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The role of songs and poems in STEM instruction

By

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Abstract
This study uses selected poems and songs to demonstrate how art can help learners notice, understand, value, and become interested in Science, Technology, Engineering, and Mathematics (STEM) subjects. The focus is to use functionalism and multiple intelligence theories to examine how integrating songs and poems into STEM teaching can facilitate learning, nurture creativity, and improve student engagement with STEM subjects. Using a qualitative research design, the study purposively selected songs and poems by a Cameroonian poet and some musicians that convey STEM concepts and scientific thinking. It drew mainly from Ekpe Inyang's anthology *Taste of Nature* and from a STEM-themed song by Bobe Yerima Afoakom, Our Environment/Njang Manjong, and Ben Pol, Mr Leo, Khendy Key, and Elijah Tembo in African songs for nature, accessed via YouTube. The data were analysed through content analysis, focusing on the linguistic and thematic features of the texts to identify how they communicate STEM ideas and foster skills such as critical thinking and understanding. This study reveals the value of literary and artistic expressions in enriching STEM learning experiences. It reveals that the selected songs and poems serve as effective instructional tools, appealing to diverse intelligence types, particularly the musical and linguistic, thereby embedding complex STEM concepts in memorable, accessible formats. The findings demonstrate that incorporating songs and poems in STEM curricula can significantly enhance students' understanding of STEM content, build foundational STEM skills, and promote a more inclusive and engaging learning environment. This interdisciplinary approach underscores the importance of blending arts and sciences to inspire innovation and lifelong interest in STEM fields.

Keywords: Songs and Poems, STEM education, STEM awareness, STEM skills, Functionalism, Multiple Intelligences Theory.

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1. Introduction

In today's rapidly evolving world, Science, Technology, Engineering, and Mathematics (STEM) education has become central to equipping students with the skills needed for innovation, critical thinking, and problem-solving (Sanders, 2009; Widya et al., 2019). STEM education is a teaching and learning method that integrates the content and skills of science, technology, engineering, and math, and entails providing opportunities for students to be innovators, inventors, self-confident, logical thinkers, technologically literate, and able to solve problems. While STEM programmes have been widely adopted globally, a significant challenge remains: the tendency to prioritise technical content over holistic, interdisciplinary learning. This often leads to the marginalisation of the arts and humanities, despite growing evidence that these disciplines play a vital role in fostering creativity, communication, and deeper understanding (Sousa & Pilecki, 2013). Historically, the separation of STEM from the arts has been justified by the belief that scientific subjects are inherently more practical and valuable. However, scholars argue that a balanced education integrating both the objective rigor of science and the sensory appeal of the arts cultivates more adaptable and innovative thinkers (Sousa & Pilecki, 2013). The United Nations policy brief on STEM Education in Africa (2022) further highlights the need for multidimensional skills, emphasising that successful STEM education should connect learning to real-world experiences.

Despite the well-documented benefits of STEM education in preparing students for the demands of the 21st century, current STEM curricula, particularly in Africa, continue to marginalise the arts and humanities. This disciplinary divide limits the adoption of holistic, interdisciplinary teaching approaches (Sanders, 2009; Sousa & Pilecki, 2013; United Nations, 2022). Existing research shows that integrating the arts, such

as music and poetry, into science classrooms can enhance student engagement, memory retention, and conceptual understanding (Furlan et al., 2007; Heiss, 2024; Hustad, 2022). However, most educational interventions still focus primarily on technical achievement, with limited investigation into how artistic forms such as songs and poems can promote STEM awareness and skill development across diverse student populations (Kibar Sungur Gül et al., 2023).

Despite these promising findings, the integration of arts into STEM, often referred to as Science, Technology, Engineering, Arts, and Mathematics (STEAM), is not being sufficiently discussed. STEAM education integrates the arts, including visual arts, music, literature, and drama, into the traditional STEM curriculum to foster creativity, critical thinking, and innovation by encouraging interdisciplinary connections. This approach aims to produce well-rounded learners better equipped to solve complex, real-world problems. Kibar Sungur Gül et al. (2023) note that most STEM interventions still focus on technical achievement, with limited attention to approaches that leverage the strengths of multiple intelligences. Howard Gardner's Multiple Intelligences Theory provides a convincing framework for this integration, suggesting that students' diverse cognitive strengths, including musical and linguistic intelligences, can be harnessed to deepen STEM learning.

The core problem this study addresses is the persistent underutilisation of songs and poems as pedagogical tools in STEM education, particularly in African contexts such as Cameroon. Despite evidence that arts integration (STEAM) boosts engagement and retention, STEM curricula remain rigid and technical, sidelining accessible, culturally resonant forms like local songs and poems. This gap results in low STEM awareness, reduced motivation among diverse learners (e.g., those strong in musical/linguistic intelligences), and missed opportunities to make abstract concepts relatable via rhythm, metaphor, and narrative. Without targeted exploration of these tools, STEM teaching fails to leverage

multiple intelligences or real-world cultural resources, perpetuating disinterest and inequity in STEM uptake (Kibar Sungur Gül et al., 2023; Sousa & Pilecki, 2013).

Specifically, the research gap addressed by this study concerns the insufficient exploration of songs and poems as pedagogical tools in STEM education. While the potential of arts integration is acknowledged, there is a lack of targeted research on how these specific literary and musical forms can make STEM content more accessible, memorable, and engaging, especially in African contexts where such interdisciplinary methods remain underutilised. Recent studies emphasise that songs and poems have long served as powerful tools for communication, memory, and the transmission of complex ideas (Okafor, 1991; Furlan et al., 2007). In classrooms, these forms can make abstract STEM concepts more accessible, particularly for students who might struggle with traditional methods. Poetry and music have been found to enhance scientific understanding, facilitate memory retention, and boost motivation by making STEM content more relatable and enjoyable (Heiss, 2024; Hustad, 2022).

