academic progress. Fara extended her narrative using filler choreography to convey the role that moral support and others' expectations played throughout her experiences. Lawson added meaning to a garment change to express his feelings towards science. For Devon, watching the video of her ethnodance offered her an opportunity to elaborate on planned choreography to further position herself as a knower, doer, and liker of science.

Highlighted in the excerpt below, Tiffany used "just another dance move" to extend her science identity authoring process to include how her self-advocacy could have impacted her experiences within school-based science. Though the bent over hip sway taunting-like move (Figure 5) was not choreographed to represent a specific aspect of her experiences within the practice of science, Tiffany connected the movement to a shift in her science course sequence.

Figure 5

Tiffany's Bent-Over-Hip-Swaying Move Towards the Camera



- Chappell: So, in the lyrics, H.E.R. says, I'm the one to blame, and you kind of bend over and like wave your, uh, butt towards the camera in like of taunting fashion almost, was that meant to represent anything specific?
- Tiffany: No, at that point, it wasn't. I mean, it was just another choreography move to me. I don't know if it means anything specific to you or if it meant anything. But, mainly in all my dances, I try to, you know, I try to make up moves that incorporate with the lyrics most of the time. So, probably at that time, I probably did mean something about it, but it was just another dance move.
- Chappell: So, if you could, thinking back now on your experience in science and throughout your educational journey, right when she says, um, I'm the one to blame and you do that move // if you had to give an explanation, what could you use that to explain about your experience?
- Tiffany: Well when she says I'm the one to blame and I layover?
- Chappell: Mmhmm!
- Tiffany: So basically, in my experience in science throughout the years...I started with uh, environmental science, I think. And I know when I, when I was in high school, alot of kids said they didn't start with that. And then, I also didn't take chemistry. So, maybe that can relate to my dance moves and H.E.R. saying I'm the one to blame. If for me not, being the advocate or speaking out about why we didn't take chemistry or why we started out with environmental science or why we weren't taught as the kids were taught before us or why after us. It did change into // the [students] that came after us took chemistry, and we didn't.

Even though Tiffany did not question why she and her peers in that year did not have the opportunity to take chemistry before physics, the dance move stood as a revelation that she could have spoken up. Thus, Tiffany continued to author her science self beyond the planned choreography, adding self-advocacy to her science identity capital. Furthermore, ethnodance allowed Tiffany to reflect in the moment and on past experiences, which unveiled a salient part of her science experience (going from biology to physics without chemistry) that shaped her low confidence in her science knowledge and ability after transitioning from biology to physics (described in more detail in section 4.7). Moreover, Tiffany's extension sheds light on the impact

institutional structures such as science course sequences can have on students' self-efficacy, perceived competency, agency, and feeling of belonging within science.

Similarly, Jasmine gave meaning to unplanned oral commentary that deepened the narration of her science self. Jasmine used her choreographic "accident" of not being able to "remember the steps" to extend her narrated science identity authoring to include her explanation of the role that test preparation played in her academic success in science.

Chappell: So, doing this portion of the performance^^^when I was watching the video, um, you said that I'm too early and then you stayed in this low move [figure 6], but then you said, I don't remember. I don't remember, before you eventually continued the buck. And so, you were saying like, this is your signature move. Um, does that // was that meant to represent any part of your science experience?

Jasmine: I did it [oral speech during performance "I'm too early...I don't remember"]// I actually did it on accident, but it could. Because like taking a test. You taking a test and you don't remember certain things. ...I couldn't remember the steps because it's been so long. So that's basically like I didn't study or like, um, or I didn't put my all into it. So, I couldn't like, remember certain things. So that's how that can relate to it. It was actually on accident though.

Figure 6

Jasmine Stating "I'm Too Early! I Don't Remember!"



As a tool for continued interaction and engagement with her experiences, the ethnodance allowed Jasmine to extend her narration to incorporate the significance of studying and preparing for exams to her academic success. While Jasmine initially struggled with physics due to the math-heavy content, she overcame this barrier to her success by seeking teacher support and going to tutoring. However, seeing and hearing herself declare, “I don’t remember, I don’t remember” triggered recollection of moments when her own actions or inactions (not studying) could have impacted her progress towards her A in physics. Thus, ethnodance was a critical elicitation tool for Jasmine to construct her science self further and reflect on her agentic ability to navigate the barriers she faced in science and specifically physics.

Accordingly, Fara’s ethnodance cultivated three moments to extend her narration to create a visual representation of the roles that moral support and others’ expectations played in her experiences within science. Using a chair as a visual manifestation of the support she received from peers during projects and experiments in science, Fara’s excerpts illuminated the important role that peer interactions play in shaping how one sees themselves in science classes. At the same time, Fara’s extension revealed how “trying to hold on” or not “mess this up” to avoid letting others down nuanced the construction of her science identity.

Chappell: Okay. So, what, uh, tell me about that part. Um, in terms of like when you were on the stage, getting ready to start, and then the audience called out your name and you kind of smile, right. There was that meant to convey anything. And if not, uh, what was that like for you at that moment?

Fara: I mean, it wasn’t meant to convey anything at that moment. I was extremely nervous. Before I do any dance on stage, I’m extremely nervous. Um, and just to have people, you know, cheering you on, even before you do it, that’s the moral support. There was just like, okay, you know what? [Fara] just breathe, you got this. And it’s kinda the same way with science. I was always nervous when it came to projects. Um, especially if it was something I found difficult. So, you know, just to have someone there telling you, you know, you can do things it’s // it’s always a helpful // helpful thing.

- Chappell: So, so even though that wasn't something intentional, you were able to connect it to one of your experiences in science. So, if you could capture that in a photo from this snippet, what part of it would you say represents that?
- Fara: Um probably stepping onto the chair stepping onto the chair [Figure 7]
- ...
- Chappell: So, like that part [Figure 7]?
- Fara: That part.
- Chappell: Okay. And then can you see on that part, there's also where you can see the smile on your face?
- Fara: Yes!
- Chappell: Okay. So, what would you title this is as?
- Fara: What would I title this, it's going to be something cliché. I just // I just feel it.
- Chappell: I mean, but it's your experience. So, you said that you were always nervous and things like that. Um, but then you said you connected it to science and that how you was nervous about projects, but you have support. So, what would you==
- Fara: I would name it moral support. It's just, you know, the chair was giving me support, people were supporting me.

Figure 7

Fara's Representation of Moral Support



Fara's narration of her experiences in science class, and specifically in physics class, evolved as she rewatched her ethnodance. The chair stood as a physical source of support during her dance performance and a metaphorical representation of her peers' support during projects and experiments in physics class. Thus, Fara's extension revealed that positive and supportive interactions with peers in physics helped create a sense of belonging within the practice of science and the discourse of physics. Evident by the smile on Fara's face as she stepped into the chair, these interactions helped cultivate joyous moments that shifted her towards a positive affinity to science.

Another segment of unplanned choreography involving the chairs provided an opportunity for Fara to extend her narrative further. After rewatching the segment of her performing the chair split (Figure 6), Fara used the dancer feelings and thoughts she had when she was on the stage about to perform to construct feelings and thoughts she had in science, revealing the pressure she felt to not mess up because people were watching and had high expectations of her.

Chappell: So then if we go to, when you're in your split, talk me through like what this means for you. Because in watching you choreograph the, um, rehearsal, this move here, it was a trying move. Sometimes you executed it perfectly, without any assistance. And then sometimes people needed to hold the chair. So, talk me through like this part.

Fara: This moment on stage was extremely nerve wracking. I was, this was what I was most nervous about because I knew that sometimes during practice, like leading up to it, it was like perfect. The rehearsals before were perfect, ended up on stage and everything in my head was like, okay, [Fara] don't mess this up. Don't mess this up. Like, you cannot mess this up right now, do not fall. So that was, that was really odd. I was going through my head. Um, it's like, you kind of saw me stumble a little bit and I had to grab the chair, which I don't think I was initially supposed to grab the chair.

Chappell: So then if you talk about it, I know you said for this segment, it was meant to just convey, you know, those emotions of being in one of those days as you were

going through school. Um, but if you had to try to connect this particular part in this particular move to anything related to your science identity, what could you connect it to and why?

Fara: Um, to my science identity~

Chappell: Or your science // like an experience that you had in science.

Fara: Um, I wanted to say physics. That was a challenging course for me. It was mostly just like at a certain point. It was like, it's my ... year. I kind of don't want to do this anymore. And I was just like, man, [Fara] you can't mess this up. You can't mess up your grades. And so, it was kind of connected to the dance like [Fara] you can't mess this up. Like its people watching you. It was always people who were watching me and telling me, like, you have to do this. You have to go to school, you have to, you know, it was, um, it was people counting on me. So, in that moment, it's like, [Fara], these people are here and they're watching you dance. So, you can't mess this up. Whereas in science it's like [Fara] with this people who are, you kind of expect, they have high expectations of you, so you can't mess this up.

Figure 8

Fara's Chair Split to Represent "You Can't Mess This Up!"



In this extension, Fara authored interactions that nuanced her affinity to science. While the moral support Fara received during projects and experiments cultivated space and place (Varelas, 2018) for her to enjoy and achieve in physics class, the pressure that she felt to meet the high expectations of trusted adults in the school and her life created a challenging learning

environment for Fara. Instead of being in a space where she felt free to make mistakes and take risks in science class, Fara wrestled with the possibility of messing up and disappointing those who were watching and counting on her. These interactions and pressure positioned, for Fara, a good science person as someone who does not make mistakes. Thus, messing up or not meeting the expectations of others would position Fara outside of science, challenging the place that she was carving out to belong and persist in physics.

Fara continued to extend her narrative using another piece of unintentional choreography to explain why “I really just had to make a decision to drop [AP Physics]” and “just walk away from it.” At the end of her ethnodance, Fara walked towards the chair before abruptly changing directions and walking off stage. Rewatching the ethnodance cultivated reflection that allowed Fara to assign meaning to this unplanned choreography that illustrated experiences that contested her belonging within the practice of science, leading her ultimately to walk away from AP Physics and science.

Chappell: Okay, and so there’s my last point that I noticed. And I don’t know if you noticed it too, here, you walk towards the chair and then you turn and go the other way. Was that intentional, um, in your choreography and if it weren’t intentional, what could you use that to describe about your experience with science?

Fara: No, I don’t think I’ve ever noticed that. So, you said it with, uh, how could it correlate my experience with science?

Chappell: Umhmm, so here I’ll play it again so you can see it in the actual, like why you’re performing the dance. ...[S]o yeah, you walk, towards the chair and then you kind of like just made a quick turn and went the other way. So, you said it wasn’t intentional, but if you had to think about an experience or experiences in science, what could you use that to describe?

Fara: ...I’m it was certain things I had to walk away from. So, um, I eventually ended up dropping my AP physics class, and, um, I guess... [this can] relate to that. I was trying // like I was trying to it’s like, you’re trying to hold on to something, but you know, you have to walk away from it. So, I was kind of trying to hold on to physics because it was an AP class. It looks great, you know, with colleges, but it was like, no [Fara] just walk away from it.

Chappell: That's powerful. And given the way AP is positioned at the school, I imagine that that was a challenging process for you.

Fara: It was, it was like, everyone was like, no, you should just keep your AP class. Like, um, my teacher didn't want me to drop the class. And so, it was kinda like trying to hold onto it for other people, but like I had to make the decision for me, like, no, just leave // drop the class.

Chappell: ...And so, um, academically we know that wasn't a challenge. What were some of the challenges that led to you needing to be able to drop the class?

Fara: Um, I think it was, I had a lot going on, so living on the [neighborhood not near the school] and having to travel [to school], um, I was getting up at four o'clock in the morning and some nights I didn't get home until like 10 o'clock at night, um, with, you know, the afterschool activities with, um, you know, the dance team and stuff like that. So, um, it's like, it was so much work with so much that I had to be doing and it was like, I wasn't able to get everything done. So, it was a very stressful year because of the commute mostly, and then trying to figure out, you know, what school to go to and everything like that. So, I really just had to make a decision to drop that class.

Figure 9

Fara's Representation of "Walking Away" from AP Physics



Though this choreographic ending was not planned, the video artifact of her ethnodance made space for reflection that led to an embodied representation of Fara's agentic ability to not conform and make decisions regarding her engagement within science. Just as she walked away from the chair in the dance performance, Fara had to push against school-based structures to

walk away from AP Physics to reduce some of the stress she felt that year. In doing so, although walking away was the best decision for her, dropping AP Physics meant letting others down or not meeting their high expectations. Based on her conception of a good science person as someone who does not mess up or let others down, Fara's membership within science was contested by her decision to drop the class. Moreover, instead of her teacher and counselor using their agency to transform the structure of AP Physics to accommodate Fara's commute and maintain her insider science identity, they encouraged Fara to stay in the class and work harder to bring up her grade. Thus, Fara's only recourse and method of survival was to drop the class, thereby positioning herself outside of science.

While Fara used moments when she interacted with a chair prop in her ethnodance to further author aspects of her experience that shaped her science self, Lawson used an unplanned garment removal to extend his narration. As stated in the excerpt below, Lawson removed his denim vest to avoid feeling the buttons press in his back during the more intense part of his performance. However, rewatching and reflecting on the ethnodance provided an opportunity for Lawson to assign meaning to the garment change that was specifically connected to his experiences within the practice of science.

Chappell: So, when you throw your // you take your jacket off and you kinda throw it, was that meant to mean anything?

Lawson: Um, the jacket throwing? No, the jacket throwing was just because I knew I was going to have to do so much, and the jacket was going to be in the way [laughing].

Chappell: Okay, okay [giggling].

Lawson: I was like uh un. And then if you remember, um, the performance... year when I had to throw the jacket, cause I had to do the deathdrop and I was like, the buttons are in my back# that's literally the same jacket from...year#|

Chappell: #Oh okay [laughing]#|

Lawson: The same jacket. It was PTSD. I was like un uh it got to go off this time. It got to go.

Chappell: [Laughing] All right. So that was just a garment change. Well, let's think about it. So' if you could, even though it wasn't meant to // if you could think about anything about your high school experience specifically, let's think about your experiences in science. Cause I know a lot about your science experience, having been your formal teacher, as well as, you know, talking to you about it. Could that have meant anything? Could you use that to mean anything about your experience specifically in science?

Lawson: How much I hated it [science] in the beginning.

Chappell: Okay, so how much you hated it.

Lawson: [Laughing] I hated // not really hated science, science it wasn't my favorite in terms of like, um, ~yeah science it wasn't my favorite // It was not, yeah like I didn't really like biology. Chemistry, I guess we could say because I mean, I think I'm pretty sure everybody liked chemistry more only because chemistry was more hands-on like, yeah. Cause I did not like science in the beginning. Not at all.

Chappell: So, you tossing the jacket is kind of like you not liking science could be?

