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Bridging Theory and Practice in the Urban Science Classroom

A Framework for Hip-Hop Pedagogy

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Abstract

This paper explores the state of urban science education as it relates to achievement and engagement of urban youth in science and provides insight on improving the experiences of urban youth in the science classroom through the lens of an urban science educator. It provides a framework for Hip-Hop Pedagogy as an innovative approach to teaching and learning, which anchors the culture, realities and lived experiences of urban youth in pedagogy. Finally, this paper provides educators with practical tools and approaches, which were formed from theory and research that transcend the traditional monolithic approach to teaching science and allows educators to learn and incorporate the culture of urban youth within their pedagogy.



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Introduction

As a science educator teaching in the same urban community where I grew up and attended public school, I notice that my students have a very similar connection to Hip-Hop culture as I had as an adolescent. Students sing along to Hip-Hop music that they hear blaring from cars driving past the school and constantly tap their pencils on the desk creating and replicating Hip-Hop beats. While noticing urban students' apparent connection to Hip-Hop, it is difficult to ignore the rates of achievement as it relates to students of color, who predominantly populate the urban communities where they attend school.

Educators are aware of the persistent achievement gaps or as Gloria Ladson-Billings (2006) refers to "educational debts" that exist between minority students and their counterparts of less diverse social settings, especially if we consider students' performance on standardized exams as the chief marker of achievement. Evidence shows that in relation to Caucasian students, minority students earn lower grades and score lower on standardized tests of academic ability developed for the state(s) (Vanneman, Hamilton, Anderson & Rahman, 2009). In addition, researchers reveal the significance of the achievement gap between the test scores of both low-income and minority students as compared to others (Jencks & Phillips, 1998; Bohrnstedt, et al. 2015). Gloria Ladson-Billings (2006) argues that when educators discuss and suggest proposals to improve the achievement gap, which mainly focuses on the disparities on students' academic ability to perform on standardized test that are normed based on the knowledge and values of majority groups, we are solely focusing on student achievement without questioning the systems and structures in place that may account for disparities in achievement measures. Therefore, if we only interrogate the achievement gap as a phenomenon birthed from minority and disadvantaged students performing poorly when compared to their white counterparts, the burden of poor academic achievement lies solely on the student, without considering the systems, structures, and spaces which provide urban students a so-called valuable education that is ineffective. It is significant to note that no intervention established by education reformers has been successful in closing the seemingly perpetual achievement gap to date (Heissel, Levy, & Adam, 2017).

Similar educational debts persist in STEM (Science, Technology, Engineering and Mathematics) education writ large, and science education in particular as it relates to urban youth (National Governors' Association, 2005). In the United States, there is a significant education debt between minority students and their White counterparts (Vanneman et al., 2009). Researchers find that schools that serve mainly minority groups of students offer less science courses, and therefore offer less opportunities for students to experience and succeed in science (Norman, Ault, Bentz, & Meskimen, 2001). Moreover, Norman et al. (2001) argue that the science education debt for students of color is due to minority group's disadvantaged position in the United States' society in general. Groups of people who have a disadvantaged position in society tend to suffer from socioeconomic hardship, and the stigma of inferiority (Norman et al., 2001). "In urban settings schools in impoverished neighborhoods underperform relative to schools in more affluent settings" (Norman et al., 2001, p. 105). Students of color may experience a stigma of inferiority as it relates to science because they may not relate to how science is taught and the content, in addition to not knowing or identifying scientist in their communities who look like them. A limited number of students of color successfully complete high school and go on to pursue a science related degree in college. Therefore, only about 17

percent of scientists and engineers in the United States are minorities (National Science Foundation, 2015).

Furthermore, in recognizing educational debts of urban youth, we must acknowledge that there has been a monocultural approach to teaching science. This monocultural approach to teaching science stems from the standards for college preparedness, dating back to the turn of the 20th century. Science curricula and pedagogies have historically benefited middle class White students, and have failed to provide quality instruction for students who have been traditionally marginalized coming from culturally diverse backgrounds, largely urban students (Melnick & Zeichner, 1998; Tyack & Cuban, 1995). Possibly due to the fact that when standards for college preparedness were initially established, schools across the country were segregated, and it was unimaginable for students of color and White students to attend the same schools and universities. As per the *Brown V. Board of Education* Supreme Court ruling, schools across the nation were desegregated, but no form of action was taken to integrate the curriculum or instructional practices to support and incorporate the students of color culture and lived experiences.