The following research questions guided the analysis of songs and poems for STEM awareness promotion: How do selected Cameroonian songs and poems convey STEM concepts (e.g., scientific inquiry, ecological interconnectedness) through linguistic and thematic features? In what ways do these artistic forms function as pedagogical tools to promote STEM awareness, skills, and engagement, per functionalism and multiple intelligences theories? What implications do these findings hold for integrating songs and poems into African STEM curricula to foster inclusive learning?

The significance and originality of this study lie in its focus on how songs and poems, as artistic and literary forms, can be employed to promote STEM awareness and skill development. Unlike previous research and

practice that treat arts and sciences as separate domains, this study evaluates the benefits of their intersection, offering new insights into effective, engaging pedagogy for 21st-century learners. The primary aim of this research is to demonstrate that selected songs and poems are effective pedagogical tools for building STEM skills, fostering creativity, and promoting a more inclusive and engaging STEM learning environment.

2. Methods and Theoretical Framework

This study employed a qualitative research design to explore how songs and poems can be used as effective pedagogical tools to promote STEM awareness and skill development among students. This section proceeds in two main phases. Firstly, it presents a methods subsection detailing the data selection, content analysis procedures, and ethical considerations. Then secondly, it presents a theoretical framework, outlining the complementary application of functionalism and Howard Gardner's Multiple Intelligences theory to interpret how these artistic forms function educationally and engage diverse learner strengths

2.1. Methods

The data consisted of selected songs and poems authored by a Cameroonian poet and some musicians, focusing on those that convey STEM concepts or encourage scientific thinking. These artistic works were sourced from secondary materials, particularly the printed anthology by Ekpe Inyang titled *Tastes of Nature* (2022), Bobe Yerima AfoAkom's song, *Our Environment/Njang Manjong*, and collaborators Ben Pol, Mr Leo, Khendy Key, and Elijah Tembo in *African song for nature* accessed through the YouTube digital platform. The selection of data was purposive, with passages that engage with STEM themes included. Using content analysis, the study examined the linguistic and thematic elements of the selected songs and poems to identify how they facilitate understanding of STEM content and foster relevant skills such as critical

thinking and technological literacy. Ethical considerations were minimal as the data are publicly available artistic works.

2.2. Theoretical Framework

The analysis was guided by functionalism and multiple intelligence theories, focusing on the social functions of these art forms in education and their capacity to engage multiple mental strengths in learners. Functionalism, rooted in the sociological work of Emile Durkheim, focuses on understanding social phenomena by examining their roles, purposes, or functions within a system (Durkheim, 1912/2014). It posits that every element of society contributes to its stability and continuity by fulfilling specific functions (Parsons, 1951; Merton, 1968). In the context of education, Functionalism views learning tools and cultural artifacts as serving critical social functions such as socialisation, knowledge transmission, and the reinforcement of shared values (Alexander, 2017). Recent scholarship has extended Functionalism to emphasise the dynamic role of cultural products in shaping educational outcomes and social change (Friedman & Hechter, 2020; Ritzer, 2019). Building on Bascom's (1954) four primary functions of oral literature, namely, escapism, cultural validation, pedagogy, and social control, this study applies Functionalism to understand how songs and poems function as educational instruments within STEM learning environments. Specifically, these art forms can facilitate cognitive engagement by making abstract STEM concepts accessible and memorable, reinforce cultural values related to innovation, curiosity, and problem-solving, serve as pedagogical devices that build critical thinking and creativity, and promote social cohesion by fostering a shared appreciation for STEM knowledge and its applications.

While Functionalism offers valuable insights into the roles and purposes of songs and poems in education, it tends to emphasise social order and stability, overlooking individual learner differences and the complex

nature of learning processes in some contexts, such as Cameroon (Alexander, 2017). It sometimes also underappreciates the emotional and affective dimensions of arts integration in STEM, which are critical for motivation and creativity. For these reasons, Howard Gardner's Multiple Intelligences Theory (MIT) complements the functionalism framework. It posits that intelligence is not a single, fixed attribute but a set of diverse cognitive capacities, including linguistic, musical, logical-mathematical, spatial, bodily-kinaesthetic, interpersonal, intrapersonal, and naturalistic intelligences (Gardner, 1983; Gardner, 2011). This theory challenges traditional, narrow definitions of intelligence and advocates for educational approaches that engage multiple intelligences to optimise learning. In the context of this study, MIT provides a framework for understanding how songs and poems, engaging primarily linguistic and musical intelligences, can enhance STEM learning by appealing to students' varied cognitive strengths. Integrating the arts into STEM, resulting in STEAM, enables educators to create more inclusive and effective learning environments that foster creativity, problem-solving, and critical thinking (Chen et al., 2021; Sousa & Pilecki, 2013). Recent studies affirm that leveraging multiple intelligences in STEM education improves student motivation, retention, and conceptual understanding (Kim et al., 2020; Lee & Park, 2022). Songs and poems, as multisensory and multimodal tools, align well with this approach, enabling learners to internalise complex STEM concepts through rhythm, metaphor, and narrative. Despite its popularity, MIT has faced criticism for lacking strong empirical validation and for its broad, sometimes ambiguous categorisation of intelligences (Waterhouse, 2006; Visser et al., 2006). Additionally, practical challenges arise in fully implementing MIT-based curricula, including resource constraints and teacher preparedness (Chen et al., 2021). In this study, while Functionalism foregrounds the social and educational functions of songs and poems, MIT highlights cognitive diversity and learner engagement.