Lawson: Mhmm

Figure 10

Snapshots of Lawson Throwing His Vest



Aware that his performance energy and the intensity of his movement would increase in the second part of his ethnodance, Lawson remembered to remove his denim vest. Similar to how his dancer self recalled an experience that prompted the removal of his vest, the video

elicited recollection that gave meaning to this movement and deepened his science identity authoring. Even more, the seamlessness and intentionality embedded in the removal of his vest make this movement seem like an intentional aspect of his narrative. For some reason (known or unknown to him), Lawson chose to wear the vest during the portion of his narrative that represented him being reserved and wary of letting people in the school know who he really was as a person. As his confidence shifted in school, the intensity of his movement in his dance performance shifted, rendering the removal of his vest in this part of the transitioning. So, as Lawson removed his vest to prepare for the more intense “this is me” segment of his performance, he took off who he was to reveal the confident, outspoken, and phenomenal dancer and student he became within the school.

Unlike Tiffany, Jasmine, Fara, and Lawson, Devon did not explicitly state that any of her choreography was unplanned or unintentional. However, Devon was able to expand her narrative, giving more elaborate meaning to choreographic features of her ethnodance. Devon used the landing of her signature move (a handstand into a limber) as an embodied representation of her self-affirmed and recognized insider science position. Additionally, she used an ending rollover into a split to transduce the emotionality or “uplift” of “being done with everything involving science” and having “something off your shoulder.” Following the split, Devon offered her ending “show off” shoulder shrug as a visual representation of her emotions when experiences in science classes affirmed her competence in science.

Chappell: Okay. And what about the handstand itself [Figure 11]? If you had to think back to a particular moment in your experience in science, what could this represent about a particular moment or a particular experience in science?

Devon: Um, what’s another word I can use~I don’t want to say strong. I want to say~hmm, well built or something.

- Chappell: So well built. So, you felt like...your science experience was well built, or you were, well-built= =
- Devon: Both science and me.
- Chappell: Okay. And so, would you describe yourself as well built for science or you're well-built and science is well built?
- Devon: I'm well-built and science is well-built.

Figure 11

Devon Being "Well-Built" for Science



Through her declaration of being “well-built” for science, Devon positioned herself within science. Furthermore, Devon’s expansion illuminated her positive affinity towards science through her statement that “I’m well-built and science is well-built.” Her statements indicate that she was constructing a level of alignment between herself and science, associated with a level of ability that she saw in herself for a field that she also associated with a particular level of ability. Her competence and confidence in that competence were part of how she saw herself as being in science. Her signature move, a symbol of her affirmed membership within the dance club, was used to represent her affirmed membership within the practice of science, thereby illustrating the

interconnectedness between her dancer and science self. Just as she is well-built to execute her signature move, she is well-built to do science.

Devon continued to expand her narrative by elaborating on her ending choreography. In explaining the meaning, she assigned to her rollover into a split, she created a visual representation of the emotional “uplift” she felt at the revelation that “I really did this” after completing a science class. Getting through “everything dealing with science” cultivated a sense of pride for Devon that continued to affirm and shape her “well-built” insider science identity.

Figure 12

Snapshots of Devon’s Rollover-Into-A-Split Move



Devon used a rollover movement to represent getting through science as a knower, doer, and liker of science, which was affirmed by her teachers and maintained beyond this study. Instead of this rollover movement representing overcoming a struggle or challenge, this movement represented Devon’s pride and joy after completing her science classes. Therefore,

experiences and interactions that continued to affirm her insider identity and confidence allowed Devon to maintain her positive affinity to science and membership within the practice of science to the end (the completion of her science classes).

Additionally, moments throughout her experiences in science where she could “show off” because “I know that makes sense” supported her competence in science. In the final expansion of her narrative, Devon recalled an experience in chemistry where she was able to show off her conceptual understanding by correctly answering a question that the majority of the class struggled with at the time. Thus, her ending shoulder shrug stood as an embodied representation of experiences that cultivated the joy and pride she felt and carried with her throughout her science classes.

Chappell: ...So when you do that little shrug forward [figure 13], what part is that? Cause you kind of in #the end#

Devon: #[chuckling] That’s show a off#|

Devon: And so, what do you // what about your science experience do you feel like was worth showing off?

Devon: Everything! Because when it comes // like I said, when it comes to science, you gotta think for real, it’s not just going to be there. That sometimes you might have to infer the answer, or you know, like imply something in order to make everything make sense.

Chappell: So, do you feel like there was a specific time or experience within a class where you felt like you were in a position to show off?

Devon: Yes. And I remember this~

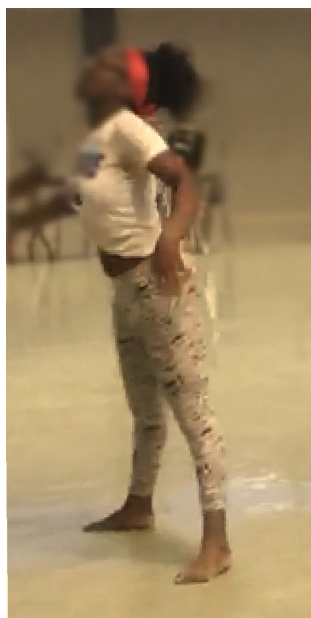
Chappell: What?

Devon: Um, it’s this question you [Ms. Chappell her teacher] asked us. And I think the answer was like being B or E it was one of them. And my table was the only one that got it right. But I wasn’t sure that I got it right. But I’m like, I know that makes sense. Cause all the other ones didn’t and I was the only table that got it right. And everybody else was wrong [Smiling].

Chappell: Okay. So then would you say that this lil like show off at the end can describe that feeling?
Devon: Yes, definitely.

Figure 13

Devon's Representation of Emotionality of Affirmed Science Competence



Devon's chemistry class created a space for her to take a risk even when "I wasn't sure I got it" and share her answer. In doing so, Devon was able to experience a sense of joy and pride in her science competence and meaning making that was associated with being able to "think for real...in order to make everything make sense." Thus, being in a space where she felt comfortable sharing her thoughts even when she might not have known the correct answer played a critical role in how she positioned herself within science. For Devon, being a well-built person for science included taking a risk and being willing to engage even when she was not certain. Devon's experience created a path for her to be a good science person and take a risk or make mistakes, which contrasted with Fara's construction of a good science person as one who did not make mistakes or mess up.

Without the video elicitation, these critical experiences that helped shape her competent and affirmed science self might have stayed within the nooks of Devon's memory. Like Devon, the video artifact of their ethnodances was a vital tool for Tiffany, Jasmine, and Fara to extend their narratives in ways that revealed interactions, experiences, trials, and tribulations that affirmed, nuanced, or contested their science identity construction. Thus, while the ethnodance was a critical tool for students with dancer identities to construct, convey, and narrate their science selves, the video artifact of their ethnodance was a necessary form of visual elicitation that prompted recollection, retelling, extension, and expansion of their embodied narratives that enriched their science identity authoring and its analysis.

4.5 Transduction of Emotionality

Students ethnodances offered them opportunities to transduce the affective and emotional dimensions of their experiences in ways that their written narrations (Bezemer & Kress, 2008) of their experiences in science could not represent. During the oral conversation, students noted how particular features of their dance performance (choice of music, choice of dance genre, and specific dance move(s)) pertained to the emotions that were central to their ways of being in science (Maulucci, 2012). They had chosen slow-tempo songs to establish the mood for challenging or frustrating experiences and upbeat, fast-tempo songs or dance mesh ups to represent periods of perseverance, triumph, or affirming shifts in how they saw themselves in science.

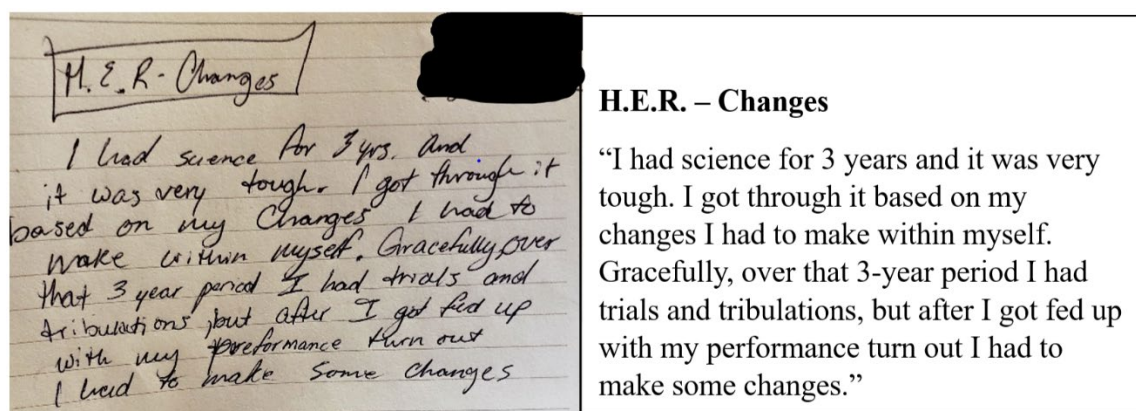
Though Tiffany and Jasmine both choreographed, performed, and analyzed their ethnodances independently and in separate spaces, they both referred to the emotionality of their experience(s) as being or getting in their "beast mode." For Tiffany, this meant a transition to a space where her dancer identity and signature tongue-sticking-out move (Figure 13) let "people

know that I am not afraid.” Jasmine used her signature low-ground-grazing move to represent “getting into my beast mode” and “grinding... [so] I can go to the college of my choice.” She used “what I’m good at” to represent the sense of joy and pride that her tenacity to achieve her goal had created. Lawson coupled a transition in music and dance genres with a shift in performance intensity to represent his inner negotiation, agony, wrestling, and perseverance throughout his experiences in high school and science. Fara used the melody, tone, and lyrics of “One of Them Days” by Kiana Ledé to foreground the sorrow, pain, perseverance, and anger present in her science identity authoring process.

Tiffany’s written narrative correlates with the embodied narrative told through her ethnodance. However, her written narrative does not convey all the emotions she felt throughout the “tough [times]... trials and tribulations” that led her to “make some changes” (Figure 14). Except of indicating a feeling dissatisfaction and frustration (“got fed up with my performance”), her written narrative does not illustrate what it felt like for Tiffany to “get into beast mode” to change “my performance turn out.”

Figure 14

Tiffany’s Written Narrative



However, Tiffany was able to use the title of the H.E.R.'s song "Changes," directional shifting moves (described in section 4.1.1), and a "stale" facial expression to embody the "pain that I felt [when H.E.R. was] singing" that related to her "difficult" experience "growing and learning new things about myself and about the world around me" throughout her three years of science in high school. Additionally, Tiffany used her signature tongue-sticking-out facial gestures to illustrate her transition into "beast mode" and triumph.

Chappell: And so, in the dance, in the beginning, your face facial expressions are like stoic or not really a frown, not really a smile but just kinda like stoic it. But there's a part in the song or in the choreography where you start to smile, and even at one point, you stick out your tongue. ... Was that done to represent any part of your experience? |

Tiffany: Um, basically in the beginning I, my expression was very like stale because I was showing the pain that I felt her singing in the song. So, it was just like the facial expression that describes (**). And me, by me sticking out my tongue and smiling, that's showing me my personality in my dance moves and how I express myself. |

Figure 15

Snapshots of Tiffany's Stoic "Stale" vs. Tongue-Sticking-Out Facial Expressions



As the more facially expressive member of the Dance Club, Tiffany's moments of frustrations were represented with stoic expressions and eye squints, which stood in stark contrast to periods of triumph that were represented with open-mouth smiles and her tongue stuck out. Using her signature dancer identity markers to represent being in beast mode meant that this was a positive and affirming space for Tiffany. Though at first her experiences were challenging and painfully, the agentic changes she made (transferring schools, ending relationships, and shifting how she responded to situations) were joyous moments for Tiffany, which is not evident in her words alone. Thus, her ethnodance offered her a medium to construct who she was becoming as a science person and story her science identity beyond the constraints of words, transducing powerful emotional dimensions of her experiences.

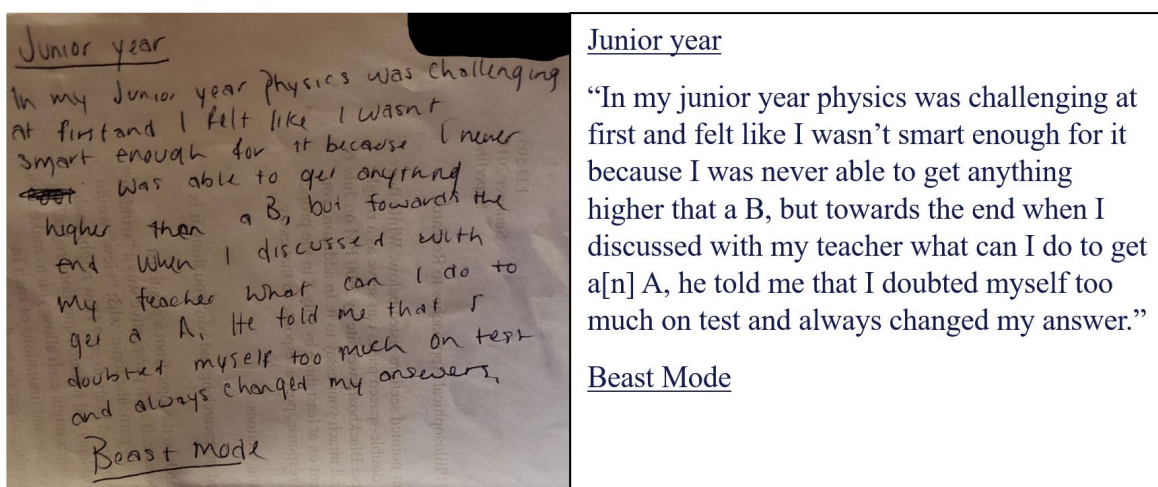
Jasmine titled her written narrative "Beast Mode," which is the title of the Snappy Jit song she chose for her ethnodance (Figure 16). Thus, her written narrative aligned with the emotional context intended to convey through her ethnodance. However, her written narrative does not evoke the emotions she felt trying to navigate the challenging discourse of physics that made her feel "like I wasn't smart enough...because I was never able to get anything higher than a B." It was the "tough [times]...trials and tribulations" that led her to "make some changes." Additionally, the feeling of satisfaction for achieving her goal in physics through self-advocacy and teacher support does not come through in her written narrative.

Jasmine coupled the title of the song with a series of quick-paced and intense majorette moves (Figure 17) to illustrate the feeling of being in "my beast mode, grinding and making sure that I can get an A" in physics (see excerpt in section 4.1.2). Additionally, Jasmine used her

signature low-ground-grazing move to illustrate being in beast mode, striving for and persisting in what she is good at in science and physics, in order to achieve her goal.