Research suggests that students from underrepresented ethnic groups traditionally fall behind their counterparts of less diverse backgrounds in major content areas (National Governors' Association, 2005). In addition, urban students are less likely to be interested in the sciences, not because they have a deficit mindset, but partially because educators misunderstand the realities and experiences of urban students and as a result they are not able to demonstrate the relevance of science (Kahle, Meece, & Scantlebury, 2000; Seiler, 2001). According to Munce and Fraser (2012), African-American students' interest in science has decreased significantly over time, is now lower than that of any other ethnic group, and is expected to remain low in upcoming years. As such, scholars such as Gloria Ladson-Billings (1995) and most recently Django Paris and Samy Alim (2014) have argued for culturally relevant and sustaining pedagogies. In Science Education, scholars like Mary Atwater (1996) speak directly to the ways that culture may be a powerful piece of science teaching and learning. In order to gain insight into urban students' experiences to better engage them in the science classroom, I argue that it is time that science education researchers identify pedagogical approaches that "focus explicitly on understanding the realities of youth within urban classrooms and supports the teacher in utilizing an understanding of these realities as an anchor for instruction delivery," and move away from oppressive pedagogies and practices, that are not anchored in the culture of students and that do not encourage students to be critical to gain a better understanding of the inner workings of the world around them (Emdin, 2011, p. 5). Especially as oppressive pedagogies and practices are known to further disengage and marginalize urban students in science (Emdin, 2011).

In this paper, I provide a framework for Hip-Hop pedagogy, which is rooted in culturally relevant pedagogy and reality pedagogy, that is directly connected to the culture of Hip-Hop and therefore connected to students' cultural and lived experiences as an effective way to engage urban students in content, utilizing their realities in the science classroom. Hip-Hop pedagogy is "a way of authentically incorporating the creative elements of Hip-Hop into teaching and inviting students to have a connection with the content, all while meeting students on their cultural turf and teaching to their realities and experiences" (Adjapong & Emdin, 2015). As a teacher researcher I implement Hip-Hop pedagogical approaches in my everyday instruction as a middle school science teacher and notice the opportunities that this innovative approach to teaching provides my students to make connections between their true selves and content (Adjapong, 2017). Emdin (2010) calls for a teaching approach "which involves a process of

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learning and or utilizing the complex nuances of communication in Hip-Hop and a valuing of student culture” (p. 62). In this paper, I suggest a framework for Hip-Hop pedagogy and the implications for each of the five elements of Hip-Hop to be used practically in classroom settings, which I argue will encourage the realities and lived experiences of students to be considered in the classroom.

Conceptual Framework

Culture, capital, and social networks

This study is rooted in a sociocultural framework that explores the concepts of culture and social capital as they relate to the experiences of African- American and Latino/a urban students in a science classroom. Vygotsky states that “human activities take place in cultural context, [and] are mediated by language” (John-Steiner & Mahn, 1996, p. 191). Most urban students’ experiences outside of school are rooted in Hip-Hop culture (Emdin, 2010). The ways urban students dress, talk, dance and engage in other non-verbal forms of communication are all rooted in Hip-Hop culture. Vygotsky (1981), in his research, demonstrated an understanding of culture as something that is firmly entrenched in societal processes, which he believes is the emergence of mental processes. Vygotsky states, “above all, in the widest sense of the word, it means that everything that is cultural is social. Culture is the product of social life and human social activity. That is why just by raising the question of the cultural development of behavior we are directly introducing the *social* plane of development” (Vygotsky, 1981, p. 164). Vygotsky’s account of culture puts forward that humans are never free of cultural influences, even when engaging in an action alone. “Instead, human mental functioning, even when carried out by an individual acting in isolation, is inherently social, or sociocultural, in that it incorporates socially evolved and socially organized cultural tools” (Wertsch & Tulviste, 1992). Vygotsky posits that all actions performed by individuals are somehow shaped by cultural influences. Urban students who identify as a part of the Hip-Hop generation frequently engage in traditional Hip-Hop practices outside of school, but once those practices are incorporated in teaching and learning students are given the opportunity to engage in science content as seamlessly as they would in a traditional Hip-Hop practice.

I suggest bringing Hip-Hop culture into urban science classrooms and not only incorporating it into curricula, but also incorporating the culture into the ways in which teachers teach their students. Normally, learners depend on others with more experience to teach them in a way that will make them feel comfortable with the content. If students are engaged and excited about science content in the classroom, and their exchanges around the content are occurring with the use of Hip-Hop forms of communication, over time, students take on increasing responsibility for their own learning (Lave & Wenger, 1991; John-Steiner & Mahn, 1996). Being culturally relevant through Hip-Hop pedagogy will not only allow students to view themselves as a part of a classroom culture that they value, but it can also encourage independent self education of science content; since students will take increasing responsibility of their own learning (Ladson-Billings, 1995).