3. Results and discussions: Thematic preoccupation in songs and poems in STEM

Themes in literary works reflect the ideas and motivations that drive artistic expression. This study examines how the selected songs and poems with STEM-related content serve as pedagogical tools that make learners notice, value, understand, and become more interested in STEM subjects. Through selected songs and poems, two recurring themes are sourced out: the scientific inquiry process and technology valorisation, and the Value and interconnectedness of species.

3.1. Scientific Inquiry Processes and Technology Valorisation

The theme of scientific inquiry emerges as a central thematic concern in Inyang's (2022, p.4) poem "Asteroids", foregrounding curiosity, observation, and the search for explanations about the natural world and the universe. The poem stages a moment of scientific alert and reflection, as the speaker contemplates the asteroid's trajectory and its dangerous proximity to Earth, thereby modelling the core processes of scientific inquiry, such as questioning, hypothesising, and interpreting data, characterising scientific practice. "Asteroid" reveals this scientific practice through the following lines:

> Great minds have been seeing you tumbling down
> in space, but now one of you – so big –
> as quite close to earth, after billions of years
> in its endless journey steadily on its orbit. (Inyang, 2022, p. 4).

The poem "Asteroids" translates complex cosmological phenomena into vivid and emotionally charged images. This artistic translation not only makes key ideas in physics and astronomy more accessible to learners but also models attitudes such as wonder, caution, and intellectual humility that underpin effective scientific thinking. For instance, "Asteroids" uses celestial motion to illustrate principles of physics and astronomy. The poem narrates the near-collision of an

asteroid with Earth, framing it as a consequence of a disturbed or altered orbit:

> I hear you're named Asteroids, scattered
> pieces of rocks in space after that primordial blast –
> The Big Bang! Some of you are larger than earth,
> and you're now in near collision with Earth (Inyang, 2022, p.4)

The excerpt above from the poem expands the theme of scientific inquiry by combining precise scientific allusion with imaginative language. The line "I hear you're named Asteroids, scattered / pieces of rocks in space after that primordial blast – / The Big Bang!" (Inyang, 2022, p. 4), situates the poem clearly within a scientific cosmology, introducing learners to core ideas about the origin of the universe and the nature of asteroids as remnants of an early explosive event. The reference to "the Big Bang" functions as a great scientific lesson, revealing a key cosmological theory through a memorable poetic frame. The description of asteroids as "scattered pieces of rocks in space" invites students to visualise debris fields and orbital paths, encouraging observational imagination and conceptualisation typical of scientific inquiry. Also, while the clause "Some of you are larger than Earth" raises questions about the scale, the phrase "you're now in near collision with Earth" raises questions about motion and distance. These questions motivate and prompt learners to think about gravitational forces, impact risk, and planetary vulnerability.

Moreso, the next lines extend and deepen the poem's treatment of scientific inquiry, risk, and human agency:

> I guess it was a most forbidden hug
> sending chills down the spines even
> of great minds - top scientists – who know and say
> just an inch of a shift from an orbit can cause a collision. (Inyang, 2022, p. 4).

The metaphor of a "most forbidden hug / sending chills down the spines even / of great minds – top scientists" intensifies the earlier image of the asteroid's dangerous approach to Earth. The "hug" suggests contact and

intimacy, but its "forbidden" nature implies a violation of cosmic order, reinforcing the sense that this close encounter is both unnatural and perilous. The fact that even "top scientists" feel "chills" underlines the gravity of the situation and dramatizes the limits of human control in the face of vast cosmic forces. Here, the metaphor of a "forbidden hug" personifies gravitational forces, transforming abstract planetary concepts into relatable imagery. This aligns with research by Gurnon et al. (2013), who argue that poetic devices like metaphor and narrative can simplify complex scientific ideas, making them more accessible to learners. The poem employs vivid imagery and personification to transform an abstract scientific phenomenon, the near-collision of an asteroid with Earth, into a dramatic and relatable event.

The choice of the word "hug" is particularly evocative because it contrasts the usual warmth and affection associated with a hug against the destructive potential of an asteroid impact. This juxtaposition invites reflection on the delicate balance within the universe and the fragility of life on Earth. The poem evokes emotional responses, such as fear of collision and admiration for scientists, but it also reinforces the societal value of STEM fields in addressing global challenges (Lee & Park, 2022). The tone of the poem is a blend of awe and apprehension, as can be seen in the speaker's declaration, "sending chills down the spines even / of great minds, top scientists." This emphasises the gravity of the event, highlighting that even expert with profound knowledge and understanding are unsettled by the asteroids near damage. This effect elevates the significance of the event and underscores the limits of human control over natural forces. The mood created is one of suspense and wonder, engaging learners emotionally and intellectually. It prompts curiosity about the scientific principles governing celestial bodies and the potential consequences of their interactions with Earth.

The poem succinctly introduces key STEM concepts: asteroids as "pieces of rocks in space" originating from a "primordial blast," and this alludes to the formation of the solar system and the remnants of cosmic events. The "near collision" references orbital mechanics and gravitational forces, foundational topics in physics and astronomy. These scientific ideas are embedded within poetic language, making the poem serve an educational function by creating complex content that is accessible, memorable, and revealing of multiple intelligences. This aligns with research suggesting that metaphor and narrative in poetry can enhance comprehension and retention of STEM concepts (Gurnon, Voss-Andreae, & Stanley, 2013). The passage also implicitly celebrates scientific endeavour, as the mention of "great minds, top scientists" acknowledges the role of human intellect and perseverance in confronting cosmic challenges. This dual focus on wonder and scientific responsibility encourages learners to appreciate the relevance of STEM fields in addressing real-world issues.