Figure 16

Jasmine's Written Narrative

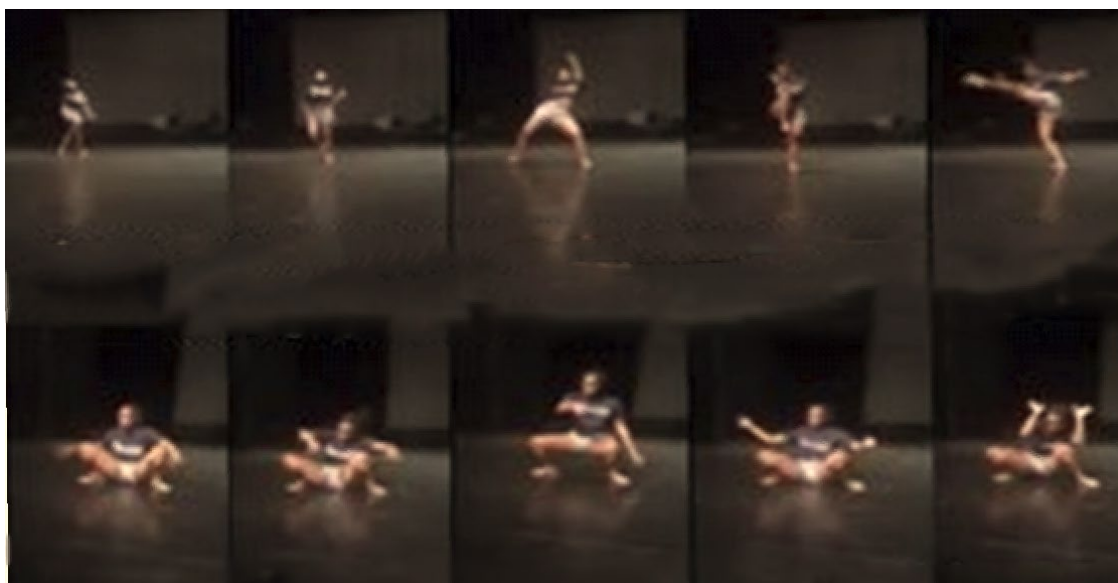


Thus, persisting and working hard to earn an A in physics was a joyful experience that cultivated a sense of self-pride that helped shape her doer and knower science identity by the end of physics. Her ethnodance offered her a space to embody the agentic choices that helped shape who she became in physics and narrate her affirmed science self in ways that was not communicated in her written narrative.

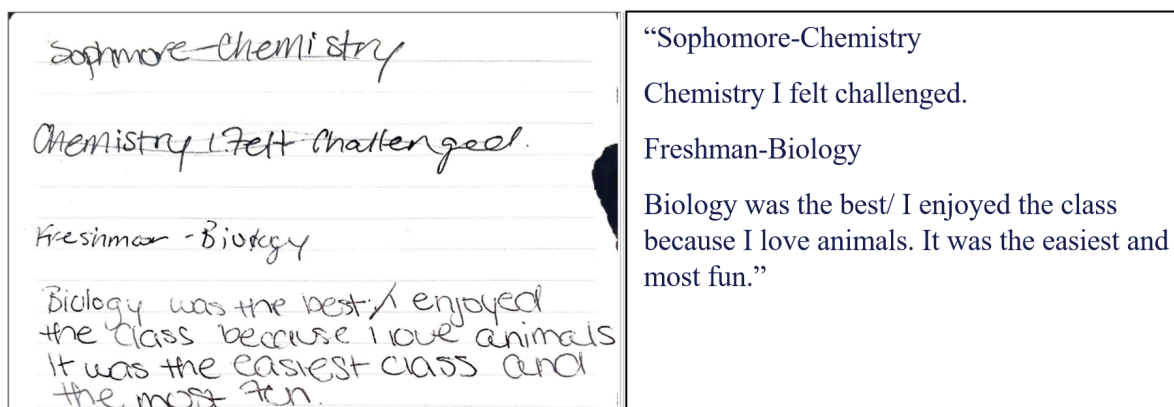
Lawson’s written narrative illustrates a stark contrast between the meanings and emotions transduced in his ethnodance compared to his written words. In his written narrative, Lawson shared that “I felt challenged” in chemistry while biology class was “the best...the easiest, and most fun” (Figure 18). His love of animals and the ease of the course made biology an enjoyable experience, which is evident in his written narrative. However, his written narrative does not communicate how the challenge he felt in chemistry positioned him within science.

Figure 17

Snapshots of Beginning of Jasmine's Ethnodance and "Beast Mode"

**Figure 18**

Lawson's Written Narrative



Moreover, Lawson's written narrative does not include how he felt regarding his experience in physics class or the inner wrestling and negotiating of his identity expressed in his ethnodance. Lawson meshed contemporary dance with Kelly Clarkson's slow and emotionally evoked song "I Don't Think About You" to convey the "bottled in, the hidden" inner turmoil he felt trying to become comfortable being openly "gay in America" while navigating school and

science. The heart-wrenching and rhythmically enticing song coupled with his low intensity yet emotional movements create chills and tears as the lyrics “were hitting hard in a lot of ways.” In other words, his dance performance draws an audience member into the experiencing space of his narrative and allows for a brief moment in time to feel the emotions he had felt and was conveying through his ethnodance that were not communicated in his written narrative.

Chappell: Okay. So, if I was going through the dance, there are some parts that like speak volumes. And I think for me as your dance coach, um, you know, like I’ve cried multiple times watching this video. #Um#

Lawson: #Oh, I’ve cried hundreds of times watching that video#

Additionally, Lawson’s written narrative does not include the joy he felt when he became who he wanted to be and be seen within the school. To illustrate this triumph and joy, Lawson meshed majorette dance with Cardi B’s upbeat and self-affirming song “Bartier Cardi” to convey “finding myself on my own terms and not based on what everybody else had in mind for me” in school. The thrilling and movement-inducing song beat, and the lyrics coupled with his intense, fast-paced movements, represented his transition into “this is me.” This shift in performance energy, dance, and music genres denoted the positive and affirming emotions he had felt as he became who he wanted to be in school. Like Tiffany and Jasmine, Lawson’s ethnodance transduced critical emotional aspects of his experience in school that were not evident in his written narrative, rendering the ethnodance a critical tool for him to express the emotions he felt throughout his experiences.

4.6 The Structure-Agency Dialectic

Students’ sense making with and of their ethnodance emphasized aspects of the structure-agency dialectic (Varelas et al., 2015) in their identity narratives. They noted specific school-based structures (grading policies, schedule programing, science discourse, and AP discourse)

that hindered or impacted their academic progress or engagement in science. Additionally, they highlighted ways in which their agency (sometimes in conjunction with their teacher's agency) enabled them to push against or maneuver around these structures. For Jasmine, the structural aspects of her physics class were considered in relation with her agency to persist and advocate for herself and the agency of trusted adults. Tiffany highlighted a missed opportunity to use her agentic voice to advocate or speak out against a structural impediment to her success in science. However, Fara had to push against and resist certain structures (Duncan-Andrade & Morrell, 2008) to give herself space, as agentic being (Varelas et al., 2015), to decide what was best for her regardless of others' expectations.

Moreover, Tiffany, Jasmine, and Fara's collective ethnodance revealed how a one-year change in science course sequence impacted how they saw themselves in science and specifically physics. Tiffany, Jasmine, and Fara had taken environmental science, biology, and physics due to a shift in the school's science course sequence, that was formerly biology, chemistry, and physics. They associated their challenging experience at the start of their physics class with the restructured course sequence coupled with the "math-heavy" discourse of physics.

In the history of the school, Tiffany, Jasmine, and Fara's class is the only one to follow an environmental science, biology, and physics sequence. The classes before and after them followed the usual biology, chemistry, and physics science program. In her individual ethnodance, Tiffany embedded this experience within the extension of her unplanned "may I the one to blame" bent-over-hip-swaying move (Figure 5 in section 4.4). Even though Jasmine and Fara did not specifically reference the course sequence in their individual ethnodances, their collective oral conversation and sense-making of their collective ethnodance revealed that this

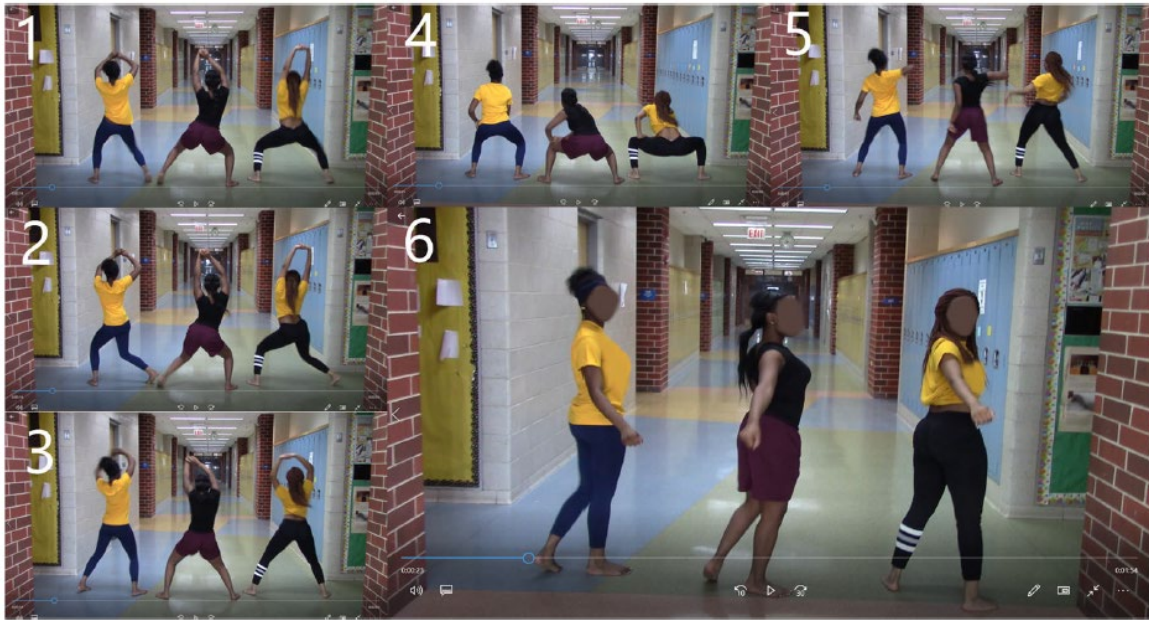
experience played a significant role in how they saw themselves in science, especially physics, as well as how they positioned themselves relative to science content.

These three saw the beginning of physics class as a noticeable shift from what they experienced the year prior in biology, which they embodied with dramatically contrasting genres of dance. They began their dance performance with an upbeat hip-hop dance. In line with the nature of hip-hop dance, they gathered to honor themselves as knowledgeable beings (Durden, 2009). Throughout this segment of the dance performance, the students utilized a variety of up-and-down bouncing movements coupled with rolls to the side initiated through the hips, locking (i.e., a hard stop in between moves), forward thrust known as popping, and forward and back step sequences. Snapshots 1-5 in Figure 19 illustrate how the students were performing varying interpretations of the same move during the first part of their performance. The very moment that students transitioned from “Biological Bliss” to “The Gap” is encapsulated in Snapshot 6 (Chappell & Varelas, 2020).

They entitled this first part of their dance performance “Biological Bliss” to indicate the extent of the comfort and joy they had cultivated in their biology course. Though they acknowledged that their biology course “was difficult,” they still felt good about they were in biology because their teacher “helped, it was easier to understand, throughout the whole year” (Chappell & Varelas, 2020, p. 203). Being able to make sense of the concepts and content explored in their science classes seemed to be salient aspects of the students being able to identify with the particular course. The title that they assigned to the portion of choreography utilized to convey their overall experience in their biology course encompassed the euphoria they had linked with science and with biology, which stood in contrast to how they saw themselves in their physics course.

Figure 19

Snapshots of the Collective Dance Performance: From “Biological Bliss” to “The Gap”
(Chappell & Varelas, 2020, p. 204)



Their transition from biology to physics challenged and nuanced the science insider position they had in their biology class, placing them outside of science. The students meshed contemporary and lyrical/ballet moves in their dance performance to illustrate shifting to physics from biology, the moment where they felt like science outsiders. Of the genres of dance available for them to use to construct their narrative, they selected genres that they are not particular inclined to learn or perform to embody their being in the physics class. In doing so, they represented the alienation and struggle they were experiencing as their science identity was transforming. Their ways of being and becoming as a dancer was informing their construction and making explicit who they saw themselves being and becoming regarding their engagement in and with science.

In the portion of their dance performance that they titled “The Gap,” the students utilized ballet to articulate the “sad” and “frustrating” position they found themselves in at the start of

physics, embodying it in their dance performance and further expressing it in oral conversation shown below (Chappell & Varelas, 2020, p. 207).

- Fara: They [school administrators] wanted to experiment with our class so they gave us environmental instead of biology our freshman year.
- Jasmine: Everything was new to me.
- Chappell: Is it new because you didn't take chemistry or was it new because it's physics, what do you mean?
- Fara: Because we didn't take |
- Jasmine: It [physics] is like another math.
- Fara: Physics is definitely a math class.
- Jasmine: So, it's like ==
- Fara: So, coming from biology where it was #more about#
- Jasmine: #Science#|
- Fara: [M]ore science-related going to a class where it is mostly math-related, it [physics] was challenging because I'm not good at math ~ but I'm somehow good at physics!

As a result of the school's rearrangement of the science course sequence, these students' physics course was their first encounter with a science class that heavily depended on math. Seeing herself as "not good at math" but "somehow good at physics" illustrated both Fara's surprise regarding her achievement in physics and positioning as less competent in math. Their emphasis on physics reliance on math illustrates that they were distinguishing between the math-based and qualitative aspects of science. Fara's self-assurance in her ability in physics in spite of its reliance on math illustrates her fragmented confidence. Fara simultaneously positioned herself as a doer of science and questioned her competence in science due to the math-heavy nature of the physics class.

The students' dedication to strive for success in science despite their frustration and the challenging start of their physics class was illustrated with a transition from lyrical to contemporary dance. They were intentional about pushing through their discontentment; their agency (individual and collective) at work and in display for others to notice (Chappell & Varelas, 2020, p. 207).

- Chappell: What type of moves will you use to show that you're like frustrated, what do you think you'll be doing?
- Jasmine: Slow |
- Fara: I would say yea! I can imagine like a |
- Jasmine I can imagine like ~ yea!
- Fara: Mime-ish type of dance |
- Jasmine: Yea! You know how they be like trapped in something // like you tryna fight // you basically fighting the battle within yourself, tryna break that frustration. So, sum like that.
- Fara: I was tryna say contemporary dance ==
- Jasmine: Yea!