In framing Hip-Hop Pedagogy, I also draw insight from sociologist Bourdieu (1986) who describes capital and its varied forms as necessary for articulating the ways that humans exist in a social world. In particular, I focus on the form of capital that is acquired in social fields like classrooms when individuals develop a conscious or unconscious personal investment in an

activity or process. This form of capital is called “cultural capital” and in its embodied state, is both inherited and acquired as one engages with either new or familiar tools in an activity. In other words, one may possess forms of cultural capital outside of the classroom, and then use these forms of capital to acquire new forms of knowledge in the classroom. The goal is for science educators to create contexts that generate new forms of cultural capital that will eventually lead to the acquisition of science content knowledge. If students develop more opportunities to expand their cultural capital as it relates to science content within their science classrooms, they will not only be more prepared to navigate science spaces outside of the science classroom, but they will also be more comfortable while navigating these spaces. For example, if a student develops cultural capital as it relates to their experiences around science content and science skills, that student is more likely to identify as a scientist, and therefore self select to participate in additional science experiences such as advance classes, science internships etc. Hip-Hop is a form of cultural capital that many urban youth possess. When brought into science classrooms, and used as a viable form of knowledge acquisition in science, it can be used to expand youth cultural capital to include science. Students who develop more cultural capital within the science classroom may be more likely to take on a science identity because both Hip-Hop and the teaching approaches being employed in the classroom are connected to their lived experiences. In this type of scenario, students are accumulating and exchanging cultural capital both in Hip-Hop spaces outside of the classroom and within science spaces within schools (traditional educational spaces). Bourdieu describes cultural capital as having an unconscious and non-deliberate quality in terms of how the individual generates it. However, he also describes cultural capital as something gained as the result of “conditions of acquisition.” I suggest that science classrooms that allow and welcome the expression of Hip-Hop culture are the ideal spaces for the “conditions of acquisition” for urban youth who identify as Hip-Hop.

The Hip-Hop Generation as the Neoindigenous

In developing a framework to Hip-Hop pedagogy I acknowledge indigenous populations but, similar to Emdin (2016), draw parallels between indigenous populations and urban youth, especially those who identify as the Hip-Hop generation. Despite the explicit connection that indigenous populations have to specific territories and natural surroundings, there are connections that can be made between indigenous populations and urban youth. More obvious connections revolve around how urban youth, similar to indigenous populations, are traditionally known to construct knowledge differently (Smith, 1999), they follow and identify as part of a different culture (Hip-Hop) than the dominant group, they communicate with one another differently than dominant groups, and they follow a different set of beliefs than the dominant group. Most importantly, in recognizing urban youth who identify as the Hip-Hop generation as neoindigenous, we must consider how urban youth have suffered from oppression and been marginalized as a result of decisions made by the dominant group.

In Linda Tuhiwai Smith’s (1999) text *Decolonizing Methodologies*, she suggests that research and scholars have traditionally favored imperialistic ways of knowing developed primarily by Westerners. In other words, those in power, those who have colonized and marginalized other groups of people, have privileged their ways of knowing and constructing knowledge. Privileging the dominant group's ways of knowing promotes a lack consideration as it relates to marginalized groups ways of knowing and constructing knowledge, which I argue

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may be different especially if the dominant group and marginalized group do not follow the same culture or belief system.

Smith (1999) posits that proving the validity of indigenous knowledge, including “that indigenous peoples have ways of viewing the world which are unique,” is not the only challenge indigenous populations face, but also proving the authenticity and control over those forms of knowledge (p. 104). These are similar challenges found with the Hip-Hop generation who often have different experiences than the dominant group due to the differences in lived realities and beliefs, which encourage them to construct knowledge and view the world differently. We know urban youth and the Hip-Hop generation construct knowledge and view the world differently as there has been a push for educators to use culturally relevant pedagogies and practices especially when engaging with urban youth (Brown, 2003). The Hip-Hop generation identifies with the five creative elements of Hip-Hop (which will be explored in subsequent section), which guide their experiences and the unique way in which they view the world and the way they construct knowledge. Smith also highlights that indigenous populations “often have their own language or code” (Smith, 1999, p. 127). The Hip-Hop generation, too, often communicate and engage with one another using alternative colloquialism, commonly known as slang, when engaging their peers.

Similar to Emdin (2016) my intention in making connections between indigenous populations and the Hip-Hop generation is not meant to draw attention away from indigenous studies and research and to focus population in urban communities, rather my goal is to draw comparison between indigenous populations and urban communities to highlight the collective oppression that both groups experience at the hands of a more powerful and dominant group; in this case, the discipline of science and science educators.