The next lines dramatize a cluster of rhetorical questions that intensify the poem's enactment of scientific inquiry by slowing down the narrative and forcing both speaker and reader into a moment of analytical reflection:

> What would it mean to life – especially us – on earth?
> What really caused your derailment from orbit,
> Violating the law of physics? Thank goodness,
> Those great minds guided you back and away onto orbit. (Inyang, 2022, p. 4).

The rhetorical questions in the above stanza clearly stage scientific inquiry within the poem. These questions mirror the core steps of scientific reasoning: considering consequences, seeking causes, and invoking the "law of physics" as a reference point for understanding deviation and anomaly. They invite readers to think alongside scientists about impact scenarios, orbital mechanics, and causality, thereby modelling the dispositions of curiosity, hypothesising, and critical reflection that are central to STEM thinking. Particularly, the question "What would it mean to life – especially us – on earth?" shifts

the focus from the purely astronomical event to its biospheric and human implications, echoing how scientists assess risk not only in terms of celestial mechanics but also in terms of potential impact on ecosystems, infrastructure, and human survival. When the speaker asks, "what really caused," the poet implicitly invokes the need for evidence, hypotheses, and models that can explain deviations from expected behaviour, in this case, an asteroid's stable orbit. Also, the reference to the "law of physics" positions scientific laws as normative baselines against which anomalies are measured, reinforcing learners' understanding that science is built on regularities that make prediction and explanation possible. Pedagogically, these questions do more than describe; they invite learners to participate in the cognitive work of science. They are further encouraged to imagine possible mechanisms for orbital change (gravitational perturbations, collisions, human intervention) and to think through chain reactions from a minor "inch of a shift" to catastrophic impact, thereby informally rehearsing risk-assessment thinking used in astrophysics and planetary defence. This mirrors classroom practices where learners are asked to anticipate outcomes, propose explanations, and test ideas against known principles.

Furthermore, the lines "Thank goodness, / Those great minds guided you back and away onto orbit / In time to avert another apocalypse, just in time / To prevent the imminent celestial war" (Inyang, 2022, p. 4), shift the tone toward relief and celebration of technological and scientific intervention. Scientists are portrayed as "great minds" capable of recalibrating the asteroid's path, symbolically "guiding" it back into a safe orbit. This image presents science as an institution that protects collective survival and restores order in moments of potential catastrophe. It also reinforces a STEM narrative of problem-solving and resilience, showing how human knowledge and technology can avert disaster.

The reference in the next lines to “another apocalypse” and “the imminent celestial war, the type / known to have blasted earth, millennia / ago, into its current form, content and place” links present danger to deep time and planetary history. The poem here compresses geological and cosmological knowledge into a compact, dramatic image: earlier cosmic collisions and cataclysms “blasted” Earth into what it is today. This allusion subtly invokes scientific theories about asteroid impacts, mass extinctions, and the shaping of Earth’s surface, encouraging readers to connect literary imagery with concepts from astronomy, geology, and evolutionary science. For STEM instruction, this means that “Asteroids” can be used as an entry point into lessons on astronomy and physics, where learners first engage with the poem’s imagery and questions, and then formalise these ideas through scientific vocabulary, diagrams, and problem-solving tasks.

From a functionalist perspective, “Asteroid” illustrates how a poem can perform clear social and educational functions. It informs readers about the structure and history of the universe, warns of potential cosmic threats, and implicitly reinforces the societal importance of scientific monitoring and preparedness. Through the dramatization of a near-collision scenario, the poem cultivates a shared sense of risk and dependence on scientific knowledge, thereby sustaining values of vigilance, rational inquiry, and trust in scientific institutions. In this sense, “Asteroids” operates as a cultural instrument that stabilises society by encouraging informed awareness of environmental and cosmic dangers and by validating the role of science in managing them.

From the Multiple Intelligences perspective, the poet activates several types of intelligence in the poem. The first one is the linguistic intelligence, which is engaged through the crafted phrasing (“scattered pieces of rocks,” “primordial blast”), exclamation (“The Big Bang!”), and the poetic narrative voice that “hears” and names the asteroids. Also,

logical mathematical intelligence is invoked by references to comparative size ("larger than earth"), motion ("near collision"), and the causal logic linking the primordial blast to present-day celestial debris. Then the naturalistic intelligence is inspired when the poet invites learners to categorise and understand asteroids as a class of natural objects within the broader cosmic environment. Astrophysical content is presented in the poem through vivid metaphor and narrative, exemplifying how artistic forms can appeal to multiple intelligences at once, thereby deepening comprehension and retention of STEM concepts.

Bobe Yerima Afo-Akom's song "Our Environment" in *Njang Manjong* also enacts the processes of scientific inquiry, but does so implicitly, as can be seen in the lyrics of the song:

> Our environment.
> Make we lookot am fine
> Awoh ahh. 2x
> Make we plant more trees.
> For constant water supply
> No water no life.
> …
> At a time when mankind and nations are crying for salvation
> The struggle to fight against climate change and protect the ozone layer
> Is the duty of al for dangers await. (2022, 0:50-0:53 minutes)

The call to "lookot am fine" is more than a casual glance; it suggests systematic observation of the environment, akin to the first step in scientific investigation, where phenomena are noticed, described, and problematised. The link between "plant more trees" and "constant water supply" encodes an if–then logic that reflects causal reasoning: trees help regulate the water cycle, prevent erosion, and sustain groundwater, so their reduction threatens water availability. Similarly, the reference to "climate change" and "protect the ozone layer" invokes established scientific explanations of global warming and atmospheric chemistry, signalling awareness of complex, evidence-based global processes. The musician's condensing of these relationships into accessible lines is his

way of using the song to invite listeners, especially STEM learners, to ask questions like, why does tree planting affect water? How do human activities influence the climate and the ozone layer? These questions mirror those asked in scientific inquiry across environmental science, climatology, and geography. Thus, the song functions as a trigger for curiosity, hypothesis formation, and reflection on human–environment interactions.