The students utilized the semiotic resources available to them via contemporary dance to convey that physics was “uncertain and frustrating, yet willing to try.” They illustrated the compromised competence, frustration, and ambivalence that they experienced at the beginning of physics, which stood in contrast to their “happy” and confident science identity at the end of biology. Even so, they also illustrated being “willing to try.”

As the students were “telling a story through dance,” they then shifted to identify dimensions of their experiences in and with their physics class experiences which brought about additional positive engagement. Switching to Kalin White's R&B song “Twisted,” the students

stayed with contemporary dance. This portion of their dance performance was divided into three parts to represent “structural dimensions: their engagement in lab activities” (“The Glow Up,” Figure 20), “the changing teacher–student interactions” (“A New Attitude,” Figure 21), and “the support they were receiving from their physics teacher” (“Don’t Stay Behind,” Figure 22) (Chappell & Varelas, 2020, p. 207).

Figure 20

Snapshots of the Collective Dance Performance: From “The Glow Up” (Chappell & Varelas, 2020, p. 208)



The choreography in “The Glow Up” segment of their dance performance represented their shift back to science insiders. Their agency catalyzed their “fighting the battle within yourself, tryna break that frustration” that they experienced in physics and represented with the beating of their hip in the dance performance. The shift in mood and tempo of the song together with the gradual release of the arms illustrated their transition from frustrated to liking physics and more explicitly the lab activities, “The Glow Up” (Figure 20). In the section “A New Attitude” (Figure 21), the students conveyed the significance they attributed to recognition of

each other's positive attitude and mutually respectful interactions between teacher and students, illuminated in the discourse excerpt below (Chappell & Varelas, 2020, p. 208). The choreography for "Don't Stay Behind" (Figure 22) was used to convey the active roles they had to employ in order to achieve academic success in physics and receive and perceive teacher support and, an example of the intricate interactions of agency and structure.

- Fara: The teacher's definitely relevant to be able to teach you what you need to be taught but you're gonna have to put forth the effort to want to be taught and to actually sit there and listen to it so ==
- Jasmine: And then like some students // they'll like come in the class with an attitude |
- Fara: Yea.
- Jasmine: You gotta come in with the same vibe the teacher has ~ So the teacher is all happy and willing to help you, take it. Like don't |
- Fara: Right.
- Jasmine: [G]ive them attitude cause that makes them not want to help you and they'll help the next person.
- Fara: Right.

The students perceived their physics teacher as "happy" and eager to help students learn physics concepts. They also denoted being willing to engage and being respectful as important aspects of student identities, further shaping their identification with physics and illuminating entry points to insider status. The support they received helped build a bridge of access into their once challenging physics classroom community, reconstructing their science identities.

Their physics class was challenging and required consisted engagement– "you cannot miss a day. You cannot like // you just can't miss out on nothing. If you miss out on something it is hard to catch up or it's hard to understand. You have to be there every single day."

Figure 21

Snapshots of the Collective Dance Performance: From “A New Attitude” (Chappell & Varelas, 2020, p. 209)

**Figure 22**

Snapshots of the Collective Dance Performance: From “Don’t Stay Behind” (Chappell & Varelas, 2020, p. 209)



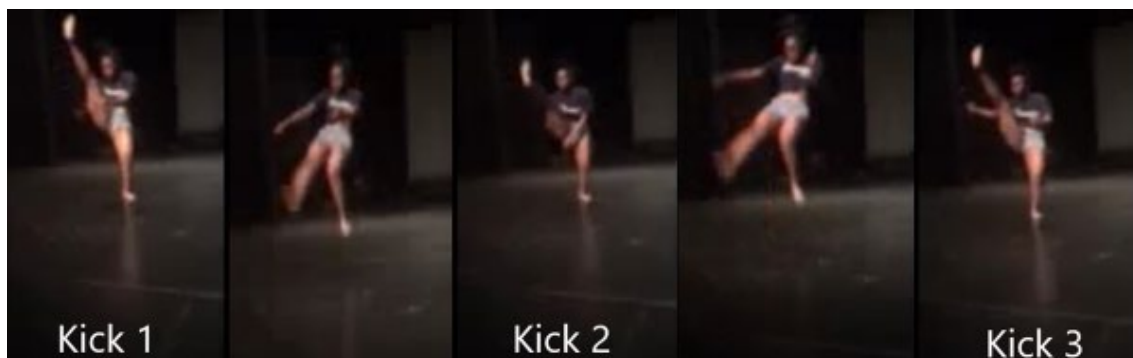
Nevertheless, using the bridges constructed by the teacher’s willingness to help students and positive attitude coupled with their own willingness and persistence to “fight” through their

challenges, offered the students space to see themselves as successful members of the physics class. Structure and agency kept shaping each other. Their ethnodance was skillfully conveying their science identity construction intertwining the structures that shaped how they saw themselves in science and their own, teacher-supported, agency to push through or circumvent barriers to carve a space of belonging in physics.

Jasmine's individual ethnodance echoed the significance of teacher-supported student agency to transform or overcome the barriers to academic success she experienced in physics. For Jasmine, the practice of physics emerged as a structural impediment to her academic success due to the “math-heavy” of physics. Despite her efforts, she could “never get an A.” This reference to getting an A shows how the school-based grading policy impacted Jasmine's science identity in terms of who she was in physics. Though she was earning a C or B in physics, her science identity was weakened because she could not see herself as successful in physics without earning an A. The three kicks that she performed (Figure 23) in this segment represents her agency, “the power that I had or the courage” it took to advocate for herself by asking her teacher for “extra credit... [or to] redo test or retake tests or...for a better study guide” (see 4.1.2 for discourse excerpt).

Figure 23

Snapshots of Jasmine's Three Kicks “Power and Courage”



Tiffany's individual ethnodance reemphasized the salience of the course-sequence change to her experience in science. In her extension of the bent-over-hip-sway-taunting-like move (Figure 5 in section 4.4), Tiffany positioned herself as a mediator to transform or question the decision for her class to begin their science journey with environment science, rather than chemistry. However, the decision for her class to start with environmental science was made before Tiffany enrolled, and she was not made aware that she would not take chemistry before the start of physics. On the one hand, watching the video of, and reflecting on, her ethnodance created an opportunity for Tiffany to realize that as a student, she had agency to advocate for herself and her class regarding their science course sequence. On the other hand, Tiffany's extension highlighted a disconnect between her imagined and actual agency that was limited by the school's decision-making power. Tiffany's class was not given space to provide input on the change prior to the decision being made. Additionally, they were not allowed to opt out of physics and take chemistry, even though there was no graduation-required course sequence at the time. Thus, Tiffany assumed that "being the advocate or speaking out about why we didn't take chemistry or why we started out with environmental science or why we weren't taught as the kids were taught before us or why after us" could have shifted her experience in science by transforming the program structure. In actuality, though, there was little to nothing that she could have done to transform this critical structural impediment to her success in science and experience in physics.

Even though they were not able to change their science course sequence, collaborating and working cooperatively with one another in a class where they initially encountered challenges cultivated an opportunity for Tiffany, Jasmine, and Fara to become insiders of the physics class (Chappell & Varelas, 2020, p. 204).

- Fara: In the beginning, you [referring to Jasmine] didn't like physics that much |
- Jasmine: Yea!
- Fara: But toward the end, you was like # "yea, I like this!" #|
- Jasmine: #It's fun! #|
- Fara: You can do ~ like what in terms of the sad to jolly ~ you can do [chuckling] like um uh no ~ types// ballerina type moves in the beginning and then go into like some |
- Jasmine: Fun!
- ...
- Fara: [H]ow frustrating it [referring to physics] was at first and then slowly changing to like understanding it.
- ...
- Jasmine: [Physics is] a lot of work.
- Fara: [laughs] I wouldn't necessarily just say a lot of work. It is a lot of work, but it requires you to actually think about it. Like put forth your knowledge to figure it out. It's definitely a class that helps you challenge yourself.
- Jasmine: Critical thinking |
- Fara: Yea!
- Jasmine: It's actually common sense too!
- ...
- Fara: You gotta be on track ~ you gotta try to stay on top of it. You gotta be dedicated to tryna do what you gotta do to get where you want to be. But at the same time, you gotta try and have fun with it ~ because I mean |
- Jasmine: Yes!
- Fara: If you're not having fun while you're doing it, what's the purpose of doing it?

The students outlined dedication, hard work, focus, and resilience as required components necessary to achieve in physics. They also contemplated two apparently opposite characteristics of the experiences in physics—being challenged, since doing physics necessitated “critical thinking,” and also being calm and at ease, seeing that doing physics also meant “common sense too.” As an instrumental tool that promoted both their continued willingness to

engage in physics and hopefulness, this “in-between state,” felt like both a challenging and natural space to for them to succeed. Thus, their willingness to try allowed them to move around “The Gap” in their science learning experience to create a positive affinity to physics as inside members.

The teacher-recognized insider status led to Fara being recommended for AP Physics. As a trusted adult within the school and her dance coach, Fara excitedly shared with me her final grade of an A in honors physics and her subsequent teacher recommendation for AP physics. This was after wrestling with her science competence due to being “good at physics” though she was “not good at math.” Achieving an A in physics and being recommended for AP physics affirmed her position as a knower and doer of science, shifting her once fragmented confidence in science, which, in turn, helped her shape an identity as a liker of science. However, this recognized and affirmed science identity was contested by her experiences in AP Physics (see section 4.4 for excerpt).

At the beginning of AP physics, Fara was excited about being enrolled in the course. For weeks, she tried to juggle Dance Club rehearsal, 7 classes, and a 90–120-minute commute to and from school, “hold[ing] on to [AP physics] for other people.” Fara tried to persist because “[AP physics] looks great...with colleges,” and she did not want to mess up by not meeting the high expectations for others. Her teacher and counselor encouraged her to stay in AP physics, even though “my grade did drop [because]...it was so much work with so much that I had to be done...I wasn’t able to get everything done.” After experiencing her first F in a high school science class, Fara saw dropping AP physics, despite the discouragement of the trusted adults in/out of school, as her only means of survival. Using her agency, she pushed against the discourse of AP physics and the expectations of her teacher, counselor, and family to create a

place for her to “breathe,” outside of science. The structures and requirements for membership in AP Physics and her own agency to move away from them shifted Fara’s recognized and affirmed science identity to a contested space.

The students’ ethnodances embodied aspects of the structure-agency dialectic in more unbounded ways that revealed the value, impact, and intensity of their agency, the emotions they associated with being agentic, and their ability to resist or maneuver around structures in science. Despite the structural dimensions she had experienced, Tiffany’s agency and commitment to change her outcome allowed her to overcome trials and tribulations to improve her performance in science. She created a space for herself to become who she wanted to be in science and expressed the joy and happiness of this agentic action in her ethnodance. Jasmine’s ethnodance embodied her commitment to rise above the struggle to overcome the more mathematical aspects of physics, cultivating a sense of pride, joy, and satisfaction with her science self. Fara’s agency to “walk away” from AP physics both affirmed her ability to “decide what’s best for me” and positioned her outside of the happy and excited science space where she had started. For these three students, their ethnodances became a medium to convey their agency to resist or overcome structures in science as they embodied the convergence of “who they were and were becoming as dancers” with “who they were and were becoming as science students” (Chappell & Varelas, 2020, p. 214).

4.7 Solidarity Through Black Dance

When given space to decide in which genre of dance to represent their narratives, four students chose a genre of dance that is rooted in Black culture. More specifically, students used one or more forms of Black Dance (majorette and hip-hop) to represent salient moments of their experiences, positioning their ethnodances as sites of solidarity (Daniel, 1991) and cultural

expressivity (Bragin, 2014). Jasmine, Devon, and Lawson used the majorette genre to construct their individual ethnodances. Jasmine used majorette to embody the “power and courage I had to self-advocate for teacher support” and “grind” so “I can go to the college on my choice.” Devon authored her teacher-recognized and self-affirmed “well-built” for science identity with majorette genre moves. Lawson’s transition from contemporary to majorette represented the emergence of his confidence and affirmed “this is me...this is what I do” identity within the school and dance. However, students utilized contemporary or lyrical dances to illustrate experiences in science classes that challenged or nuanced their position within science. Fara’s “not as enthusiastic...one of those days” experiences were set to lyrical genre dance. Lawson’s reticence and negotiated identity within the school was illustrated using contemporary dance moves.

The use of majorette and hip hop to author positive and affirming experiences was echoed in Tiffany, Jasmine, and Fara’s collective dance performance. The students chose majorette to embody their joy and perseverance as they were becoming competent knowers of physics and transitioning back to science insider. As an example of Black Dance, majorette provided these dancers and students space to “turn to the thing they have rights over their body” (Bakare-Yusuf, 2005, p. 267) and a feeling of cultural solidarity circumventing the constraints of “mainstream dance” to portray their story, similar to how they maneuvered around constraints and boundaries to take up active membership in their physics class community. Tiffany, Jasmine, and Fara used sassy attitudes, quick tempo songs, hard-hitting moves, and technically challenging majorette dance moves to convey their advancement into their last quarter of physics (Chappell & Varelas, 2020, p. 212).

Chappell: What moves would represent you getting to that point where you understand? What would you do to represent that?

- Fara to Jasmine: What would you do?
- Jasmine: Smile.
- Jasmine & Fara: [Both chuckle].
- Chappell: What type of dance do you do when you smile the most?
- Jasmine: Majorette.
- Chappell: Ok.
- Fara: The students don't get on my nerves, so they're alright.
- Jasmine: Um ~ we could like come together and dance like ~ we can like dance with each other and like interact with each other in the dance. Like we helped |
- Fara: Right.
- Jasmine: each other out or something
- ...
- Fara: You can actually depend on your classmates, well some of your classmates |
- Jasmine: Yea.
- Fara: to help you understand or help each other out.

As their preferred genre of dance to perform and express themselves, majorette offered the students a medium to author and communicate their transition to science insiders, and their hard work and collaborative effort that allowed them to overcome the challenges they initially encountered in physics. Though they continued to perceive physics as requiring “a lot of work,” they were able to discover a place in physics that was enjoyably and comfortably challenging for them, similar to majorette dances (Chappell & Varelas, 2020, p. 213).

- Mindy: Majorette would represent ~ what did you say again?
- Fara: Um It's a lot of work. It takes dedication ~ You have to really be focused with it |

- Jasmine: Yes!
- Fara: because of like the type of movement it is |
- Jasmine: You have to be on beat, on track.
- Fara: It's like the same thing with class.
- Fara & Jasmine: [Both chuckle]
- Fara: You gotta be on track ~ you gotta try to stay on top of it. You gotta be dedicated to tryna do what you gotta do to get where you want to be. But at the same time, you gotta try and have fun with it ~ because I mean |

Throughout the majorette choreography, from “Werk” through “The Mesh Up,” Tiffany’s facial expressions portrayed the emotional contentment of the dance performance. Tiffany stuck her tongue out (Figure 24) mere seconds into this segment of their dance performance. Additionally, she shifted through various smiles during this portion of the dance. Even though Tiffany was not present during the audio-recorded planning meeting, these snapshots reveal that, similar to Fare and Jasmine, Tiffany also associated “smiles” and “having fun” with majorette dance.