Hip-Hop Pedagogy

This framing of Hip-Hop pedagogy is an extension of my research and experiences in urban classrooms and focuses on utilizing the culture of students within particular social spaces, including the science classroom (Adjapong & Emdin, 2015). To continue to push science educators to remain culturally relevant as it relates to students who identify as the Hip-Hop generation, I suggest educators utilize pedagogical approaches that are rooted in Hip-Hop culture. It is important to recognize that Hip-Hop is more than a genre of music. Hip-Hop is a culture that has impacted and empowered youth populations across the globe, especially youth of marginalized groups, since its conception (Adjapong & Emdin, 2015; Dunley, 2000). Hip-Hop was birthed as a social justice movement as a direct response to the deterioration of the Bronx, which was caused by a number of reasons, including a steady rise in crime, a struggling economy, budget cuts to key social services such as the fire and police departments, and one of the largest construction projects (the cross bronx expressway) that the Bronx borough has experienced (Gonzalez, 2004). In the midst of this social and economic crisis that plagued the Bronx, Hip-Hop music and culture were birthed as an effort to build strong communal ties in times of economic and social hardship, urban youth attended block parties to escape their unfortunate realities. Hip-Hop was an outlet for a group of people who were in the midst of social and economic crisis and enabled a group of people to survive in and adapt to their environment (Atwater & Crockett, 2003; Bullivant, 1989). As in any culture, Hip-Hop encompasses “speech, knowledge, beliefs, customs, arts and technologies, ideals, and rules what we learn from other [people], from our elders or the past, plus what we may add to it” (Kroeber, 1948, p.253).

However, culture is not static, but is ever changing within a group of people (Preston, 1997). Hip-Hop, which was birthed as genre of music that expressed the realities of groups of people in the inner-city who have repeatedly been pushed to the margins of society, has grown into a genre of music that consist of many subcategories which include, East Coast rap, West Coast Rap, Trap, Crunk etc. Nonetheless at it's core, Hip-Hop remains a culture, first and foremost, and a genre of music that is critical of the sociopolitical climate and that shares the realities of those who have been marginalized.

It's important to recognize that much research has been published in regards to educators using Hip-Hop as a culturally relevant tool in the classroom, most of this research focuses on Hip-Hop Based Education (HHBE), which mainly focuses on how to incorporate Hip-Hop culture into school-based curricula, particularly using English curricula and the utilization of Hip-Hop as youth participatory action research (YPAR) (Akom, Cammarota, & Ginwright, 2008; Hill & Perchauer, 2013; Morrell & Duncan-Andrade 2002; Seidel, 2011). There is a lack of research regarding utilizing Hip-Hop culture to inform pedagogy (Hill & Perchauer, 2013; Morrell & Duncan-Andrade, 2002; Seidel, 2011).

Hip-Hop pedagogy draws from the frameworks of Culturally Relevant Pedagogy (Ladson-Billings, 1994) and Reality Pedagogy (Emdin, 2016). From Culturally Relevant Pedagogy, Hip-Hop Pedagogy draws a focus on understanding youth culture that is exhibited in students' communities and the use of an understanding students' youth culture and their communities in improving teacher effectiveness. Culturally relevant pedagogy encourages teachers to immerse themselves so deeply in the culture of the specific students through actual engagement with the students, that it becomes second nature to find ways to develop students' interest in, and natural affinity for, science. Culturally Relevant Pedagogy also motivates teachers to provide opportunities for students "to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools," fields of study, such as science and communities (Ladson-Billings, 1995, p.469). In honor of Hip-Hop and the framework of culturally relevant pedagogy, Hip-Hop pedagogy encourages educators to create opportunities for students to be critical and challenge social, political, and education systems that are oppressive. From Reality Pedagogy, Hip-Hop pedagogy draws a focus on the teacher learning about the authentic realities of students and teaching utilizing students' authentic realities and culture to better engage them in science. Reality pedagogy provides teachers with tools to become proximal with students to engage in dialogue where teachers can learn from the experiences and realities of students who have traditionally been marginalized by school systems as it relates to science. Culturally Relevant Pedagogy is an approach to teaching and learning that advocates for a consideration of the culture of students to determine a culturally responsive approach to teaching. Reality Pedagogy extends this notion as Emdin (2016) argues that Culturally Relevant Pedagogy cannot be implemented unless teachers broaden their scope of traditional classroom teaching. In proposing Reality Pedagogy, Emdin (2016) suggests that teachers study and utilize artifacts of students' culture such as clothing, music, and speech to engage them in classroom. Utilizing these tools and anchoring instruction in the realities of students, but also understanding that the realities of students is not static and also ever changing. Hip-Hop pedagogy recognizes that many students in all spaces (urban & suburban) identify with Hip-Hop culture and it therefore becomes a part their identity and reality. Further, Hip-Hop pedagogy encourages educators to use approaches to teaching and learning that are anchored in the daily communal practices of students who identify as a part of Hip-Hop.

