JOURNAL OF CULTURAL ANALYSIS AND SOCIAL CHANGE

Journal of Cultural Analysis and Social Change,
2025, 10(2), 4316-4322
ISSN: 2589-1316

# Exploring the Alignment of Zulu Beadwork Symbolism with Life Sciences Pedagogy

Buthelezi Penelope Zamashenge Gugulethu[1*]

[1] *University of Zululand, SOUTH AFRICA, ORCID: https://orcid.org/0009-0008-7171-4701*

*Corresponding Author: ButheleziP@unizulu.ac.za

**Citation:** Gugulethu, B. P. Z. (2025). Exploring the Alignment of Zulu Beadwork Symbolism with Life Sciences Pedagogy, *Journal of Cultural Analysis and Social Change*, 10(2), 4316-4322. https://doi.org/10.10.64753/jcasc.v10i2.2268

**Published:** November 23, 2025

## ABSTRACT

This study explores how Zulu beadwork symbolism can be integrated into Life Sciences pedagogy to promote a culturally responsive teaching and epistemic inclusion. The study is underpinned by Ubuntu theoretical framework. This study is qualitative, using ethnographic approach to explore learners lived experiences and cultural connections in Life Sciences education. This qualitative design approach is grounded in interpretivist paradigm, data were generated through co-teaching with Zulu elders (n = 6), researchers' classroom observations and learners' semi-structured interviews (n = 24) in Empangeni. Findings revealed that beadwork's colour meanings and structural patterns parallel key biological concepts such as body systems, cellular structure, ecological interdependence and reproduction. The study argues that integrating indigenous semiotic (signs, symbols, and meaning making) systems such as beadwork, enriches learners' conceptual understanding and strengthens cultural identity in Life Sciences classrooms.

**Keywords:** Zulu Beadwork, Indigenous Knowledge Systems, Life Sciences Pedagogy, Cultural Symbolism, Decolonial Education, Ubuntu

## INTRODUCTION

In African education contexts, the integration of Indigenous Knowledge Systems (IKS) into science curricula is an essential decolonial act (Le Grange, 2019). It challenges Eurocentric epistemologies that marginalise local knowledge forms and instead celebrates cultural heritage as a source of scientific insight. Among the Zulu people, beadwork (ubuhlalu) functions as both aesthetic art and a complex communication system. Each bead, colour, and pattern encodes meaning about life, morality, and relationality (Xulu, 2002; Biyela, 2013).

This study examines how the symbolic system of Zulu beadwork can align with and enrich Life Sciences teaching. It asks:

1. How do Zulu elders interpret the colour and pattern symbolism in beadwork as reflections of life processes?
2. How do learners and teachers experience the integration of beadwork symbolism into Life Sciences lessons?

## THEORETICAL FRAMEWORK

In the context of Life Sciences education, this study draws on Ubuntu epistemology and Culturally Responsive Pedagogy (CRP) (Gay, 2018) to inform teaching and learning practices. Ubuntu, with its emphasis on relationality and interdependence, resonates deeply with ecological and biological principles, where organisms, populations, and ecosystems are interconnected and mutually reliant for survival. By foregrounding these

relational principles, life sciences teaching can cultivate learners' understanding of both human and natural systems as dynamic and interdependent. Similarly, CRP supports the integration of learners' cultural knowledge, experiences and expressive practices into science education, making biological concepts more accessible and meaningful. For example, learners' traditional ecological knowledge, observations of local flora and fauna, and community practices can be used as entry points for exploring broader biological principles, thereby bridging scientific content with culturally grounded ways of knowing.

## METHODOLOGY

### Research Design

A qualitative, interpretive design was employed to explore participants' meanings and experiences. The research took place in Empangeni, KwaZulu-Natal, South Africa, where Zulu beadwork remains a living cultural practice.

### Participants

The study employed purposive sampling to select participants who possessed deep cultural insight and relevant educational experience. The sample comprised six respected Zulu elders, all women aged between 55 and 84 years, recognised within their communities as skilled craftswomen and diviners. Their inclusion was intentional, as they hold extensive indigenous knowledge systems that connect symbolism, colour, and biological understanding. In addition, three Life Sciences teachers, each with over five years of classroom experience teaching Grades 10–12, were selected to provide perspectives on how indigenous knowledge can be integrated into formal Life Sciences curricula. Although teachers were involved, no data was collected from them. Finally, twenty-four Grade 10–11 learners (aged 15–18 years) from three different schools were included to capture youthful interpretations and learning experiences. The purposive selection ensured that all participants could meaningfully contribute to the exploration of intersections between indigenous symbolism and Life Sciences education.

### Data

- Co-teaching with elders explored bead colour meanings, symbolism and moral values.
- Researchers' Classroom teaching and observations documented teaching sessions where beadwork was used to model biological systems.
- Semi-structured interviews with Grade 10-12 learners.

Storytelling and interviews were conducted in isiZulu, transcribed, and translated into English. Data were thematically analysed adapted by researcher to Saldana's (2024) coding system.