Figure 24

Tiffany’s Facial Expressions Throughout the Majorette Choreography (Chappell & Varelas, 2020, p. 214)



Even more so than the beginning of the dance performance, this section of the students' dance exuded joy and pleasure. The dance represents the fun and joy they came to experience in their physics classes, which they considered an important component of positively identifying with physics, in addition to remaining on track. As Fara verbally wondered, "if you're not having fun while you're doing it, what's the purpose of doing it?" As their preferred and most enjoyable genre of dance, the students chose majorette to express what they had considered as salient emotional dimensions of their science identity construction. Physics needed to offer students positive, fun, and affirming experiences to support their membership in the community of physics, their engagement, and their success, in addition to their persistence. Thus, their collective ethnodance became both a product of and a medium to convey their science identity construction as they performed both who they were and were becoming as dancers and as science students.

The students' explicit choice to utilize majorette to represent who they saw themselves becoming in physics communicates salient conceptions relating to their identity construction and positioning in physics. When given a choice, members of the Dance Club preferred to learn and perform majorette dances more often than not. Actually, their insistent plea for a school-based majorette team was the sole reason I had agreed to convert the externally sponsored, non-school affiliated, informal, dance club into a formally affiliated and sponsored school-based club. Their decision to represent these positive 'insiders' aspects of their experiences in physics class via majorette was explicitly linked to the positive and affirming dancer space they sought for themselves through their request for the Dance Club. In creating a place where they could come together in solidarity through dance, they created a space where they could construct, narrate,

and portray who they were becoming in science in their authentic and chosen form of expression as Black students and dancers.

In her individual ethnodance Jasmine used majorette, a “powerful dance,” to convey the joyous space her agentic choice cultivated for her in science (see section 4.6 for excerpt). In doing so, she associated positive and affirming moments in her narrative with a dance genre that she enjoyed as a dancer.

Chappell: Okay, is there anything else you feel like you would want us to know about what the dance meant? Oh, I have a question. What style of dance did you use and why did you choose that style of dance?

Jasmine: I chose majorette...because majorette is // that’s like a powerful dance. You got flips, death-drops, kicks, splits and...well I love majorette. It’s what I like to do, so that’s why I picked it.

Chappell: Um, what about majorette, do you love...why do you like majorette over other dance genres?

Jasmine: Well, I just really got introduced to majorette, but, um I like it because it works out your whole body actually. ~So, you stay fit while you’re doing the dance...

Chappell: So other than the active part, is there any other thing about majorette that speaks to you differently than how, um, what’s another style of #dance that you# |

Jasmine: #Um I wanna# say it’s more fun. Its more exciting.

Jasmine created a space where she could freely be herself as a Black female dancer away from the constraints of mainstream dance (Gittens, 2012) through majorette, a fun and exciting dance genre she loved. Consistent with decisions and explicit choices made by Black choreographers throughout history, Jasmine chose to tell her story through her body and in her own voice, which in this case was majorette. Thus, majorette was more than a dance genre for her. Majorette became a vehicle to stand in solidarity with past and present Black dancers as she authored who she was becoming in dance and in physics.

Devon used majorette to represent her well-built affirmed science self (Figure 25). She is the only participant who maintained a teacher and peer recognized and affirmed identity and a doer, knower, and liker of science throughout her experiences in high school science. In the Dance Club, she was more willing to learn and perform various genres of dance than other members. But when given the choice to represent her joyful and positive science experiences and science identity, she chose majorette. Choosing majorette to narrate her experiences in science and author her science identity, she stood in solidarity with her Dance Club members as dancers and Black students. She too made a conscious decision to move away from Eurocentric dance and cultivate a space where she could be who she was becoming as a Black dancer and science student through majorette.

Figure 25

Expansion of Devon's "Well-Built" for Science



Lawson used contemporary dance to narrate his agony and inner wrestling in the beginning, but embedded voguing into majorette to convey the emergence of his confident “this is me” towards the end of high school (Figure 26). In merging voguing with majorette, Lawson represented who he was becoming as a Black gay male, a dancer, and a student in science. As he became more confident with himself expressing who he was as a person, he chose to narrate this

transition with majorette and voguing. This deliberate choice positioned ethnodance as a critical tool for him to construct his intersecting identities in unbounded and liberating ways.

Figure 26

Lawson's "This is Me"



For Black students with developed dancer identities, ethnodance was a critical tool for them to author who they were becoming in science and build a sense of solidarity with each other through dance. Consistent with the spirit of Black Dance, their ethnodances created a space for them to unapologetically be their complete expressive selves outside of imposed Eurocentric dance discourses. Furthermore, their identities as Black youth were inextricably woven with their identities as dancers and science students. Thus, representing who they were becoming in science through Black Dance allowed themselves and their audience.

5. DISCUSSION

This study explored the affordance of ethnodance as a tool for Black students, for whom dance is a part of life and school, to make sense of their experiences in science classes and construct and narrate their science identities. I focused on identity stories of Black students as it pertained to science, a subject where they have been historically positioned as struggling, uninterested, deficient, and behind other racial groups in the US society. Analysis of the findings revealed that ethnodance offered Black youth with dance identities a medium to recount their evolving science identities, communicate salient interactional and affective dimensions of their identities (Owens et al., 2010) such as teacher-student interactions and emotions, and further construct them as reified artifacts (Rose, 2016) of their engagement in science classroom communities (Wenger, 1998).

5.1 Conclusions

The whole human body is intricately involved in how we interpret the world because learning is an embodied activity (Merleau-Ponty, 2002). Since identity construction is a vital part of learning in any subject, embodied representations of emotions, interactions, and meanings, which are integral to identity construction and were sanctioned by the ethnodance, need to be earnestly pursued and considered. Varelas and colleagues have argued that learning should be viewed as both identity construction and content learning in all subject areas, including science, and that explicit attention should be given to knowledge production and identity production in science teaching (Varelas et al., 2012; Varelas et al., 2015; Varelas, 2018). The present study further supports and extends such an argument and highlights an example of an arts-based approach, namely the ethnodance, which provided students a medium to explicitly engage with identity production in a manner that was meaningful to them. The development of these identity

artifacts allowed students to explore and weave together meanings of who they were and were becoming in science while elevating the value and significance and of the representational medium the young people chose to embrace. Thus, the current study documented how this arts-based artifact extended and expanded the linguistic narratives that the Black youth were crafting about who they were and were becoming in science spaces.

More specifically, rewatching their ethnodance created spaces of exploration and places of belonging (Varelas, 2018) for the students to continually (re)construct their experience within science, which shaped how they saw themselves in science. For Lawson, who he was in and out of school as a young gay male was central to who he was in all his classes including science. As a result, the planned part of his ethnodance embodied experiences and interactions with others that had shaped how he was seeing himself within the context of school. Reflection and rewatching the video artifact of his ethnodance allowed him to tease out and narrate aspects of his science identity that were woven together with his dancer and student identities. Therefore, the ethnodance stood as a space for him to explore his science self as embedded within his dancer self and to also feel at ease, having a sense of homey-ness and belonging. Removing his vest so that he could move freely as a dancer was also for him removing fear and worries that hindered him to be who he wanted to be in school and science.

The students' purposeful selection of various genres of dance and moves to illustrate different positionings and experiences in science revealed the aspects of their stories that they deemed salient and necessary to share. Through ethnodance, they investigated the 'in-between-ness' of their lives producing stories they wanted to share regarding their science identity authoring. Thus, ethnodance offered them space to make sense of the narrative they were constructing about themselves as science people and convey those meanings to others.

Dance identities provided an avenue for students to express / narrate their experiences in ways that was often difficult to do in other modes of communication. As a critical identity construction and communication tool, the ethnodance leveraged the intersectionality of students' identities (dancer and science student) to provide significant insight into the ways in which experiences shaped the students' science identities. Being able to construct and narrate their science identities via a dance performance in their chosen genre of dance was a liberating and authentic method of expression (Delgado, 1980), which was often hindered in written or oral language even when reflecting on the video artifact of the ethnodance as in Devon's case. Devon's struggle to transduce the meaning of choreography into oral language illustrated that the ethnodance was not a buttress to written or oral language. While she sometimes used oral language to convey the meanings she assigned to specific moves during the oral conversation, there were moments when the dance stood as representations of her science self that she could not fully or partially put into words. Thus, ethnodance provided the semiotic resources (Kress, 2001) she needed to fully construct and narrate who she saw herself being and becoming in science to both herself and others.

As a critical aspect of how these young people interact with and interpret the world, dance had to be a part of how they storied their science identities. Without the ethnodances, a vital part of who they were would have been missing from their narratives because being a dancer was such an inextricable part of who they were inside and outside of school. Ethnodance offered the students with dance backgrounds a mode to narrate via communicating emotions, interactions, and meanings their evolving science identities, and construct them further as reified artifacts of their experiences in school, and specifically science (Wenger, 1998). Thus, ethnodance was a unique tool to study students' identity construction in more unbounded and

liberatory ways consistent with the spirit of Black dances, more fruitfully supporting and exploring Black youth's science identity authoring.

As “one of the central mediators of our identities, or ways of being in the world” (Maulucci, 2012, p. 125), the youth's emotions were a significant part of their interpretation of their ethnodance and meaning making process through the ethnodance. As Maulucci (2012) noted, emotions “include cognitions, bodily responses, and actions” (p. 124), and the ethnodance seemed to allow students to engage in all three—their bodies performed moves that allowed them to feel what the interactions, positionings, experiences, and knowledge construction meant for them in their science classes, while their reflection on their video and photo artifacts allowed them a medium to make sense of themselves and express to others the emotionality of one's agentic self and the emotions felt when being agentic. They selected slow-tempo melodies coupled with lyric or contemporary dance moves to showcase challenging or frustrating experiences. They chose upbeat, fast-tempo songs or dance mashups coupled with hip-hop and majorette dance moves were used to establish moments of triumph and perseverance. This allowed the young people to portray the emotionality of their narratives, evoking deeper feelings regarding their experiences in science classes “that oppressed voices could not” (Gittens, 2012, p. 51).

Similarly, students' facial expression illustrated their emotional state of their experiences. As the emotionality of their experiences shifted, student's facial expressions shifted throughout their dance performances. Frustrating and challenging moments were filled with confused gazes, stoic faces, and frowns, while affirming and joyful moments of triumph were filled with a variety of smiles and smirks. As one of the more facially expressive members of the Dance Club, Tiffany's periods of frustration were represented with deep frowns and eye squints, a sharp contrast to her

tongue being stuck out and the open-mouth smiles showcased throughout her moments of triumph.

In addition, signature dance moves represented the emotional mood of persevering. The young people embedded their Dance-Club-recognized signature moves into their ethnodance to represent overcoming challenges to become who they wanted to be in school and science. Jasmine had one of the most challenging signature moves to execute amongst members of the Dance Club, her low-ground-graze-buck move, which she used to represent her persistence, resilience, determination, and the hard work she dedicated to achieving her goal in physics. As an essential part in their learning, their whole body was involved in understanding (Merleau-Ponty, 2002), as they were processing and making-sense of their experiences in science. The ethnodance provided the students a modal ensemble to convey who they were becoming as science students and to narrate their science identities beyond written and oral language. As all representation involves development and construction of new understandings, by expanding representational capacity, the ethnodance engaged students in developing and expressing expanded understandings of their science identities. As a multimodal example of what Bamberg and Georgakopoulou (2008) called small stories, the ethnodance provided students an avenue to construct a sense of who they were as people in relation to certain roles, interactive practices, and contexts, capturing identity as an ever-evolving process.

Furthermore, the ethnodance allowed students to author their science identity in ways that were inextricably woven with their other identities—dancer, student, friend, and peer identities. This provided a window into experiences in science that challenged, contested, nuanced, affirmed, or acknowledged their position in science. Their ethnodance allowed students to go beyond the boundaries of language to author their science identity in ways that highlighted the

impact of institutional structures, peer and family interactions, and agency. The students' interpretation of their ethnodances illustrated aspects of the structure-agency dialectic in more unbounded ways that revealed their ability to overcome barriers that challenged their insider science position or walk away from science, coupled with the feelings associated with being agentic. Structures that exist in, and define, the science spaces where the students were learning, and their agency to identify and push against or maneuver around these structures, transforming or maintaining them, were integral aspects of their identity construction process (Varelas et al., 2015).

Jasmine's commitment and effort to rise above the struggle, interwoven with her competence in physics, was constructed, de-constructed, and re-constructed. As she began to ask for and receive additional support, her competence to engage in physics evolved. Her agency allowed her to overcome the challenges she had faced with the more mathematical configurations of ideas and accomplish her goals. Fara's teacher-recognized competency in physics was affirmed, re-constructed, contested, and de-constructed. Overcoming the math-heavy nature of the course to be successful in physics affirmed her knower position in physics and re-constructed her science identity. However, her agentic decision to walk away from the stress, pressure, and low scores she experienced in AP physics contested her competence to persist in physics and reconstructed her science self. The chairs she stood on in her ethnodance stood as a concealed representation of the structures she faced in AP physics. As she pushed the chairs apart with her feet, she pushed against the pressures and expectations of others to decide the best path for her. Tiffany's ability to transform her experience in science through choice re-constructed her science identity that was de-constructed by the structural decisions regarding her science course sequence. The ethnodance offered the students an opportunity to convey the

emotions coupled with their agentic ability to intervene in their experiences in science and to narrate the often-hidden power structures (Strong et al., 2016) in science and especially physics that maintain oppressive experiences for Black youth (Mutegi, 2011) and limit or restrict insider access and engagement. Thus, the ethnodance was an embodied duet of the dialectic relationship between structure and agency present in students' narratives. Through their ethnodances, they authored who they were becoming in science and the structures that hindered or challenged their position as well as the supports that allowed them to overcome and persist in science. Thus, ethnodance is a noteworthy tool to study students' science identity construction intertwined with the emotions and actions of agentic transformation against structures that maintain exclusionary science spaces from the students' perspective.

Dance genres aligned with the students' perceptions and emotions associated with multiple facets of identity construction and de-construction experienced during science classes. The various dance genres that the students chose for their ethnodances revealed the interaction of several identities—their science identities, their dance identities influenced by what they were learning in their Dance Club, and their racial identities of who they were as Black people. The Black youth in the study unapologetically utilized Black dances to communicate their sense of pride and affirming experiences and affiliation with what they were learning and doing in their science classes. As a “unified cultural aesthetic” (Amin, 2011, p. 9), Black Dance (majorette and hip-hop) provided an avenue for these Black dancers to maneuver around the boundaries of mainstream dance, and portray their story, similarly to how they navigated the boundaries and constraints of science to take up active membership. Through Black Dance, they opened up modes of cultural expression that are often invisible (Sutherland, 2019).