Hip-Hop Pedagogical Approaches

Hip-Hop pedagogy is an approach to teaching and learning that is rooted in Hip-Hop culture; which urban youth identify with (Adjapong, 2015). While Hip-Hop pedagogy was developed in a science classroom, I argue the following approaches to teaching and learning can be utilized in any content area. In the subsequent sections, I have outlined and make specific connections between pedagogical approaches and each of the five creative elements of Hip-Hop (MCing, graffiti art, breakdancing, DJ and knowledge of self) (Chang, 2007) and provided practical tools, which educators can utilize to engage urban youth in science.

MCing (Master of Ceremonies)

Traditionally, the Master of Ceremonies (MC) is known host of an event and their responsibilities consist of introducing speakers and maintaining the flow of an event. In Hip-Hop, MC is the artist who is responsible for delivering musical content to an audience. All MCs approach the role of MCing differently using their unique style. Oftentimes when an MC is performing to an audience, they are accompanied by a fellow MC whose essential role is to be a professional in terms of knowing and understanding the musical content to provide support to successfully showcase meaningful performance for the audience.

Co-Teaching. Co-teaching is a teaching approach, most commonly used in secondary education, which has been popular for decades. Co-teaching is defined as “two or more professionals delivering substantive instruction to a group of students with diverse learning needs” (Cook & Friend, 1995, p. 25). The goal for implementing this approach in a classroom is to allow the responsibilities for instruction to be shared between the two masters of content. In this study, the student is identified as a professional and master of content in the science classroom. As the responsibilities for instruction are shared between both the teacher, who is normally viewed as the main authority figure of the classroom and a student, the student feels a sense of empowerment and excitement that can allow them to take responsibility for their own learning and participation to enhance their science content knowledge (Lave & Wenger, 1991; John-Steiner & Mahn, 1996). Co-teaching between a student and teacher increases instructional options, provides students with the opportunity showcase their mastery of the content as they support their colleagues to gain that same mastery. In addition, co-teaching in itself is a culturally relevant approach in the sense that the student who is now deemed the professional is a part of the same population that is receiving the instruction. In Hip-Hop Pedagogy, co-teaching occurs with a student and the teacher who both identify as the masters of content, parallel in Hip-Hop where traditionally two MC’s deliver musical content to an audience and is supported by the utilizing the following steps:

Before class:

- A student who volunteered to be a co-teacher is given a lesson plan to review for homework in preparation to teach the class the following day.
- The teacher performed a quick review of the lesson plan with the co-teacher to ensure that content is reflected accurately.
- The student was responsible for enhancing that lesson plan so that it can reflect their “teaching style.”

During class:

- The teacher sits in a student's seat in a place that is prominent in the classroom and in the view of the co-teacher.
- The teacher pays close attention to parts of the lesson where the content delivered and guides the instruction (by raising a hand as a traditional student would) only when there are issues with the content (Emdin, 2011).

Call-and-response. Smitherman (1977) defines call-and-response as "spontaneous verbal and non-verbal interaction between speaker and listener in which all of the statements ('calls') are punctuated by expressions ('responses') from the listener" (p. 104). Responses from the audience can follow from a speaker specifically requesting them, or they can be unsolicited and spontaneously interjected into the ongoing interaction (Foster, 1989). Call-and-response is a popular teacher approach and is commonly used in music and dance produced by African-Americans. Several studies show call-and-response to be effective in teaching students in urban communities (Foster, 2002; Piestrup, 1973). Call and response is considered integral to communicative behavior and functions as an expression of identity and as a means of conveying cognitive information among African-Americans (Cazden, 1988). In Hip-Hop, to engage the audience, the MC traditionally uses call-and-response during their performance as a way for audience members to have an opportunity to be active participants during the performance. This exchange between the MC and the audience generates high energy and allows every audience member to participate in the exchange. When utilizing Hip-Hop Pedagogy, call-and-response can be used to review and reinforce science content information, as a classroom management tool and to generate positive emotional energy among students. For example:

Review and reinforce content information: To review and reinforce potential and kinetic energy.

Teacher: Kinetic energy is the energy that an object has

Students (in unison): When it's in motion

Teacher: Potential energy is the energy that an object has

Students (in unison): When it's in the position to do work

Classroom management: To gain the attention of students when necessary.

Teacher: If you can hear my voice clap once

Students (in unison): [Clap] Teacher: If you can hear my voice clap twice

Students (in unison): [Clap] [Clap]

Teacher: No music

Students (in unison): [Clap]...[Clap] [Clap]...[Clap]

The clapping rhythm used in this call and response pattern originated from a classic Hip-Hop dance song entitled "No Music" by a Harlem rapper named Voice of Harlem.

