

Olokun Symbolism and Cosmological Infinity¹ (OSCI): Addressing the Axiomatic and Symbolic barriers to Mathematics and Physics Learning for African (American) STEM Students through Mandombe: Validating the Next Generation of African-Centered STEM Pedagogy

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Abstract

Axiomatic and ontological barriers to learning math involve students struggling with the foundational concepts that define mathematical systems and the abstract nature of mathematical objects and configuration spaces. The **axiomatic barrier** comes from difficulty with the rules and logic of building a system from basic axioms, while the **ontological barrier** stems from challenges with understanding the "existence" and nature of mathematical objects like numbers or points, which are abstract and can seem disconnected from reality (Banach-Tarski Paradox²). Both are compounded by the "**symbol barrier**," where students struggle with the abstract language and symbols used to represent these ideas.

Eurocentric pedagogical norms constitute a systemic barrier to success for African (American) STEM learners and have led to calls for novel African-Centered Education (ACE) models. While resultant proposals have successfully outlined necessary philosophical and cultural elements (e.g., Ma'at, examples of African contributions), the integration of ACE principles into scalable K-12 curricula faces a critical deficiency: the lack of a demonstrably effective set of culturally situated *cognitive instruments* that precisely measure and accelerate foundational skills like numeracy, symbolic decomposition, and spatial reasoning.

This paper reviews the literature on the Mandombe Cognitive Acceleration Paradigm, specifically referencing the empirical findings of *Early Childhood Math Learning Through Mandombe: A New Paradigm*³ and the ongoing *Phase-II Replication study*⁴ in the Democratic Republic of Congo (DRC). It proposes that the **Mandombe script**—an African Indigenous Information System (IIS) inherently structured around mathematical logic, matrices, and multidimensional relationships—provides the necessary tool to address this deficiency. The proven ability of Mandombe to yield measurable gains (an average increase of approximately thirty one percent) in early math and symbolic abstraction frames it as an ideal candidate for transitioning ACE-STEM from a conceptual framework to a scientifically verifiable national curriculum policy.

Keywords: *African-Centered Education (ACE), Mandombe, Cognitive Acceleration, Ethnomathematics, STEM Pipeline, Symbolic Cognition, Standard Model.*

¹ Benin Olokun Symbolism: From Spatio-Temporal Coordinates Into Infinity

² How a Mathematical Paradox Allows Infinite Cloning, Quanta Magazine

³ Early Childhood Math Learning Through Mandombe: A New Paradigm

⁴ Phase-II Replication of the Mandombe Cognitive Acceleration Paradigm in Congolese Primary Schools

Introduction: The Problem of Proving Value in African-Centered STEM

The article "Proposing African-Centered Education in STEM for African (American) STEM Learners" effectively articulates the stasis in contemporary STEM education: traditional curricula fail Black students because they are rooted in a European worldview that disregards African contributions and ways of knowing. The authors propose African-Centered Education (ACE) as the necessary revolution, emphasizing that centering the African experience, history, and philosophy will increase interest, participation, and learning.

However, the field now faces a profound intellectual instability. To achieve the systemic change envisioned by proponents of ACE, it must move beyond simply celebrating historical figures or teaching philosophical concepts like Ma'at and the Nguzo Saba—elements which, while necessary, function primarily as valuable *background*. For ACE to achieve widespread institutional legitimacy and curricular integration, it must demonstrate that African knowledge systems provide mechanisms for verifiable cognitive and academic enhancement that are superior or complementary to Eurocentric models.

The Cost of This Instability:

If ACE-STEM remains predominantly philosophical and historical (a "gap" filler), it risks failing to deliver the scalable, data-driven outcomes demanded by policy makers and educational systems. The resulting cost for the NSBE community and African (American) learners is the possible neglect or abandonment of ACE principles, as institutions may deem the approach insufficiently rigorous or lacking a robust, quantifiable foundation for improving student outcomes. The value of this paper is twofold: 1) to propose an Olokun Symbolic framework (OSCI) as an African centered cultural mnemonic rubric for efficiently relaying culturally equivalent western scientific concepts to African (American) STEM learners and 2) introduce a rigorously tested methodology within this rubric—the **Mandombe Cognitive Acceleration Paradigm**—which addresses this exact problem of scientific validation.