From a functionalist perspective, the song disseminates ecological knowledge, problematises harmful practices, and orients the community toward informed, sustainable behaviour. The poem's vision resonates with Sousa and Pilecki's (2013) assertion that arts-integrated STEM, that is, STEAM curricula, can inspire students by linking scientific rigor to creative expression. Some researchers have suggested that artistic representations of technology foster technological literacy and an innovative mindset in learners, key components of 21st-century STEM education (Kim et al., 2020; Chen et al., 2021). In this song, it helps maintain social and ecological stability by embedding scientific concerns in a culturally resonant artistic form.

Although the song foregrounds traditional practices like tree planting, the lines about "the struggle to fight against climate change and protect the ozone layer" recognise the role of modern environmental science and technology. Fighting climate change and safeguarding the ozone layer involves scientific monitoring (satellites, atmospheric measurements), technological innovation (clean energy, less harmful refrigerants), and policy tools informed by STEM research. In the song, the musician names these global issues and so valorises scientific and technological efforts led by many scientists and institutions.

From a functionalist standpoint, the song thus reinforces the legitimacy and necessity of environmental science and technology as institutions that protect the social and ecological order, while also calling on ordinary

citizens to join that struggle through everyday practices such as planting trees and caring for water sources. Also, the song links to multiple intelligence theories as it strongly activates linguistic, musical, and naturalistic intelligences. The Pidgin–English code-switching ("Make we lookot am fine", "No water no life") engages linguistic intelligence through rhythm, repetition, and culturally familiar phrasing, making scientific and environmental content memorable and emotionally resonant. The musical setting (repetition, chant lines) taps into musical intelligence, aiding recall and collective performance, while the focus on trees, water, climate, and ozone directly engages naturalistic intelligence, which concerns the classification and understanding of natural systems. In "Our Environment", environmental science is not delivered as an abstract text but as a song, enabling learners to internalise relationships such as "trees–water–life" and "human activity–climate/ozone" through sound, rhythm, and culturally embedded language. This is exactly the kind of multimodal, arts-integrated learning that can make STEM concepts more accessible and enduring.

In classroom practice, these songs can anchor units on ecology and climate change, with learners analysing the lyrics to identify ecological relationships and then designing local conservation projects or simple investigations that respond to the environmental issues named in the songs

3.2. The value and interconnectedness of species

A significant thematic preoccupation in STEM-related songs and poems selected for this study is the value and interconnectedness of species within ecosystems. The poems and songs selected praise and explain the interdependence of living organisms, emphasise their ecological roles, and the importance of harmony in nature. Through vivid imagery and metaphor, the poems and songs serve as accessible educational tools that foster environmental literacy, a key component of STEM education (Anderson et al., 2018).

The theme of the value and interconnectedness of species is strongly foregrounded in Bobe Yerima Afo-Akom's "Our Environment". It presents a web of relationships in which water, trees, humans, and the broader biosphere are mutually dependent. The line "Make we plant more trees /For constant water supply / No water no life" compresses a chain of ecological connections: trees help to regulate the water cycle and protect soils; reliable water means the survival of plants, animals, and humans; and the loss of any element in this chain destabilises the others (Anderson et al., 2018). The song asserts water as a shared lifeline across species, implicitly affirming that human wellbeing cannot be separated from the health of the ecosystems that sustain it (Folke et al., 2016). Afo-Akom's deliberate use of code-switching, combining Pidgin English with Standard English, serves several important literary and pedagogical functions that affirm the communal values of the interconnectedness of species. The Pidgin phrases such as "Make we lookot am fine" and "Awoh ahh" evoke a conversational, communal tone that identifies with local audiences, grounding the song in cultural reality and accessibility. This dialect invites students into a shared dialogue about environmental stewardship, fostering inclusivity and engagement, which are essential skills in STEM. The repetition of "Make we plant more trees" emphasises urgency and collective responsibility, employing a rhythmic, chant-like quality that aids learners in memorisation and transmission. The phrase "No water, no life" is a concise and powerful aphorism that reveals a fundamental ecological truth in a simple, memorable line, reinforcing the critical link between water conservation and survival.

The song also frames "mankind and nature" as crying "for salvation," suggesting that humans and non-human species are caught together in a common crisis rather than standing in opposition. This connection-in-crisis effect dilutes any strict divide between humanity and "the environment," presenting them instead as co-sufferers within a single threatened system (Berkes, 2018). The call to "lookot am fine" and to care

for “Our environment” thus becomes a call to protect an intricate living network in which trees anchor soils, water nourishes all life, and climate stability underpins the survival of multiple species. In this way, the song teaches learners to see environmental issues not as isolated problems, but as disruptions to an entire fabric of interdependent species and processes, an understanding that lies at the heart of ecological thinking in STEM education (Anderson et al., 2018; Folke et al., 2016).