Graffiti Art

Graffiti art is an aspect of Hip-Hop culture that has not been nearly as received as rap music. The graffiti movement was popularized in Philadelphia as early as 1965 by a Black teenager who was trying to attract the attention of a woman he was interested in. The graffiti movement then found its way to New York City by 1968 where urban youth who

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participated in tagging their street alias on the walls of urban neighborhoods, train cars etc. enjoyed the attention their art received because it made them feel like a celebrity (Chang, 2007). Graffiti artists find it liberating to climb tall gates and slip under fences to create murals that represent them. Gregory Tate identified this a reverse colonization, graffiti artists created murals of their street names across New York City to reclaim their communities when have been taken away from them due to gentrification and New York City's planning efforts led by Robert Moses Cross Bronx Expressway in the Bronx (Bronx Museum of the Arts, Walker Art Center, & Spelman College, 2001). Graffiti art provided urban youth an opportunity to be expressive in their communities.

In recent years, educators have been focusing on incorporating the arts into the STEM acronym, changing it to STEAM (Science, Technology, Engineering, Arts, Mathematics). Educators (Alberts, 2008) suggest that "art and science are intrinsically linked" and students are able to better their understanding of science content through creating their own artistic representations of the science content. In support of incorporating art in the teaching and learning of science, science educators note that the "visual arts just seems to really be able to hone in on the concept, taking it from the abstract to the concrete, so students are really able to understand it" (Robelen, 2011). When utilizing Hip-Hop pedagogy, students are charged with tasks where they engaged in the visual arts, similar to graffiti artist, to work through and demonstrate their understanding of science content. Using visual art as a pedagogical approach to support students understanding of science content also allows students to "make representations to: express their thoughts, feelings and perceptions; show relationships and changes; and make explanations and predictions" (Nelson & Chandler, 1999, p. 41). Teachers are encouraged to create task where students are able to visually demonstrate science concepts and make connections between science and real world examples. For example, if students are learning about the law of conservation of energy, they can be tasked to illustrate a real world example of objects that transfer energy and explain with evidence and reasoning how energy is transferred.

B-boying/B-girling

As in any culture, there is a performance aspect where many participants of the culture communicate through dance. The aboriginals' (an indigenous group) of Australia Haka dance, a traditional ancestral war cry dance, has transformed into a dance that is currently performed at celebratory events such as weddings. Many indigenous African tribes have dances that serve many social purposes such as communicating their Gods to ask for rain (rain dance) to prepare for the harvest, to prepare for war and to welcome a new born baby into the world, to name a few. In early days of the formation of Hip-Hop, breakdancing began as a direct response to the social factors that urban youth experienced in the late 1960's and during the 1970's in the South Bronx. During that time, the development of the Cross Bronx Expressway abruptly displaced over 5,000 families in the South Bronx and destroyed neighborhoods, amid high crime rates and gang violence that consumed the bronx (Shapiro, 2005). Instead of fighting, gangs formed breakdancing crews where their best b-boys/b-girls would battle one another on the dance floor. B-boys/b-girls would dance to the rhythm of the beat played the neighborhood Disc Jockey (DJ). As time progressed, b-boys/b-girls took the art of dancing more seriously and always strived to perfect their moves. They danced faster, developed more complex moves and improved their form (Fresh, 1984). Although b-boying is not currently as popular as it once was in the 1970's, I argue that this style of dancing has evolved into contemporary Hip-Hop dance, which continues

to be a pivotal part of Hip-Hop culture. The intricate, well thought out and well performed dances that Hip-Hop dancers perform demonstrates a kinesthetic aspect of Hip-Hop culture.

There are four stages of cognitive development which Bruner (1966) and Piaget (1951) describe as how humans assimilate knowledge about their surrounding environment through four sensory modalities, one of which is kinesthetic learning. Kinesthetic learners prefer “learning achieved through the use of experience and practice. In other words, the kinesthetic learner has to feel or live the experience in order to learn it” (Murphy, Gray, Straja, & Bogert, 2004). Kinesthetic learning involves the physical manipulation of objects or the body, like a dancer (Gardner, 1993). Through breakdancing and contemporary Hip-Hop dance, urban youth learn how to manipulate their body. In doing so, youth who follow Hip-Hop culture, communicate well through body language and can be taught through physical activity, hands-on learning, acting out, role playing (Lane, 2008). When utilizing Hip-Hop pedagogy, students engage in kinesthetic learning activities, which allow them to physically manipulate objects and their body alike, similar to Hip-Hop b-boys/b-girls, with the goal of better understanding and engaging in science content. For example, when discussing the various states of matter, students can conceptualize themselves as particles and move around the classroom as particles would when energy increases and decrease. When energy decreases students should be moving closer to one another to the point where they are huddled in a fixed position (solid) and when the energy increased students should move around the classroom at a faster rate at times bumping into one another.