Olokun Symbolism and Cosmological Infinity⁵ (OSCI)

A new old way of seeing modern technology –

African peoples across the continent developed the earliest examples of information technology (e.g. math, language, expert (divination) systems etc.) They used these conceptual tools to preserve and communicate their knowledge. Their understanding of material science is evidenced by the artifacts they left behind. When we follow the themes found in many African cultures we find an understanding of symmetry, doubling, coupling and what physicist Jacob Barandes refers to as the “*indivisible stochastic*”⁶ (fluidic, probabilistic) nature of material physics.

⁵ Olokun Symbolism and Cosmological Infinity

⁶ A Simple Correspondence Between Stochastic Processes and Quantum Systems

Researcher Oluwatoyin Adepoju⁷ refers to this cosmological view as **Olokun Symbolism (OS)**: a set of cognitive processes and systems that describe/prescribe both our interaction with and observation of nature.

Cognitive Tools for Making The Invisible Visible⁸

This paper proposes the integration of several West, Central, and Northeast, African conceptual symbolic systems to produce an African-based yet universally applicable framework for conveying and understanding material physics and mathematics concepts. Among this toolset of culturally relevant cognitive mnemonics are:

Olokun Symbolic System	Western Symbolic System
Ifa (West African)	Standard Model
12 Odu "O"	12 Fermions
4 Odu "I"	4 Bosons
16 Primary Odu	16 Fundamental Particles

Khemenu/Ogdoad (Egyptian)	Quantum Physics
Nun (Primordial/chaotic watery abyss)	Wave Function, Indivisible Stochastic Processes
8 primordial deities	8 Gluons (mediating the Strong Nuclear Force)
Atum-Re	Particle-Wave Duality, Wave Function Collapse

Mandombe (Bantu-Congo)	Geometric Algebra, String Theory
Konde Grid (Structural Framework)	Metric Tensor/Lattice Structure
Singini (Dots)	Fundamental Particles
Mvuala (Strings)	Strings/Wave Functions (Ψ)
Mazita (Interactions/Transformations)	Feynman Diagrams/Adinkra Symbols

⁷ Founder, Director at CompCros : [Comparative Cognitive Processes and Systems](#)

⁸ MIT Quest for Intelligence. (2025, April 8). *Prof. Judy Fan: Cognitive Tools for Making the Invisible Visible*

Mandombe as a Foundational Cognitive Accelerator

To successfully integrate an ACE framework into K-12 STEM, educators must identify Indigenous Knowledge Systems (IKS) that possess intrinsic, verifiable mathematical and geometric logic. The Mandombe script, originating in the Congo region, functions not only as a means of communication but also as a scientific paradigm and a research medium across several scientific fields. It is an ideal instrument for bridging African culture and foundational STEM concepts because it encodes core mathematical concepts such as spatial symmetry, recursion, balance, transformation, ratio, mirroring, and pattern recognition. This aligns directly with the core themes of duality, reciprocity, balance, and symmetry present in broader African cosmological expression, such as Ma'at.

Empirical Evidence of Cognitive Acceleration

Two distinct, yet highly complementary, studies provide the empirical basis for integrating Mandombe as a foundational component of ACE-STEM:

1. Early Childhood Math Learning Through Mandombe: A New Paradigm This study established Mandombe as a new paradigm for early childhood mathematics education.

- The Intervention: A Mandombe-based pedagogy was implemented over ten weeks with 120 preschool learners (aged five to seven), involving visual writing practice and shape manipulation tasks.
- The Result: The intervention group showed measurable gains in numeracy, spatial reasoning, and symbolic abstraction compared to the control group. Crucially, the intervention group demonstrated an average increase of approximately thirty one percent on the composite score.
- Implication for ACE-STEM: This validates that early symbolic geometry, facilitated by Mandombe writing, serves as a culturally grounded structure for introducing numerical concepts and rule-based reasoning. This directly addresses the need to develop a K-12 Black engineering pipeline using African ways of knowing.

2. Phase-II Replication of the Mandombe Cognitive Acceleration Paradigm This ongoing research deployment demonstrates the scalability and rigor required for curriculum integration.