Majorette illuminated the bonding that students felt with each other as they performed collectively and individually using this genre of Black Dance to perform their moments of joy, accomplishments, and periods of perseverance. This bonding is evident in the intensity of Tiffany, Jasmine, and Fara's movement during a segment of their collective performance. The students' dance shifted from a "survival mechanism... [to a] ...network and source of...solidarity and support" (Maulucci, 2012, p. 132) through majorette. Majorette appeared to provide the students a sense of cultural solidarity, a solidarity that is also a symbolic representation of their collective overcoming of the obstacles they encountered, and the alienation and frustration they initially felt in the physics class. Their collective motivation and dedication to overcome the challenges were interconnected with the ways in which their competence in physics was constructed, deconstructed, and reconstructed. As students engaged in doing projects and experiments, which were their favorite aspects of science, they saw their competence to engage in science shift back to the place they were in their biology classes. This shift in competency boosted their confidence and belief in their ability to overcome the challenges they encountered regarding the more mathematical configurations of concepts for which they were not prepared given that they had not taken chemistry. Similarly, the students' individual agency and resilience to persevere through challenges was linked with how their competence in science was evolving. As they advocated for themselves, sought teacher support or resisted the worries of others' opinions of them, their competence to engage in science evolved. Their love for and competence in majorette powered the energy of their collective and individual dance performances and, together with contemporary, lyrical, and ballet dances, captured the ways in which their positioning in science classes ebbed and flowed with contextual factors and experiences.

The expressions and body movements that the young people incorporated into their dance performances captured noticeably more than preset meanings of who they were and were becoming in science, similarly to what Leander and Boldt (2012) noted about literacy research and youth identities. The students' dance performances represented the predefined ideas related to their science identity construction and also served as construction sites "where affect, imagination, passion, and energy are constantly being produced...opening toward new possibilities that cannot be determined in advance" (Leander & Boldt, 2012, p. 32). Thus, ethnodance allowed students a method of expressivity to construct the predetermined story they wanted to tell about their experiences in science and the one they were authoring in the process of their narrations and reflections.

5.2 Methodological Limitations and Affordances of Ethnodance

Arts-based and narrative-inquiry methodological approaches to research were used to draw the conclusions outlined above. Students' ideas and positioning in science were made visible through Halliday's metafunctions (Halliday, 1978). As a form of artistic expression and representation, their ethnodance, with all its features and their relations, stood as the textual aspects of my analysis. The semiotic resources available to students in their dance performance provided a window into their ideas about how experiences and interactions in science shaped their science identity. If we consider the forms of thinking and representing facilitated by artistic media, such as dance, essential for people's understanding of the world (Barone & Eisner, 2012), and, thus, in my case, making sense of experiences in science, then the dance itself needs to be analyzed to understand and interpret aspects of students' identity construction embedded in this embodied representation. As alluded by the prefix "ethno," an ethnodance captures and performs experiences that constitute the essence of practices and stories that people construct about life in

interaction with others and is integrally intertwined with an ethnographic approach to research, similarly to what Saldaña (2005) argued about ethnodrama. Ethnographic practices necessitate spending time immersed with participants in their own worlds and an in-depth understanding of the culture, context, norms, and semiotic resources available in these settings. In the case of an ethnodance, in order to understand the meanings embedded in a dance move or tempo of a song, one needs to be able to identify and classify the dance move as well as determine when and how the observed dancer typically uses that move or genre of dance to “speak” with their body.

For the Black students who crafted ethnodances of their science identities in this study, dance was an integral part of their lives. They were members of their school Dance Club, which, although provided them opportunities to study various dances, mainly focused on the majorette genre that the Black students identified with the most. Additionally, I was both a science and a dance teacher, who shared the same racial identity, with students, and had an understanding of dance and particularly Black dances. These are vital components of the study that granted me an opportunity to develop an empirical illustration of how Black students with dancer identities used the resources available in a dance performance to construct their science identity. The fact that the students and I were insiders of the various communities, which were central to this exploration, not only enhanced the trustworthiness of the interpretations but was rather essential in noticing the ways in which dance granted space for representing science identities.

Even though such arrangements are needed to continue developing the impact and value of ethnodance as a tool for educational research, expanding the use of ethnodance with students who may not be dancers but are willing to try expressing themselves through dance can foster a deeper understanding of how accepting and valuing art-based practices and embodied performances offer pathways to meaningful engagement with science identities. Even though

ethnodance as an arts-based identity narrative does not exclusively belong to people who are already members of the dance community, researchers and participants will need to spend time immersed in the practice and discourse of dance (McFee, 2003) in order to collaboratively negotiate the meaning of ethnodance as a medium for supporting and capturing identity authoring and construction. In other words, participants and researchers will need time to learn different genres of dance and the semiotic tools for meaning making available in a dance.

This time and practice will provide space for them to come to know and appreciate the affordances of dance. Like the participants in this study, they can come to know the power that dance as a mode of communication has to express meanings and transduce the emotionality of experiences in liberating and authentic ways that words cannot fully capture. Art, such as dance, forces people to think, feel, and express the human condition. Thus, dancers and others who might come to use dance can construct their identities through ethnodance in ways that cannot be described in other modalities.

5.3 Implications for Science Education Research

Identity studies in science education that focus on narrated rather than performed contexts tend to be more text-centric (considering texts as both written and oral accounts of past, present, or future ideas to which the author commits). Artistic performances, including dance performances and their visual imagery, have a different potential: capturing identity construction in emergent ways with an “ongoing flow of affective intensities that are different from the rational control of meanings and forms” (Leander & Boldt, 2012, p. 36). Thus, to build on the findings and conclusions of this study, future research should continue to explore the ways in

which ethnodance can capture, narrate, convey, extend, and expand students' science selves for those with and without dancer identities.

Such studies could explore the intricacies of dance as a medium of expressivity for authoring one's science identity for students with beginning, emerging, and developed dancer identities. Who can use this tool and how? In what ways can ethnodance be a meaningful tool for science students who are not dancers? Exploring the ethnographic nature of ethnodance, future research could compare and contrast students' evolving narratives regarding their experiences in science as researchers and students build their dance repertoire together. What expertise is needed by the researchers and the students without dancer identities to use ethnodance to study one's science identity construction? How does exposure to different genres of dance impact students' embodied narratives of their science selves? How can researchers work in collaboration with dance teachers and science teachers to explore students' science identity construction? Studies guided by these types of research questions could explore the affordances that are offered to students to construct and narrate their science identity, and to researchers to interpret and analyze students' science identity construction process as they collectively learn the semiotic resources available in the artistic form of dance.

Future research could also explore the expansion of ethnodance as a tool for teaching and learning science. Is ethnodance merely a research tool, or does it offer possibilities for uses in the teaching of science? How can ethnodance be used to teaching science concepts in ways that acknowledge and embrace students' culture and methods of expressivity while resist patronizing actions and culture appropriation? How can the orchestration of a dance performance convey science content learning along with science identity construction? How can ethnodance facilitate both science knowledge and science identity production, which involves both re-production and

transformation? These types of studies can expand the potential of ethnodance as a teaching and learning in science education while actively resisting the ways that Black, Indigenous, and other young people of color have been “misrepresented, exploited, silenced, and taken for granted in education research” (Milner, 2007, p. 1).

5.4 Implications for Science Education Practice

Ethnodance could potentially serve as a teaching tool given its potential to emerge Black students in intricate reflections on their interactions with science and engagement in science classes, as well as creating a space for themselves in challenging classes, such as physics, and strengthening their sense of belonging in such classes. In alignment with Darder and Cronin’s (2018) critical pedagogy of dance, the ethnodance is a site where “the dance becomes a shared space of cultural release and expression of one’s individual and collective being, connected to all those who have danced before us and all those who will dance in the future” and where knowledge created by “decolonizing dance pedagogy...can function as important forms of both resistance against and healing from cultural oppression” (pp. 33-34). Emerging students in systematic and periodic attention on science identity construction in their science courses by supporting their orchestration and performance of an ethnodance would offer both students who are and who are not dancers’ space to utilize the movement of their bodies to process how they see themselves being and becoming in science classes and alter such conceptions along the way.

Using their own cultural ways of being to make sense of their evolving identities frees students up to express themselves as they see fit, thereby cultivating space for them to see themselves as legitimate participating members of science communities, noticing how their practices align with those of the community or identify and work on misaligned areas, and envision their future selves doing science in the form that appeals to them (Varelas, Martin et al,

2012; Wenger, 1998). Hence, encouraging and allowing students to make sense of who they are and are becoming in science spaces via their preferred arts-based ways, regardless of their teachers' perception and appreciation of these ways, may be valuable towards students' science learning, expansively defined as both content learning and identity construction.

The production of tangible and meaningful artifacts allows young people to center their identities as objects of inquiry and reflection. For Black youth in the US who have been historically and presently positioned by others as struggling science students, and for whom science is often an exclusionary space, carrying out such identity exploration in the space where they do and learn science conveys to them that their construction of who they are as Black people doing science is desirable and essential. Intentionally reflecting on synthesizing, analyzing, and pondering on who they are and are becoming pertaining to science could prompt them to craft their voices in ways that may force others to stop, pause, and question settled expectations, which could further provide others with an opportunity to consider Black youth as the competent, brilliant, creative, and expressive people they are, people who seek to cultivate their own niches in science spaces.

Freire (1970), over five decades ago, wrote about liberation being a *praxis* defined by the dialectical relationship of reflection and action. Science classrooms need to be spaces where young people engage in the praxis of identity construction. In other words, they need to be (a) authoring identities while experiencing science and science education, which occurs by default as they engage in the learning of science content, and (b) reflecting on this authoring by crafting modal ensembles that interrogate and express that authoring. In this way, they will be not only allowed but also supported in working toward liberation, thereby freeing themselves from the narratives of underperformance, deficiency, and despair, and crafting ways to transform their real

world lived experience and the world. For many Black youth, this is gravely outstanding (Jackson & Howard, 2014). The present study proposes that research focused on exploring one approach to the attainment of such a space in science classrooms is a worthwhile pursuit.

CITED LITERATURE

- Aikenhead, G.S. (2006). *Science education for everyday life: Evidence-based practice*. Teachers College Press.
- Amin, T (2011). A Terminology of difference: making the case for Black dance in the 21st century and beyond. *The Journal of Pan African Studies.*, 4(6), 7-15.
- Archer, L., Dawson, E., DeWitt, J., Godec, S., King, H., Mau, A., Nomikou, E., & Seakins, A. (2017). Killing curiosity? An analysis of celebrated identity performances among teachers and students in nine London secondary science classrooms. *Science Education*, 101(5), 741-764.
- Archer, M. S. (2004). Emotions as commentaries on human concerns. In J.H. Turner (Ed.), *Theory and research on human emotions—Advances in Group Processes* (pp. 327-356). Bingley.
- ATLAS.ti (PC). Version 8.3. [Computer software] (2016) Scientific Software.
- Avraamidou, L. (Ed.). (2016). *Studying science teacher identity: Theoretical, methodological and empirical explorations*. Sense Publishers.
- Bakhtin, M.M. (1981). Forms of time and chronotope in the novel. In M. Holquist (Ed.), *The dialogic imagination: Four essays by M.M. Bakhtin* (C. Emerson & M. Holquist, Trans.). University of Texas Press.
- Bakare-Yusuf, B. (2005). 'I love myself when I am dancing and carrying on': Refiguring the agency of black women's creative expression in Jamaican dancehall culture. *International Journal of Media & Cultural Politics*, 1(3), 263-276.
- Bamberg, M. & Georgakopoulou, A. (2008). Small stories as a new perspective in narrative and identity analysis. *Text and Talk*, 28(3), 377-396.
- Barone, T., & Eisner, E., (2012) *Arts based research*. Sage Publications.
- Bezemer, J., & Kress, G. (2008). Writing in multimodal texts: A social semiotic account of designs for learning. *Written Communication*, 25, 166-195.
- Bochner, A.P., & Ellis, C. (2003). An introduction to the arts and narrative research: Art as inquiry. *Qualitative Inquiry*, 9, 506-514.
- Bragin, N. (2014). Shot and captured: Turf dance, YAK films, and the Oakland, California, R.I.P. project. *The Drama Review (1988-)*, 58(2), 99-114.

- Bredo, E. & Feinberg, W. (1982). The positivist approach to social and educational research. In E. Bredo, & W. Feinberg, *Knowledge and values in social and educational research* (pp. 13-27). Temple University Press.
- Brown, B.A., Parsons, E., Miles, R., & Henderson, J.B. (2013). Exploring the alignment of Black scientists with the American scientific community: Does race still matter? *Journal of Women and Minorities in Science and Engineering*, 19(2), 95-120.
- Bruna, K.R., & Vann, R. (2007). On pigs and packers: Radically contextualizing a practice of science with Mexican immigrant students. *Cultural Studies of Science Education*, 2, 19-59.
- Bruner, J. (1986). *Actual minds, possible worlds*. Harvard University Press.
- Burchinal, M., McCartney, K., Steinberg, L., Crosnoe, R., Friedman, S. L., McLoyd, V., Pianta, R., & NICHD Early Child Care Research Network (2011). Examining the Black-White achievement gap among low-income children using the NICHD study of early child care and youth development. *Child Development*, 82(5), 1404-1420.
- Butler-Kisber, L. (2010). Narrative inquiry. *Qualitative inquiry: Thematic, narrative and arts-based perspectives* (2nd ed.), (pp. 62-81). Sage Publications.
- Calabrese Barton, A., & Tan, E. (2010). We be burnin'! Agency, identity, and science learning. *Journal of the Learning Sciences*, 19, 187-229.
- Calabrese Barton, A., Tan, E., & Rivet, A. (2008). Creating hybrid spaces for engaging school science among urban middle school girls. *American Educational Research Journal*, 45, 68-103.
- Calabrese-Barton, A., Kang, H., Tan, E., O'Neill, T.B., Bautista-Guerra, J., & Brecklin, C. (2013). Crafting a future in science: Tracing middle school girls' identity work over time and space. *American Educational Research Journal*, 50(1), 37-75.
- Carlone, H.B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching*, 44, 1187-1218.
- Carlone, H.B., Johnson, A., & Scott, C. (2015). Agency amidst formidable structures: how girls perform gender in science class. *Journal of Research in Science Teaching*, 52, 474-488.
- Carr, W., & Kemmis, S. (1990). *Becoming critical: education, knowledge and action research*. The Falmer Press.
- Carter, L., (2004). Thinking about cultural diversity Using postcolonial theory to (re)read science education. *Science Education*, 88(6)819-836.