Disc Jockey (DJ)

The disc jockey (DJ) is arguably the most important creative element of Hip-Hop culture. At its core the DJ is responsible for supporting other creative elements including the Master of Ceremonies (MC) and the b-boys/b-girls. The DJ's primary duty is playing and controlling the music, the rhythm, and the beat to which the MC adds their lyrical content to produce a completed song. The DJ is also responsible for finding the break in the beat, the moment in the song where only the drums are present, to provide an optimal rhythm for the b-boys/b-girls to showcase their best dance moves. Furthermore, the DJ is responsible for reading the mood of a crowd and playing the perfect arrangement of songs to harness the crowd's energy. In Jeff Chang's (2007) depiction of the conception of Hip-Hop describes DJ Kool Herc,

[L]ike any proud DJ, he wanted to stamp his personality onto his playlist. But this was the Bronx. They wanted the breaks. So, like any good DJ, he gave the people what they wanted, and dropped some soul and funk bombs. [People] were packing the room. There was a new energy. (p. 85)

Chang describes DJ Kool Herc as a DJ who incorporated his personality into his playlist while playing songs to the crowds' preference. Chang also explains that DJ Kool Herc was responsible for harnessing a new energy that was attractive to a crowd of people. When utilizing Hip-Hop pedagogy, students will be in charge of being the DJ of the classroom and harnessing energy among their peers by creating playlist that are played during class. Teachers allow students to curate a class playlist of their favorite music instrumentals (music without lyrics). The student-curated playlist should be played during class as background music when students are completing individual and group task. The goal of utilizing a playlist curated by students is to harness the same form of energy as a traditional DJ within the classroom. Also, a student curated

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playlist provides an opportunity for teachers to gain knowledge about student's interest that they would not have learned otherwise.

Knowledge of Self

Knowledge of self is last and most unknown creative element of Hip-Hop culture. Afrika Bambaataa is a DJ and is known as the grandfather of Hip-Hop. He is best known for creating the first sounds that first influenced the creation of Hip-Hop music. Bambaataa defines knowledge of self as a central component of Hip-Hop culture. In support of the knowledge of self as a creative element of Hip-Hop, Bambaataa states,

We got to get people back to the knowledge. Too many are caught up on the partying... they are not dealing with all the elements of Hip Hop; they're just dealing with the rap side of Hip Hop. We got to let them know that it's a culture, and come back to the knowledge, because this is what controls and holds everything together. (Conzo, Bambatta, Esquire & Chang, 2007, p. 57)

Bambaataa argues that the Hip-Hop generation has been overly consumed in rap music and is not engaging in Hip-Hop as a culture. Rap music is a small fraction of Hip-Hop culture, which is known to have been commercialized and therefore slightly removed from being nested in the authenticity of Hip-Hop culture. Bambaataa along with many Hip-Hop purists believe that knowledge of self is central because participants of Hip-Hop culture must remember that Hip-Hop was created as a social political movement. Essentially, knowledge of self is central to Hip-Hop as it encourages participants of Hip-Hop culture to be aware of who they are, be authentic to themselves and be confident in oneself to make positive social political change for their communities. At its core Hip-Hop culture was birthed as a means to push back against the existing systemic inequalities in 1970's post-industrialized South Bronx community in order to provide an outlet and voice for urban youth.

As urban students' interest in science continue to decrease (Munce & Fraser, 2012), it is important that urban students increase their engagement in science, specifically science. Through the implementation of Hip-Hop pedagogy in an urban science classroom, I suggest that students' will increase their engagement as it relates to science and increase their cultural capital (Bourdieu, 1986) in the science classroom, which will allow them to be more comfortable navigating science spaces outside of the science classroom. Students would be confident in their skills and abilities as related to science and be confident enough to pursue a career in science if they chose to, rather than not wanting to pursue a career in science because they are not engaged. In essence, Hip-Hop Pedagogy provides a similar outlet for urban youth in contemporary educational spaces as it did in the 1970's post-industrialized South Bronx. Hip-Hop pedagogy positions youth to use their voice to push back against existing educational structures, including the implementation of monolithic pedagogies, to include knowledge of self and culture within educational spaces.

Teachers can support and join their students in utilizing their voice to push back against oppressive educational systems and structures by creating opportunities for students to learn about the context and history of science as a discipline. Youth who populate urban inner-city schools across the country are predominantly Black and Latinx. It is important that our urban youth understand that Whites consist of 69% of the science and engineering workforce, while Blacks and Latinxs consist of only 11% combined (Guterl, 2014). Once students are provided

opportunities to research and learn about the history of science and statistics related to who mainly pursues careers in science they can be critical of science as a discipline and question why the number of Black and Latinx populations is fairly low and finally identify solutions for their immediate school and community.

For example, ask questions like:

- What can we do at Urban High School to increase the number of Black and Latinx students in the sciences?
- What are the different careers in STEM and what requirements are necessary to pursue these careers?
- Who are scientist in our community? What do they do? What are their stories?