## FINDINGS

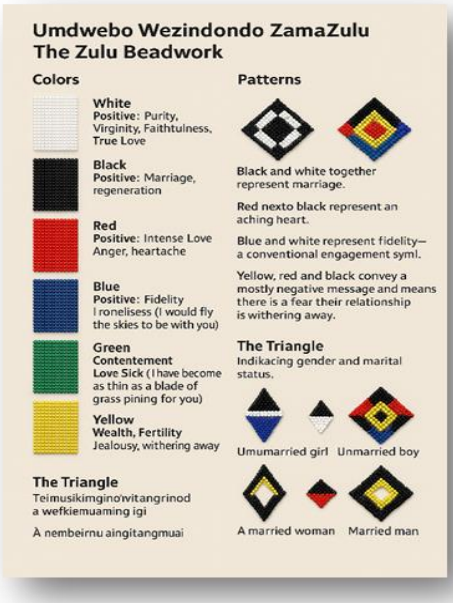
### Elders' Interpretations: Beadwork as the Pattern of Life

**Beads are t**he ornaments of a woman, not just for beauty, but for memory too. "In the past, when **izincwadi zothando** (love letters) did not exist, Zulu women in South Africa in rural settlements would express

their love and intentions for marriage through **ubuhlalu** (beadwork)," says Elder 5, 84 years. "**Ubuhlalu besiZulu** refers to necklaces and other jewellery made with colourful beads. Every shade in the beadwork holds meaning, a language through colour that the **umbhali** (artist/author) carefully uses to send a specific message.

The **ubucwebe** (jewellery) may not speak with words, but it reflects **imizwa**(emotions), desires, and moods of a **intombi** (young woman) or **insizwa** (young man)."


Elders described beadwork as a "language of life", a reflection of natural cycles and moral order. One elder stated: "Each colour speaks of what is living and what is dying; green tells of new life, red of life's strength, and black of resting or ending." (Elder 2, 55 years)

The elders consistently linked colours to life processes, growth (green), circulation and emotion (red), balance and rest (black), and fertility (yellow). These associations mirror biological principles observable in natural systems. For instance, **green**, symbolising *growth* (Elder 3, 65 years), which in this context resonates with the role of chlorophyll in plants. The pigment responsible for photosynthesis and the sustenance of nearly all life on Earth. Just as green plants capture sunlight to produce energy, the elders viewed the colour as representing vitality, regeneration, and the cyclical renewal of life.

Similarly, **red**, associated with *circulation and emotion* (Elder 5, 70 years), in this study, aligns with the biological significance of blood in the human body. Blood carries oxygen and nutrients essential for sustaining life, just as emotions and social bonds circulate within a community to maintain its vitality. The pulsing movement of blood can be metaphorically compared to the rhythm of collective life in an ecosystem, continuous, dynamic, and interconnected.

The colour **black** is interpreted as *balance and rest* (Elder 6, 80 years). In this context, it corresponds to biological processes such as homeostasis and dormancy. In ecosystems, rest periods like night cycles or seasonal dormancy in plants and animals are essential for restoration and equilibrium. The elders' understanding of black as a colour of stillness and grounding echoes the scientific appreciation of balance in physiological and ecological systems.

**Yellow**, symbolising *fertility and abundance* (Elder 1, 79 years). This finds a clear parallel in reproductive biology. The colour often appears in pollen, fruits, and flowers, all of which signify reproductive maturity and genetic continuation. Just as yellow flowers attract pollinators to sustain plant populations, the elders associated the colour with productivity, lineage, and the continuity of life.

Furthermore, bead shapes such as **triangles and diamonds** were understood to represent *family structures and interdependence.* (Elder 4, 60 years). In this context, this symbolism aligns closely with the biological concept of **systems organisation**, where different components work together to form a cohesive, functioning whole. For example, in an ecosystem, producers, consumers, and decomposers form an interdependent web, much like the interconnected points of a beaded triangle symbolising kinship and support. In cellular biology, organelles cooperate within a cell to maintain life, reflecting how traditional beadwork conveys harmony and unity within diversity.

**Imibala Nezincazelo Zobuhlalu bakwaZulu:**

| **Umbala (**Colour**)** | **Okuhle (**good omen**)** | **Okubi (**bad omen**)** |
|---|---|---|
| **Mhlophe (**White**)** | Ubuqotho, UbuNgcwele, Ukuthembeka, Uthando Lwangempela | **Akukho** (none) |
| **Mnyama (**Black**)** | Umshado, Ukuvuselelwa | **Usizi, Ukufa, Ukuphelelwa ithemba** (sorrow, suffering and death) |
| **Bomvu (**Red**)** | **Kuvutha uthando** (Burning love) | **Ulaka, Ukuhlupheka kwenhliziyo** (anger, heartache) |
| **Oluhlaza okwesibhakabhaka (**Blue**)** | **Ukuthembeka** (Trustworthiness) | **Ukudabuka** (misery) |
| **Oluhlaza kotshani (**Green**)** | **Ukwenela** (Satisfaction) | **Ukugula ngenxa yothan**do (love sickness) |
| **Ophuzi (**Yellow**)** | **Umnotho, ukuzala** (Wealth, birth) | **Umona, Ukuphela kothando** (jealousy,love ending) |

**Colour Patterns in Beads**

- Black and white together: Wedding
- Red next to black: broken hearted
- Sky blue and white: trustworthiness (keeping a vow)
- Yellow, red and black together: Symbolise fear and the end of a relationship.