The song further focuses on traditional ecological knowledge when it highlights tree planting as a longstanding cultural practice vital for sustaining water supplies, preventing soil erosion, and ensuring food security, an integral traditional ecological practice linked to the worldview and survival strategies of indigenous peoples and local communities. It reveals a discussion among many researchers about the fact that traditional ecological knowledge encompasses a body of knowledge, practices, and beliefs developed and transmitted over generations within indigenous and local communities about their relationships with the environment. Also, it includes place-based, culturally embedded sustainable resource management practices aimed at maintaining ecological balance and ensuring environmental sustainability (Gordon & Krech, 2012; Kimmerer, 2013; Nelson & Shilling, 2018; Berkes, 2018; Jacobs, 2022). Tree planting, as revealed in the song, is therefore a longstanding cultural practice for sustaining water supplies, preventing soil erosion, and ensuring food security. This fits within the scope of this research as it reflects an empirical, adaptive strategy for environmental stewardship passed down through generations. It is an example of how communities use localised knowledge to manage natural resources sustainably and promote ecosystem health, which are core elements of traditional ecological knowledge. This emphasis reflects indigenous wisdom that aligns closely with contemporary environmental science, illustrating the continuity between cultural heritage and modern sustainability efforts (Berkes, 2018). The song’s repetitive

structure and simple, direct language make it an effective educational tool, especially for diverse audiences, including young learners. Also, repetition reinforces key messages about indigenous knowledge and helps learners retain and internalise environmental concepts crucial to STEM education.

In the collaborative piece "African song for nature" (Ben Pol, Mr Leo, Khendy Key, & Elijah Tembo, 2022) produced for WWF for Africa, the artists present a passionate call to halt environmental degradation, as they urge learners to protect freshwater sources, rivers, oceans, and the broader ecosystem. "The African song for nature" is a call, from nature, a call on everyone to stop the destruction of nature, a call for us to protect our land, our fresh water, rivers, and oceans, and Keep the environment and earth cleaner because the best of nature is disappearing, different species are no more. The song mourns the loss of biodiversity and warns of species extinction, reinforcing the urgency of conservation efforts that go a long way to connect species in a chain of survival. They sing passionately:

> Stop the destruction of nature,
> Protect our land and waters,
> Keep the earth clean and green,
> For future generations to live and dream. (YouTube video, WWF for Africa, 2022)

The song underscores the urgent need to halt ecological destruction, which reveals the value placed on the interconnectedness of species. The song's central theme is conservation, emphasising the protection of vital natural resources such as freshwater sources, rivers, oceans, and ecosystems in their interconnected web. The song invokes the responsibility to "stop the destruction of nature", as it directly appeals to listeners' sense of stewardship and collective action. The phrase "for future generations to live and dream" introduces the concept of intergenerational justice, a key principle in sustainability discourse. This forward-looking message encourages learners to consider the long-term consequences of environmental degradation, fostering a sense of

ethical obligation to preserve the planet for future generations. The song employs simple, direct language and a rhythmic, repetitive structure that enhances memorability and accessibility. The imperative verbs "Stop," "Protect," and "Keep" serve as urgent calls to action, mobilising the audience to actively participate in environmental preservation. The use of parallelism in the first three lines ("Stop the destruction… Protect our land… Keep the earth…") creates a powerful rhetorical effect, reinforcing the interconnectedness of natural elements and the comprehensive scope of conservation efforts. The imagery of "clean and green" evokes a vision of a healthy, thriving environment, appealing to both the aesthetic and practical values of nature. This imagery aligns with ecological principles taught in STEM fields, such as ecosystem health and biodiversity.

As a piece of environmental art, the song serves as an effective pedagogical tool by translating complex ecological concepts into accessible and emotionally resonant language. It raises awareness about biodiversity loss and species extinction, topics central to biology and environmental science curricula. Moreover, the song's emphasis on protecting "land and waters" highlights the interconnectedness of terrestrial and aquatic ecosystems, fostering holistic ecological understanding, a critical aspect of STEM education. Ben and Co.'s song encourages learners to develop environmental literacy and a proactive attitude toward sustainability challenges through conversation, recognizing it as a collective and urgent responsibility. It also reflects African cultural values of community and respect for nature, thereby enhancing the relevance and impact of STEM education in local contexts. The song serves as a powerful advocacy tool, inspiring environmental stewardship and scientific curiosity among learners (Miller, 2020). This aligns with the Multiple Intelligences theory, which posits that diverse cognitive strengths are activated when learning materials appeal to varied modalities (Gardner, 2011; Chen et al., 2021). A 2022 meta-analysis by

Lee and Park found that students exposed to arts-integrated STEM instruction demonstrated 23% higher retention rates and greater motivation to pursue STEM careers than those in traditional methods. So, the song acts as an urgent pedagogical tool on the importance of placing value to the interconnected web of species.

To further demonstrate the value and interconnectedness of species, Ekpe Inyang (2022) celebrates culturally misunderstood species like the owl, the bat, and the chameleon. In the poem "The Owl," Inyang challenges the common misconception of the owl as a symbol of evil or witchcraft, instead presenting it as a vital and graceful member of the ecosystem. The poem highlights the owl's remarkable physical features, its sharp eyes akin to an eagle's, silent flight, and ability to rotate its neck 360 degrees, and also lays emphasis on its ecological role as a natural predator controlling rodent populations:

> As a child I feared you and also
> associated you with witchcraft, but now
> I've learned about you, and I thank you (Inyang,
> 2022, p.26).

This transformation from fear to appreciation models how scientific understanding can dispel myths and promote respect for biodiversity. The idea revealed in this poem aligns with findings by Shepardson et al. (2007), who argue that cultural perceptions influence environmental attitudes, and that education through storytelling can shift misconceptions and foster pro-environmental behaviour.

Similarly, the poem "Bat and Cave" (Inyang, 2022, p. 31) explores the biology and ecological importance of bats. The speaker marvels at the bats' organised flight patterns and echolocation abilities, educating listeners about their mammalian traits and social behaviours:

> And you help us spread the seeds
> far and near like the elephant
> and other mammals and birds…
> keeping our forests rich and healthy,

to provide us with services from fruits and
fibers, air and water to leisure (Inyang, 2022, p.31).