Teachers should allow students to identify solutions to increase the number of Black and Latinx students in the sciences, supporting students to be critical of the discipline of science.

Preparing Teachers to Implement Hip-Hop Pedagogy

One of the goals for developing a framework for Hip-Hop pedagogy, is to arm educators with practical tools that are derived from the culture and realities of students who identify as the Hip-Hop generation. Previously, I outlined the value of implementing Hip-Hop pedagogical approaches which require knowledge of youth culture. In this paper, I suggest that if educators deploy strategies to understand the authentic realities of their student population as they vary from school to school or classroom to classroom, they will be more effective. Furthermore, I suggest that Hip-Hop pedagogy be acknowledged as a culturally relevant approach to teaching and learning developed for all science educators despite the fact that they may not be of the same culture (urban or Hip-Hop generation) as their students. I argue that the fact that teachers may not share the same culture as their students does not prove to be a limitation of this approach of teaching and learning, but rather a strength; as this pedagogy encourages the teachers to position themselves as a student of their students' culture. According to the U.S. Department of Education, about 50 percent of the public school student population is nonwhite, while 80 percent of public school teachers are white. Considering the racial disproportion between students and teachers across the country, the reality is many educators will not identify with the same culture and practices as the students they teach. Utilizing Hip-Hop Pedagogy in the classroom allows an opportunity for educators to validate neoindigenous students', who also identify as the Hip-Hop generation, way of viewing the world and their culture within the classroom and schools. Consequently, in preparing teachers to implement Hip-Hop pedagogy, I am providing a tool (cogenerative dialogues) that teachers can use to understand the authentic realities of youth culture before and during their implementation of the Hip-Hop based pedagogical practices outlined above. In the following section, I outline the use of cogenerative dialogues in a classroom as one possible strategy to support teachers as they deploy Hip-Hop pedagogy in their science classrooms.

Cogenerative Dialogues as Cyphers

In order to be effective when implementing Hip-Hop pedagogy I suggest all educators use strategies engage in cogenerative dialogues (cogens). Cogens are special meetings that educators hold with a small group of students to discuss and gain student perspective about

phenomena, which occur in the classroom, such as classroom culture and instruction. “Cogens are structured to emulate the ways that many urban youth communicate when they are engaged in an aspect of Hip-Hop culture called the cypher.” (Emdin, 2011, p. 287). When conducting a cogen students follow the rules of engagement of a traditional Hip-Hop cypher. Students sit in a circle equal distance from one another, students have equal turns to talk, all voices and ideas are respected and no voice privileges another (including the teachers). When engaging in cogens with students, teachers are to position themselves as equal participants of the cogen.

The goal of the cogen is to reach a collective decision about the rules, roles and responsibilities that govern the lives of students within the classroom (Roth, Tobin, & Zimmerman, 2002). Cogens are held with a group of four to six students who each represent a different demographic within the classroom (engaged, high-achieving, low-achieving etc.). The role of the educator, who is the expert of instruction, is to conduct cogens with students, who identify as the Hip-Hop generation, as they are the masters of cultural content to gain a better understanding about how to effectively implement Hip-Hop pedagogy to enhance teaching and learning within the classroom. During the cogen, the small group of students are given the “opportunity to reflect on their classroom experiences, critique the instruction, discuss the inhibitors to their classroom learning, and, most importantly, provide teachers with an insight into what can work well in the classroom from the students' perspective” (Emdin, 2011, p. 287). Ultimately, the cogen can be used as a tool for teachers to gain authentic insight from students on the implementation of Hip-Hop pedagogical approaches. It also serves as a space where teachers may member check with a small group of students about their use and effectiveness of particular Hip-Hop pedagogical practices with the whole class.

Conclusion

This framework of Hip-Hop Pedagogy is a call for science educators to consider an innovative approach to teaching and learning that is connected to the culture of urban youth. Recognizing youth who identify as Hip-Hop as the neindigenous demonstrates our understanding that urban youth engage in a different culture (Hip-Hop) than the dominant group, communicate with one another differently than dominant groups. It also encourages us to consider how urban youth have historically been pushed to the margins of society and construct knowledge differently than the dominant group, which makes the call for innovative pedagogies that are inclusive of Hip-Hop increasingly urgent. Considering the educational debts we collectively owe to urban youth as it relates to science, we must acknowledge that the monolithic approaches to teaching science, which has not considered students culture, does not encourage achievement in science. Hip-Hop pedagogy is an attempt to bridge theory and practice to demonstrate pedagogical approaches that can be used to better reach urban youth in the science classroom. Hip-Hop pedagogy allows students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools and traditional curriculum may perpetuate. If do not consider students' culture, we are ultimately doing a disservice to students of diverse backgrounds, not working towards closing the “achievement gap” and not paying the educational debts we owe to them.

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