- The Goal: The Phase-II replication extends foundational work that established Mandombe as a cognitive accelerator. The study is being conducted in ordinary schools across multiple provinces of the DRC.
- Methodological Strength: Unlike smaller initial studies, this replication is ecology-based (in real classrooms), multi-lingual, and employs finer-resolution cognitive measurement instruments.
- Status and Policy: The early 2-week interim report showed directional patterns consistent with the original foundational outcomes. The research is explicitly intended to serve as the scientific base for a national policy conversation on curriculum integration in the

DRC and justify the establishment of a doctoral school dedicated to Mandombe epistemologies and cognitive science.

These results provide the quantitative assessment data (e.g., student gains in numeracy and symbolic abstraction) previously absent from generalized ACE proposals.

Framing Mandombe as a Case Study in African Scientific Cosmology

The Mandombe script provides an ideal case study for this linkage, moving the concept of African contributions from historical acknowledgement to applied scientific modeling.

Mandombe and Foundational Physics Concepts:

Mandombe’s geometric structure and components correlate effectively with advanced physical concepts, framing it as an optimal candidate for an indigenously African epistemological framework:

Mandombe	Scientific Analogy	Function/Concept in Physics
Konde Grid (Graph Paper)	Metric Tensor	Defines the geometry of spacetime and distances in a higher-dimensional context. The Konde Grid serves as a conceptual tool to understand multidimensional relationship tracking in modern computational architectures.
Mvuala (Lines)	Strings/Wave Functions	Represent paths, connections, and the vibration of matter (open strings/closed strings) within the metric tensor (Kondi Grid). This concept is key to both string theory and quantum mechanics.
Singini (Dots)	Fundamental Particles	The irreducible building blocks of the symbolic system, analogous to quarks, leptons, or photons.
Mazita (“Knots”)	Feynman Diagrams, Adinkra Symbols	Encode particle interactions and supersymmetry relationships, visualizing transformations and cognitive organization.

The correspondences presented here function as pedagogical or conceptual analogies that help build intuition around complex scientific structures; they are not intended as literal physical derivations.

Culturally Structured Thought: Utamawazo

My own personal experience with the Mandombe Cognitive Acceleration Paradigm has been profound. It has inspired me to return to school and continue pursuing my B.Sc. IT degree. Exposure to the script has accelerated my studies and allowed me to visualize relationships between concepts and systems that facilitate rapid transdisciplinary application. This paper is a result.

It is my experience that through linking Mandombe's geometry to particle physics and computation, this approach harnesses the 'Utamawazo' (the cultural structuring of thought) of students of African descent. The benefits of this approach have also been demonstrated in classrooms on the continent and throughout the diaspora⁹.

This deep engagement with cultural mathematical heritage functions as a "special language" that makes complex technical concepts, such as parallel processing (seen in the Connection Machine/hypercube architecture) and tensor computation easier to understand.

Conclusion and Call for Action.

The proposal for African-Centered Education in STEM is not revolutionary because it merely suggests using African knowledge; it is revolutionary because it redefines the epistemological foundation of pedagogy itself. The central flaw in current implementation strategies is the failure to identify and validate scalable Indigenous Information Systems (IIS) that function as quantifiable cognitive accelerators.

The OSCI framework, in particular the Mandombe Cognitive Acceleration Paradigm resolves this problem by providing an African-centered pedagogical tool framework that is:

1. Empirically Measured: Demonstrating significant, specific gains in math and symbolic reasoning (31% increase in composite score).
2. Scalable and Rigorous: Currently undergoing large-scale, multi-lingual, ecology-based replication using high-resolution metrics to justify national policy integration.
3. Foundational to Physics and Computing: The underlying logic of the script links directly to modern concepts of spacetime, quantum fields, and parallel computing architectures.

We urge the NSBE B.E.S.T. Journal community to leverage these findings, transitioning the ACE discourse from necessary theoretical *proposals* to verifiable research publications. The true cost of ignoring this verified pedagogical model is the perpetuation of the instability—allowing Eurocentric models to dictate the criteria for excellence, even within African-centered dialogue. Further research, possibly in the form of a case study incorporating Mandombe elements into the Conscious Ingenuity curriculum, is necessary to measure the impact of this established cognitive accelerator on the self-efficacy and academic outcomes of African-American STEM learners, thereby completing the proof-of-concept for the ACE revolution.

⁹ [africanews. \(2024, October 10\). Mandombe writing gains popularity in DRC amid controversy](#)

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