This passage emphasises bats' role in seed dispersal and forest regeneration, illustrating the value of ecosystem services critical to environmental sustainability (Kunz et al., 2011). The fact that the poet embeds ecological facts within poetic form can go a long way to enhance learners' understanding of complex biological processes in an engaging manner.

In "Cry of the Woodpecker" (Inyang, 2023, p.73), the author engages in environmental advocacy and ecosystem protection. The woodpecker's voice conveys indignation and vulnerability in response to habitat destruction caused by human activity:

So now you're out to set your axe on one that makes
my nest?
That's not fair, not fair at all,
I've hardly come to yours.
Don't you know I too must survive and have a place
to live? (Inyang, 2022, p.73)

Through this anthropomorphic perspective, the poem humanises the woodpecker, giving it agency and a voice to protest environmental harm. The rhetorical questions and repetition of "not fair" emphasise the injustice of habitat loss, inviting readers to empathise with non-human life forms and hence accord it value. This literary device effectively raises awareness about the consequences of deforestation and habitat fragmentation, key issues in ecology and environmental science. The poem concludes with a call for unity among all species to protect shared habitats:

Now let's all make a sacred place
so we can live in peace;
danger may take us by surprise
if we don't think as one (Inyang, 2022, p. 73).

This appeal to collective responsibility reflects fundamental principles of ecosystem management and biodiversity conservation. It underscores the interconnectedness of all species and the necessity of cooperative stewardship to maintain ecological balance. The phrase "sacred place"

elevates the environment to a revered status, encouraging respect and protection. From a STEM education perspective, the poem reinforces critical concepts of environmental ethics, sustainability, and the importance of preserving biodiversity. It serves as a poignant reminder that human actions directly impact other species and that sustainable coexistence requires informed decision-making grounded in scientific understanding (Folke et al., 2016).

Like Afo-Akom in "Our Environment," who places value on the preservation of the environment, Inyang (2022, p.85) in "Ozone" personifies the ozone layer as a protective umbrella enveloping the Earth, shielding it from the sun's harmful ultraviolet (UV) radiation. This vivid metaphor transforms an abstract atmospheric phenomenon into a tangible and relatable image, making complex scientific concepts accessible to learners. The poem emphasises its crucial role in sustaining life on Earth by depicting the ozone layer as a guardian. The poem further educates readers about the environmental impact of chlorofluorocarbons (CFCs), chemicals commonly found in fire extinguishers, refrigerators, and aerosol sprays, that contribute to the degradation of the ozone layer. Through the naming of these specific human-made sources, the poem contextualises scientific knowledge within everyday experiences, fostering awareness of how individual and collective actions affect global ecosystems. This poetic treatment complements formal STEM instruction by bridging atmospheric science with environmental ethics and responsibility. It encourages learners to understand the interconnectedness of human technology and natural systems, highlighting the urgent need for sustainable practices to protect the planet. The poem aligns with scientific assessments such as those by the World Meteorological Organization (WMO, 2018), which document the ongoing challenges of ozone depletion and its implications for biodiversity and human health. The poem "Ozone" integrates poetic expression with

scientific facts, making it a powerful educational tool that enhances environmental literacy and motivates proactive stewardship.

Through vivid imagery, metaphor, and narrative, songs and poems analysed reveal the value of species and their interconnectedness, providing rich, multisensory learning experiences that deepen students' understanding of ecological principles and environmental challenges. Scientific facts are integrated with cultural expression through these works, promoting environmental literacy, critical thinking, and a sense of responsibility, which are core objectives of STEM education. As Anderson et al. (2018) highlight, arts-infused STEM learning can bridge cognitive and affective domains, fostering holistic education that prepares learners to address complex environmental issues.

4. Implications for STEM instruction, limitations, and future directions

This section synthesises the study's analytical insights and translates them into concrete directions for STEM teaching and curriculum design, while acknowledging the study's constraints. It first discusses the implications of using songs and poems as pedagogical tools for fostering STEM awareness, conceptual understanding, and learner engagement in diverse African classrooms. It then outlines key limitations related to the study's scope, data corpus, and methodological choices, indicating where caution is needed in generalising the findings and pointing to areas for further research

4.1. Implication for STEM instruction

The analyses above show how the selected songs and poems encode core STEM ideas such as scientific inquiry, orbital mechanics, ecological interdependence, and environmental ethics in accessible, culturally resonant forms. To make this pedagogical potential explicit, these texts can be integrated into STEM instruction through structured classroom activities that link literary analysis to scientific concepts. In practical terms, teachers can use the poems and songs as concept hooks, inquiry

prompts, modelling and communication tasks, to contextualise problem-solving and instruct learners on how to make ethical and value-based decisions in the STEM instruction process.

Instructors can introduce or revise topics such as the Big Bang, asteroids, climate change, the water cycle, biodiversity, or ozone depletion as concept hooks. For example, a physics teacher might begin a lesson on gravitational forces by reading “Asteroids,” asking learners to identify lines that refer to motion, orbit, and collision, and then mapping those images to formal scientific diagrams and equations. Also, as inquiry prompts, instructors can use rhetorical questions and metaphors in the texts to generate scientific questions. After engaging with “Asteroids,” learners can formulate testable questions such as “What happens if an asteroid’s orbit shifts slightly?” or “How do scientists detect near-Earth objects?” and then research or simulate answers using STEM tools and data.

Moreover, instructors can use literary texts to model and communicate tasks in class. They can, for example, ask learners to translate images and relationships from songs and poems into scientific representations such as graphs of orbits, food webs, water-cycle diagrams, or concept maps of greenhouse gases. Conversely, students can be asked to create their own short poem or song that explains a STEM concept, thereby consolidating understanding through linguistic and musical intelligences. Instructors can further contextualise problem-solving by using lines such as “Make we plant more trees / For constant water supply / No water no life” as starting points for quantitative or experimental tasks. For instance, learners might design a simple investigation or modelling activity on how vegetation cover affects runoff, groundwater recharge, or local temperature in their community.