- Chappell, M.J., & Varelas, M. (2020). Ethnodance and identity: Black students representing science identities in the making. *Science Education*, 104(2)193-221.
- Chase, S.E. (2005). Narrative inquiry: Multiple lenses, approaches, voices. In Denzin N.K., & Lincoln Y. S. (Eds.), *The Sage handbook of qualitative research*. (3rd ed.), (pp. 651-679). SAGE Publications.
- Childers, G., & Jones, M.G. (2017). Learning from a distance: High school students' perceptions of virtual presence, motivation, and science identity during a remote microscopy investigation. *International Journal of Science Education*, 39(3), 257-273.
- Clandinin, D.J., (2013). Engaging on narrative inquiry. Left Coast Press.
- Clandinin, D.J., & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research*. Jossey-Bass.
- Clark, J. V. (2014). *Closing the Achievement Gap from an International Perspective Transforming STEM for Effective Education* (1st ed.). Springer.
- Clough, P., Nutbrown, C. (2019). Exploring the place of arts-based approaches in early childhood education in research. *Journal of Early Childhood Research*, 17(1), 3-13.
- Cobb, C. (2008). "Organizing freedom schools." In C. Payne, & C. Strickland (Eds). *Teach freedom*. Teachers College Press.
- Conquergood, D. (1998). Beyond the text: Toward a performative cultural politics. In S. J. Dailey (Ed.), *The future of performance studies: Visions and revisions* (pp. 25-36). National Communication Association.
- Cotê, J.E., & Levine, C.G. (2002). *Identity formation, agency, and culture: A social psychological synthesis*. Erlbaum.
- Craighead, C. (2006). Black dance': Navigating the politics of 'black' in relation to 'the dance object' and the body as discourse. *Critical Arts*, 20(2), 16-33.
- Creswell, J.W. & Poth, N.C. (2018) *Qualitative inquiry & research design: Choosing among five approaches*. (4th ed.). SAGE Publications.
- Culshaw, S. (2019). The unspoken power of collage? Using an innovative arts-based research method to explore the experience of struggling as a teacher. *London Review of Education*, 17(3), 268-283.
- Daiute, C. (2014). The appeal of narrative research. In *Narrative Inquiry* (pp. 1-30). SAGE Publications.

- Daniel, Y. (1991). Changing values in Cuban Rumba, A lower class Black dance appropriated by the Cuban revolution. *Dance Research Journal*, 23(2), 1-10.
- Darder, A., & Cronin, S. (2018). A critical bicultural pedagogy of dance: Embodying cultural literacy. *Revista Portuguesa de Educação*, 31, 26-41.
- Deleuze, G., & Guattari, F. (1987). *A thousand plateaus: Capitalism and schizophrenia* (B. Massumi, Trans.). University of Minnesota Press.
- Delgado, R. (1989). Storytelling for oppositionists and others: A plea for narrative. *Michigan Law Review*, 87, 2411-2441.
- DeFrantz, T.F. (2016). Bone-breaking, Black social dance, and queer corporeal orature. *The Black Scholar*, 46(1), 66-74.
- Denzin, N.K. (1997). *Interpretive ethnography: Ethnographic practices for the 21st century*. SAGE Publications.
- Denzin, N.K. (2003a). *Performance ethnography: Critical pedagogy and the politics of culture*. SAGE Publications.
- Denzin, N.K. (2003b). The call to performance. *Symbolic Interaction*, 26(1), 187–207.
- Duncan-Andrade, J., and E. Morrell. 2008. *The Art of Critical Pedagogy: Possibilities for Moving from theory to practice in urban schools*. Peter Lang.
- Durden, M. (Director). (2009). History and concept of hip - hop dance: the street culture that became a global expression (video edition). *Dancetime Publications*. Retrieved from Dance Online: Dance in Video, Volume I database.
- Durden, E.M. (2019) *Beginning Hip-Hop Dance*. Human Kinetics.
- Emdin, C. (2011). Moving beyond the boat without a paddle: Reality pedagogy, Black youth, and urban science education. *The Journal of Negro Education*, 80(3), 284-295.
- Fierros, E. (2009). Using performance ethnography to confront issues of privilege, race, and institutional racism: an account of an arts-based teacher education project. *Journal of Multicultural Perspectives*, 11(1), 3-11.
- Freire, P. (1970). *Pedagogy of the oppressed*. Continuum.
- Gittens, A.F. (2012). Black dance and the fight for flight: Sabar and the transformation and cultural significance of dance from West Africa to Black America (1960-2010). *Journal of Black Studies*, 43(1), 49-71.

- Gottschild, B.D. (2003). *The Black dancing body: A geography from coon to cool*. Palgrave Macmillan.
- Gouzouasis, P., Irwin, R.L., Miles, E., & Gordon, A., (2013). Commitments of communities to artistic inquiry: becoming pedagogical through a/r/tography in teacher education, *International Journal of Education and the Arts*, 14(1), 1-23.
- Gresalfi, M., Martin, T., Hand, V., & Greeno, J.G. (2008). Constructing competence: an analysis of student participation in the activity systems of mathematics classrooms. *Educational Studies in Mathematics*, 70(1), 49-70.
- Gutierrez, K., & Calabrese Barton, A. (2015). The possibilities and limits of the structure - agency dialectic in advancing science for all. *Journal of Research in Science Teaching*, 52, 574-583.
- Hall, S. (Ed.). (1997). *Culture, media and identities. Representation: Cultural representations and signifying practices*. SAGE Publications: Open University Press.
- Halliday, M.A.K. (1978). *Language as social semiotic: The social interpretation of language and meaning*. Edward Arnold.
- Leavy, P. (Ed). (2017). *Handbook of arts-based research*. Guilford Publications.
- Hannigan, S., Raphael, J., White, P., Bragg, L.A., & Clark, J.C. (2016). Collaborative reflective experience and practice in education explored through self-study and arts-based research. *Creative Approaches to Research*, 9(1), 84-110.
- Hannigan, S. (2014). *Narrative inquiry and auto-ethnography: Interpretive approaches to research*. SAGE Research Methods Cases.
- Harrop, P. & Njaradi, D. (Eds.). (2013). *Performance and ethnography: Dance, drama, music*. Cambridge Scholars Pub.
- Holland, D., Lachicotte, W., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds*. Harvard University Press.
- Holstein, J.A., & Gubrium, J.F. (2000). *The self we live by: Narrative identity in a postmodern world*. Oxford University Press.
- hooks, b. (2000). *Feminist theory: From margin to center* (2nd ed.). Pluto.
- Hope, E.C., Skoog, A.B., & Jagers, R.J. (2014). "It'll never be the White kids, it'll always be us": Black high school students' evolving critical analysis of racial discrimination and inequity in schools. *Journal of Adolescent Research*, 1-30.
- Howard, Tyrone C. (Tyrone Caldwell). (2010). *Why race and culture matter in schools: closing*

- the achievement gap in America's classrooms*. Teachers College Press.
- Howard, T.C., (2016). Why Black lives (and minds) matter: Race, freedom schools & the quest for educational equity. *Journal of Negro Education*, 85(2), 101-113.
- Jackson, T.O., & Howard, T.C. (2014). The continuing legacy of freedom schools as sites of possibility for equity and social justice for black students. *Western Journal of Black Studies*, 38(3), 155–162.
- Jensen, E. (2009). *Teaching with poverty in mind: What being poor does to kids' brains and what schools can do about it*. Association for Supervision and Curriculum Development (ASCD).
- Jewitt, C. (Ed.). (2009a). *The Routledge handbook of multimodal analysis*. Routledge.
- Jewitt, C. (Ed.). (2009b). An introduction to multimodality. In *The Routledge handbook of multimodal analysis* (pp.14–27). Routledge.
- Kane, J.M. (2012). Young African American children constructing academic and disciplinary identities in an urban science classroom. *Science Education*, 96, 457-487.
- Kane, J.M. (2016). Young African American boys narrating identities in science. *Journal of Research in Science Teaching*, 53, 95-118.
- King, N.S., & Pringle, R.M. (2019). Black girls speak STEM: Counterstories of informal and formal learning experiences. *Journal of Research in Science Teaching*, 56(5), 539-569.
- Kress, G. (2009). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.
- Kress, G., Jewitt, C., Ogborn, J. & Tsatsarelis, C. (Eds.). (2001). *Multimodal teaching and learning: The rhetorics of the science classroom*. Continuum.
- Kress, G., & vanLeeuwen, T.J. (2006). *Reading images: The grammar of visual design*. Routledge.
- Ladson-Billings, G.J., & Tate, W.F. (1995). Toward a critical race theory of education. *Teachers College Record*, 97(1), 47-68.
- Latz, A.O. (2017). *PhotoVoice research in education and beyond: A practical guide from theory to exhibition*. Routledge.
- Leander, K., & Boldt, G. (2012). Rereading “A pedagogy of multiliteracies”: Bodies, texts, and emergence. *Journal of Literacy Research*, 45(1), 22-46.
- Leavy, P. (2009). *Method meets art: Arts-based research practice*. Guilford Publications.

- Leavy, P. (Ed.). (2017). *Handbook of arts-based research*. Guilford Publications.
- Lee, Y.J. (2012). Identity-based research in science education. In B. J. Fraser, K. Tobin & C. McRobbie (Eds.), *Second international handbook of science education* (pp. 35-45). Springer.
- Lewis, A., & Diamond, J.B. (2015). *Despite the best intentions: How racial inequality thrives in good schools*. Oxford University Press.
- Long, R. (1989). *The Black Tradition in American Dance*. Smithmark Publishers.
- Marshall, C., & Rossman, G.B. (2016). *Designing qualitative research* (6th Edition). SAGE Publications.
- Massumi, B. (2002). *Parables for the virtual: Movement, affect, sensation*. Duke University Press.
- Maulucci, M.S.R. (2012). Exploring linkages between identity and emotions in teaching for social justice in science teacher education. In M. Varelas (Ed.), *Identity construction and science education research: Learning, teaching, and being in multiple contexts* (pp. 123-139). Sense Publishers.
- McAdams, D.P., & McLean, K.C. (2013). Narrative Identity. *Current Directions in Psychological Science*, 22(3), 233-238.
- McFee, G. (2003). *Understanding dance*. Routledge.
- Mensah, F.M., & Fleshman, R. (2017). Drawings as identity data in elementary science teacher education. In P. Katz (Ed.), *Drawing for science education* (pp. 219-225). Sense Publishers.
- Merleau-Ponty, M. (2002). *Phenomenology of perception*. Routledge.
- Milner, H.R. (2007). Race, culture, and researcher positionality: working through dangers seen, unseen, and unforeseen. *Educational Researcher*, 36(7), 388-400.
- Moore-Clemons, K. (2014). I've got to do something for my people: Black woman teachers of the 1964 Mississippi Freedom Schools. *Western Journal of Black Studies*, 38(3), 141-154.
- Morales-Doyle, D., & Gutstein, E. 2019. Racial capitalism and STEM education in the Chicago Public Schools. *Race, Ethnicity, and Education*, 22, 525-544.
- Mutegi, J.W. (2011). The inadequacies of "science for all" and the necessity and nature of a

- socially transformative curriculum approach for African American science education. *Journal of Research in Science Teaching*, 48, 301-316.
- Nasir, N.S., & Shah, N. (2011). On defense: African American males making sense of racialized narratives in mathematics education. *Journal of African American Males in Education*, 2, 24-45.
- Ohmer, S. (2019). In the beginning was body language' clowning and krump as spiritual healing and resistance. *Evoke: A Historical, Theoretical, and Cultural Analysis of Africana Dance and Theatre*, 1, 15-30.
- Olitsky, S. (2007). Facilitating identity formation, group membership, and learning in science classrooms: What can be learned from out-of-field teaching in an urban school? *Science Education*, 91, 201-221.
- Owens, T.J., Robinson, D.T., & Smith-Lovin, L. (2010). Three faces of identity. *Annual Review of Sociology*, 36, 477-499.
- Parsons, E.C. (2008). Learning contexts, Black cultural ethos, and the science achievement of African American students in an urban middle school. *Journal of Research in Science Teaching*, 45, 665-683.
- Parsons, E.C., Simpson, J., & Cooper, J. (2009). Low status and positionality of African Americans: A critique of science education reform and research. In K. Tobin & W. -M. Roth (Eds.), *The world of science education: Handbook of research in North America* (pp. 331-351). Sense Publishers.
- Perillo, L.J. (2017). Embodying modernism. *Amerasia Journal*, 43(2), 122-140.
- Peshkin, A. (1993). The goodness of qualitative research. *Educational Researcher*, 22(2), 24-30.
- Pickard-Smith, K. (2018) Disordering mathematical identity in film parody 'Math Therapy.' *The Mathematics Enthusiast*, 15(1), 251-277.
- Porterfield, L.K. (2017). (Re)Seeing Black girls: intersections of liberalism, difference, and the hidden curriculum. *Visual Studies*, 32(4), 301-312.
- Rahm, J., & Moore, J.C. (2016). A case study of long-term engagement and identity-in-practice: insights into the STEM pathways of four underrepresented youths. *Journal of Research in Science Teaching*, 53, 768-801.
- Rodriguez, A.J. (2015). What about a dimension of engagement, equity, and diversity practices? A critique of the next generation science standards. *Journal of Research in Science Teaching*, 52(7)1031-1051.