Even discussions of ethics and values in STEM can begin from an artistic piece. For example, the environmental songs and poems foreground

responsibility to future generations, traditional ecological knowledge, and the value of non-human species. These elements can anchor classroom discussions, debates, or reflective writing on the ethical dimensions of climate action, conservation, and technological choices within science curricula. Through such activities, songs and poems do not merely contain STEM; they become instructional tools that structure lesson openings, inquiry phases, application tasks, and assessment of conceptual understanding. These instructional examples respond to calls within STEAM education to connect formal scientific content with learners' cultural resources, emotions, and everyday language, thereby supporting both the teaching and learning of STEM subjects among diverse student populations (Furlan et al., 2007; Heiss, 2024; Hustad, 2022; Kim et al., 2020; Lee & Park, 2022). The study therefore demonstrates that songs and poems can function as concrete pedagogical resources in STEM classrooms when teachers deliberately align textual features with curriculum goals. Rather than treating these works only as illustrations, educators can structure lesson phases around them, using them to diagnose prior conceptions, introduce and clarify core ideas, and support multimodal assessment. In African contexts, especially where oral and musical traditions are strong, this approach can increase relevance, participation, and conceptual understanding, addressing persistent challenges of low engagement and achievement in STEM subjects.

4.2. Limitations and Future Directions

While this study demonstrates the potential of songs and poems in STEM education, several limitations must be acknowledged, and they open promising avenues for future research. First, the analysis is based solely on textual and lyrical interpretation of a small, purposively selected corpus of Cameroonian poems and songs. It does not include classroom-based data such as lesson observations, learner assessments, or interviews with teachers and students. As a result, the study can argue

that these texts are potentially powerful STEM resources, but it cannot empirically demonstrate the extent to which they improve learners' test scores, problem-solving abilities, or long-term interest in STEM fields. Future studies could therefore design intervention projects in which teachers systematically integrate these songs and poems into physics, biology, or environmental science lessons, and then measure changes in conceptual understanding, retention, or attitudes over time using pre- and post-tests, concept maps, or attitude scales.

Second, the present analysis treats the songs and poems primarily as written texts, paying limited attention to the performative dimensions that are central to their impact in African contexts. In actual classrooms and communities, these works are usually sung, chanted, danced, or dramatized, with melody, rhythm, call-and-response, and bodily movement all contributing to engagement and memorability. This study has therefore underestimated the extent to which multisensory participation supports learning by not analysing these performance elements. Future research could, for example, compare a group of learners who only read the lyrics of "Asteroids" or "Our Environment" with another group who engage in full performance (singing, drumming, movement) and then examine differences in recall of key concepts such as orbital motion, the water cycle, or ecosystem interdependence. Video-based analysis and multimodal discourse analysis would also help capture how gesture, tone, and audience participation scaffold STEM meaning-making.

Third, the scope of the study is geographically and culturally specific, focusing on a limited set of Cameroonian and African texts. This contextual focus is a strength in terms of cultural relevance, but it limits the generalisability of the findings to other regions, languages, and educational systems. The ways in which learners respond to these songs and poems may differ in contexts where the languages, musical

traditions, or ecological concerns are not shared. Future research could therefore conduct cross-cultural comparative studies, for instance by analysing how African environmental songs function in East African versus West African classrooms, or by adapting similar arts-based approaches using local songs and poems in non-African settings and comparing learner responses. Such comparative work would clarify which aspects of arts integration are culturally specific and which are transferable across STEM curricula globally.

Finally, the study adopts a qualitative, interpretive approach grounded in functionalism and Multiple Intelligences Theory, which foregrounds meaning, function, and learner diversity but does not provide strong statistical evidence or experimental control. This theoretical and methodological choice means that the findings are rich in depth but limited in terms of causal claims. Future research could adopt mixed-methods designs that combine textual and performance analysis with quantitative measures of learning outcomes, or even experimental and quasi-experimental designs that compare arts-integrated STEM instruction with traditional approaches. Longitudinal studies following learners over several years would also help determine whether early exposure to STEM-related songs and poems influences later subject choices, career aspirations, or persistence in STEM pathways.

5. Conclusion

This study has demonstrated that songs and poems are powerful and versatile tools that can help learners notice, value, understand, and become interested in STEM, thereby enhancing STEM instruction. It analysed artistic works that embed STEM content, which clearly showed that these art forms enrich the learning experience in ways traditional STEM instruction often overlooks. Songs and poems provide a unique sensory and emotional dimension that makes complex scientific concepts more accessible, memorable, and engaging for learners. The findings

emphasise that songs and poems create cultural connection, facilitate memory, foster creative thinking, enable the communication of complex ideas, and so underscore the value of integrating the arts into STEM curricula to promote holistic and interdisciplinary learning. The study has revealed that such integration not only supports cognitive development but also nurtures the imaginative and communicative abilities critical for success in STEM fields. Therefore, STEM educators and curriculum developers are encouraged to actively incorporate songs and poems into teaching strategies, for example, by using them to introduce new topics, frame inquiry questions, scaffold conceptual explanations through metaphor and narrative, and assess understanding through creative student productions. These artistic expressions can bridge gaps in STEM content delivery and inspire students to engage more deeply with scientific knowledge. In conclusion, the arts, particularly songs and poems, hold significant promise for transforming STEM education by fostering a richer, more inclusive, and effective learning environment. Embracing this interdisciplinary approach can help cultivate the next generation of innovative thinkers and problem solvers essential for addressing the complex challenges of our time.

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