- Rolling, J.H. (2010). A paradigm analysis of arts-based research and implications for education. *Studies in Art Education*, 51(2), 102-114.
- Rose, G. (2016). *Visual Methodologies: An introduction to researching with visual materials* (4th edition). SAGE Publications.
- Roth, W.M. & Tobin, K. (Eds.). (2007). *Science, learning, and identity: Sociocultural and Cultural-historical perspectives*. Sense Publishers.
- Saldaña, J. (Ed.). (2005). *Ethnodrama: An anthology of reality theatre*. AltaMira Press.
- Saldaña, J. (2011). *Ethnotheatre: Research from page to stage*. Left Coast Press.
- Sfard, A., & Prusak, A. (2005). Telling identities: In search of an analytic tool for investigating learning as a culturally shaped activity. *Educational Researcher*, 34, 14-22.
- Smith, L. (2012). *Decolonizing methodologies: Research and indigenous peoples* (2nd edition). Zed Books.
- Smith, L. (1999). *Decolonizing methodologies: Research and indigenous peoples*. Zed Books.
- Sosa, F., & Poncin, M. (Director). (2015). Cosmic Ass (video edition). Retrieved from YouTube Online.
- Solorzano, D.G., & Yosso, T.J. (2001). Critical race and LatCrit theory and method: Counter - storytelling. *International Journal of Qualitative Studies in Education*, 14(4), 471-495.
- Springgay, S., Irwin, R.L., & Kind, S.W. (2005). A/r/tography as living inquiry through art and text. *Qualitative Inquiry*, 11, 897-912.
- Stanley, C.A. (2007). When counter narratives meet master narratives in the journal editorial-review process. *Educational Researcher*, 36(1), 14-24
- Stets, J., & Burke, P. (2000). Identity Theory and Social Identity Theory. *Social Psychology Quarterly*, 63(3), 224-237.
- Stets, J.E., & Burke, P.J. (2003). A sociological approach to self and identity. In M.R. Leary & J.P. Tangney (Eds.), *Handbook of self and identity* (pp. 128-152). Guilford Press.
- Stets, J.E., & Burke, P.J. (2014). The development of identity theory. *Advances in Group Processes*, 31, 57-97.
- Stevenson, A. (Ed.). (2010). *Oxford Dictionary of English*. Oxford University Press.
- Strong, L., Adams, J.D., Bellino, M.E., Pieroni, P., Stoops, J., & Das, A. (2016). Against

- neoliberal enclosure: Using a critical transdisciplinary approach in science teaching and learning. *Mind, Culture, and Activity*, 23(3), 225-236.
- Stryker, S. (1980). *Symbolic interactionism: A social structural version*. Benjamin-Cummings.
- Sullivan, G. (2010). *Art practice as research. Inquiry in visual arts*. SAGE Publications.
- Sutherland, T. (2019) Reading gesture: Katherine Dunham, the Dunham technique, and the vocabulary of dance as decolonizing archival praxis. *Archival Science*, 19, 167-183.
- Tan, E., & Calabrese Barton, A. (2008). Unpacking science for all through the lens of identities-in-practice: The stories of Amelia and Ginny. *Cultural Studies of Science Education*, 3, 43-71.
- Tan, E., Calabrese Barton, A., Kang, H., & O'Neill, T. (2013). Desiring a career in STEM - related fields: How middle school girls articulate and negotiate identities-in-practice in science. *Journal of Research in Science Teaching*, 50, 1143-1179.
- Tillman, L.C. (2002). Culturally sensitive research approaches: An African-American perspective. *Educational Researcher*, 31, 3-12.
- Toth, L. (2017). Praising twerk: Why aren't we all shaking our butt? *French Cultural Studies*, 28(3), 291-302.
- Tucker-Raymond, E., Varelas, M., Pappas, C.C., with Korzh, A., & Wentland, A. (2007). They probably aren't named Rachel: Young children's scientist identities as emergent multimodal narratives. *Cultural Studies of Science Education*, 1(3), 559-592.
- Varelas, M. (Ed.). (2012). *Identity construction and science education research: Learning, teaching, and being in multiple contexts*. Sense Publishers.
- Varelas, M. (2018). Dialectical relationships and how they shape (in)equitable science learning spaces and places. In L. Bryan & K. Tobin (Eds.), *13 questions: Reframing education's conversation: Science* (pp. 183-191). Peter Lang.
- Varelas, M., Kane, J.M., & Wylie, C.D. (2011). Young African American children's representations of self, science, and school: Making sense of difference. *Science Education*, 95, 824-851.
- Varelas, M., Kane, J.M., & Wylie, C.D. (2012). Young Black children and science: Chronotopes of narratives around their science journals. *Journal of Research in Science Teaching*, 49, 568-596.
- Varelas, M., Martin, D.B., & Kane, J.M. (2012). Content learning and identity construction: A framework to strengthen African American students' mathematics and science learning in urban elementary schools. *Human Development*, 55, 319-339.

- Varelas, M., Tucker-Raymond, E., & Richards, K. (2015). A structure-agency perspective on young children's engagement in school science: Carlos's performance and narrative: young children's engagement in school science. *Journal of Research in Science Teaching*, 52, 516-529.
- Vareles, M., Pappas, C.C., Tucker-Raymond, E., Kane, J., Hanks, J., Ortiz, I., & Keblawe-Shamah, N. (2010) Drama activities as ideational resource for primary-grade children in urban science classrooms. *Journal of Research in Science Teaching*, 47, 302-325.
- Varga-Dobai, K. (2018). Remixing Selfies: arts-based explorations of funds of knowledge, meaning-making, and intercultural learning in literacy. *International Journal of Multicultural Education*, 20(2), 117-132.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.
- White, J.C. (2018). See the dance: piloting an arts-based intervention in higher education. *Innovative Higher Education*, 43, 431-445.
- Zhang, X., & Hu, Z. (2018). Exploring an urban teacher's use of performance in fostering middle school students' moral awareness. *South African Journal of Education*, 38, 1-9.

APPENDICES



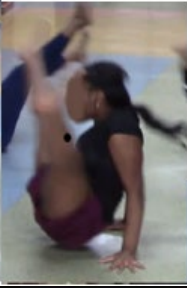



APPENDIX A




Symbols Used in Transcriptions

//	Repetitions or false starts or abandoned language replaced by new language structures.
~	Small/short pause within unit.
	Breaking off of a speaker's turn due to the next speaker's turn.
==	A speaker's pause at the end of uncompleted utterance, seemingly to encourage another speaker to talk.
(***)	One word that is inaudible or impossible to transcribe.
# #	Overlapping language spoken by two or more speakers at a time.
[]	Identifies what is being referred to or gestured and other nonverbal contextual information.
...	Omission of statements or phrases
^^^	Playing segment of dance performance

APPENDIX B

Highlighted Dance Moves with Photo Illustrations

Dance Move	Photo Illustrations		
Buck			
Deathdrop			
Dip			
Limber			

Jazz Split	
Jump Kick	
Rotating Plié	

CURRICULUM VITA
MINDY J. CHAPPELL
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EDUCATION

- 2021 Ph.D. in Curriculum and Instruction: Mathematics and Science Education,
 University of Illinois Chicago, Chicago, Illinois
 Thesis Title: *Towards Liberating Methods: Ethnodance as an Embodied
 Narrative of Black Students' Science Identity* (Thesis Advisor: Dr. Maria Varelas)
- 2011 Professional Educator License (Endorsements: Chemistry, Secondary Education)
- 2011 M.Ed. in Curriculum and Instruction: Instructional Leadership, University of
 Illinois at Chicago, Chicago, Illinois
- 2010 B.S. in Chemistry, University of Illinois at Chicago, Chicago, Illinois

HONORS

- 2021 Jhumki Basu Fellow, NARST: A Worldwide Organization for Improving Science
 Teaching and Learning Through Research
- 2015 Robert Noyce Master Teaching Fellow, University of Illinois at Chicago Project
 SEEED–Science Education for Excellence and Equity in Chicago (five-year
 award)
- 2012 Robert Noyce Scholar, University of Illinois at Chicago (one-year award)

PROFESSIONAL POSITIONS

- 2020-2021 Graduate Assistant, University of Illinois Chicago, Chicago, Illinois
- 2019 Instructor, University of Illinois Chicago, Illinois
- 2015-present High School Science Teacher, North Grand High School, Chicago, Illinois
- 2012-2015 High School Science Teacher, Morton East High School, Cicero, Illinois
- 2011-2012 High School Science Teacher, Jane Addams High School, Chicago, Illinois
- 2001-2011 Sr. Cert. Pharmacy Technician, Walgreens Pharmacy, East. St. Louis, Illinois

PUBLICATIONS

- Morales-Doyle, D., Frausto, A., Canales, C., **Chappell, M.J.**, Rajski, T., Aguilera, A., Clay, G.,
 & Lopez, D. (in press). Reflections on teaching and learning chemistry through youth
 participatory science. In M. Wallace, J. Bazzul, M. Higgins, & S. Tolbert (Eds), *Science
 education in the Anthropocene*. Palgrave MacMillan.

Chappell, M.J., & Varelas, M. (2020). Ethnodance and identity: Black students representing science identities in the making. *Science Education*, 104(2), 193-221.

Morales-Doyle, D., Childress Price, T., & **Chappell, M.J. (2019).** Chemicals are contaminants too: Teaching appreciation and critique of science in the era of next generation science standards (NGSS). *Science Education*, 103(6), 1347-1366.

PRESENTATIONS

1. Morales-Doyle, D., **Chappell, M.J.**, Childress, T., & Frausto, A. (2021, May). *Cultivating justice-centered science pedagogies*. Panel presented during the Science Collaborative's Virtual Meeting sponsored by the Council of Chief State School Officers (CCSSO).
2. Morales-Doyle, D., **Chappell, M.J.**, Childress, T., Frausto, A., & Farias, A. (2021, March). *Co-designing professional development to support science teachers transdisciplinary learning*. Paper presented at the annual international conference of NARST: A Worldwide Organization for Improving Science Teaching and Learning Through Research, Virtual.
3. **Chappell, M.J.**, Venier, M., & Gibson, J. (2020, January). Panelist for discussion on the documentary *The Devil We Know* and issues of environmental health, water safety, and the implications for STEM education, Indianapolis, IN.
4. Morales-Doyle, D., Aguilera, A., Clay, G., Frausto, A., **Chappell, M.J.**, Herrera, E., Lopez, D., Rajski, T. (2019, October). *Science Curriculum for the grassroots*. Youth participatory science townhall at the bi-annual Science Educators for Equity, Diversity, and Social Justice (SEEDS) conference. Norfolk, VA.
5. Morales-Doyle, D., Childress, T., Frausto, A., **Chappell, M.J.**, & Hatch, S. (2019, April). *Science Curriculum for the grassroots*. Youth participatory science curriculum presented at the annual national science conference of National Science Teachers Association (NSTA), St. Louis, MO.
6. Morales-Doyle, D., Childress, T., Frausto, A., & **Chappell, M.J. (2019, March).** *Beyond PCK: science teachers building critical historical knowledge for environmental justice*. Paper presented at the annual international conference of NARST: A Worldwide Organization for Improving Science Teaching and Learning Through Research, Baltimore, MD.
7. **Chappell, M.J. (2019, March).** *Ethnodance and Identity: Students making sense of their sense making*. Paper presented at the annual international conference of NARST: A Worldwide Organization for Improving Science Teaching and Learning Through Research, Baltimore, MD.
8. **Chappell, M.J. (2019, February).** *Ethnodance and Identity: Black students representing science identity in the making*. Paper presented at the annual University of Illinois at Chicago College of Education Research Day. Chicago, IL.

9. **Chappell, M.J.** (2018, March). Let's get PHYSICS-cal: *An ethno-dance-o-graphy of Black high school students' transition from biology to physics*. Paper presented at the annual international conference of NARST: A Worldwide Organization for Improving Science Teaching and Learning Through Research, Atlanta, GA.
10. Bonilla, D., Butler, M., Cathcara, E., **Chappell, M. J.**, & Clay-Akakpo, J. (2018, January). *The diverse experiences of four first year teachers in urban education*. Presentation at the international conference of the Association for Science Teacher Education (ASTE), Baltimore, MD.
11. **Chappell, M.J.** (2017, November). *The Lead-Talk Project*. Poster presentation at Teachers for Social Justice Curriculum Fair, Chicago, IL.
12. Batres, B., Cantor, P., **Chappell, M.J.**, & Hike, N. (2017, April). *Culturally responsive mentoring: Building pedagogical capacity through teacher inquiry in Chicago science classrooms*. Workshop presented at the annual national meeting of the National Science Teachers Association (NSTA), Los Angeles, CA.
13. **Chappell, M.J.**, Cuevas, G., Espinosa, E., & Herrera, E. (2017, March). *From activity to inquiry: An analytical approach to inquiry-based learning from the students' perspective*. Presentation at the annual national meeting of the National Science Teachers Association (NSTA), Los Angeles, CA.
14. **Chappell, M.J.** (2016, May). *The cultivation of a culturally relevant, content-rich, cooperative, inquiry-based classroom*. Poster presentation at the Science Education for Excellence and Equity in Chicago (SEEEC) Teacher Inquiry Symposium, Chicago, IL.

TEACHING & TEACHER EDUCATION CONTRIBUTIONS

- Graduate Assistant (2020-2021)
 - Developed anti-racist and liberatory curricular modules for preservice science teachers
- Instructor (Fall 2019)
 - Taught *CI 531: Curriculum, Instruction & Assessment for Equity in Secondary Science Education*, a UIC graduate course for pre-service MEd students seeking professional educator license for high school science
- Teacher Leader in Chicago Public Schools (2016-present)
 - Facilitate the sophomore grade level professional learning community as a member of the School Instructional Leadership Team
 - Explore youth participatory science as part of a network of high school chemistry teachers, science educators, scientists, and community advocacy organizations who engage in curricula development in response to urban environmental concerns
- Robert Noyce Master Teaching Fellow (2015-2020)

- Mentored new teachers through the development, data collection, and analysis of teacher inquiry projects
- Led professional learning communities for Chicago Public School teachers on the development of inquiry practices in science classrooms
- Contributed to teacher education through facilitating the development of classroom instructional practices, and curriculum through peer observations of new teachers
- Site Coordinator in the *Woodlawn Children's Promise Community-CDF Freedom School Program* (Summer 2013 & 2014)
 - Maintained the daily functionality of the site while leading the professional development of 13 servant leader interns and safeguarding the lives and enrichment of 150 scholars
 - Developed afternoon enrichment activities for pre-K through 8th graders
 - Developed community engagement activities centered on social action, civic engagement, and advocacy

TEACHER MENTEES

Diana Bonilla (High School Teacher, Franklin Park, IL)

Erin Cathcara (High School Teacher, Chicago Public Schools)

Veronica Rundell (High School Teacher, Maywood, IL)

Priscilla Tun (High School Teacher, Chicago Public Schools)

Mariel Rancel (High School Teacher, Chicago Public Schools)

Melanie Butler (former High School Teacher, Chicago Public Schools)

Jennifer Clay-Akakpo (High School Teacher, Chicago Public Schools)

Jasmine Jones (High School Teacher, Chicago Public Schools)

Racheal Schermitzler (High School Teacher, Waukegan, IL)

Robin Bartell (MEd Candidate)

SERVICE, CITIZENSHIP, & LEADERSHIP

National

- Reviewer on the NSF Noyce Merit Review Panels: *Education* (2013, 2015-2019)
- Children's Defense Fund Freedom Schools Ella Baker Trainer (2012-2017)
- NSF Robert Noyce National Conference Panelist (May 25, 2012)

Regional / Local

- Co-Founder of the Regional Freedom Schools Network (2020-Present)
- Head Coach and Choreographer for the Prancing Owls Majorette Dance Team at North-Grand High School (2017-Present)
- Brain Games and Teambuilding Coordinator for TENSE Annual Leadership Summit, Knoxville, TN (2016-2018)
- Co-facilitator of an integrated dance & education club as part of the Chicago Arts Partnerships in Education (2015-2016)

University of Illinois at Chicago

- Connected Chemistry Curriculum Cohort I Participant (2017-present)
- Poisoned Onion Youth Participatory Science Project Teacher Leader (2017-present)
- UIC Black Alumni Advisory Council Board Membership Chair (2013-2017)