**Isixande (Triangle):** Symbolises gender/weddings or marital status
In traditional triangular shaped beads, three lines stand for:

- **Ubaba (**father**)**
- **Umama (**mother**)**
- **Ingane (**child**)**

Gender and marital status identification depends on the elevation of a particular area of the rectangle:

| **Isimo Sesixande** | **Incazelo** |
|---|---|
| Ithiphu ibheke phezulu | Intombazane engakashadi |
| Ithiphu ibheke phansi | Insizwa engakashadi |
| Idayimane (izixande ezimbili ezihlangene) | Owesifazane oshadile |
| Imithiphu ihlangana phakathi (inhlanga yesibali) | Indoda eshadile |

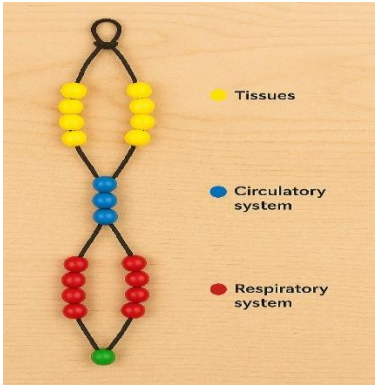
**Decorative Idea:**

- ***Borders:*** They dress in the traditional colours such as white, black, red, and green.
- ***Patterns:*** They used drums and lines that were square shaped along the edge.
- ***Background:*** A white/green background, which reflects nature and the heritage of the nation.

**Integration of Beadwork in Life Sciences Practical**

A researcher and Life science teachers incorporated beadwork in three Life Sciences topics to make abstract concepts tangible and culturally meaningful:

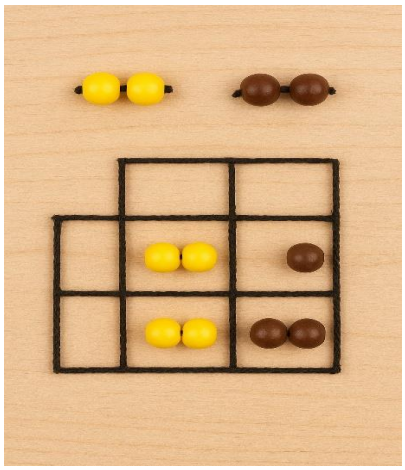
***a. Cell Structure***



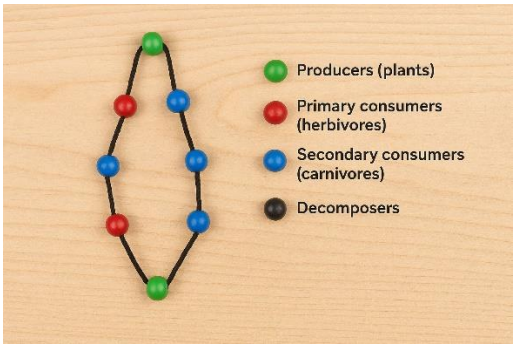
Each bead represented an individual cell, while clusters of beads illustrated tissues. Learners created necklaces where each section symbolised a different organ system, for example, a string of blue beads for the circulatory system and red beads for the respiratory system. During practical, learners could physically rearrange beads to show how cells form tissues, tissues form organs, and organs form systems, helping them visualise the hierarchy of biological organization.

***b. Genetics***



Colour-coded beads represented dominant and recessive traits. For instance, yellow beads could represent a dominant eye colour, and brown beads a recessive trait. Learners worked in pairs to model simple Punnett squares using bead strings, showing how traits are inherited from parents to offspring. By physically combining beads, learners could "see" genetic variation and predict possible offspring outcomes, making abstract Mendelian concepts concrete.

***c. Ecology***




Bead necklaces in this study can be used to model food webs. Producers can be represented with green beads (plants), primary consumers with red beads (herbivores), secondary consumers with blue beads (carnivores), and decomposers with black beads. Learners may link beads to show energy flow between organisms, observing how the removal or addition of one bead (species) affected the entire web. This hands-on method enables learners to connect ecological principles to real-life ecosystems in their communities, reinforcing interdependence and balance in nature.

**Table 1:** Beadwork Guide for Life Sciences Practical

| Topic | Bead Colour/Structure | Concept Illustrated | Classroom Activity Example |
|---|---|---|---|
| Cell Structure | Each bead = 1 cell; clusters = tissues | Hierarchy of biological organization: cells → tissues → organs → systems | Learners create necklaces: e.g., a cluster of blue beads for heart tissue, linked with red beads for blood vessels to show the circulatory system. They can rearrange beads to simulate organ system interactions. |
| Genetics | Colour-coded beads: e.g., yellow = dominant trait, brown = recessive trait | Mendelian inheritance; dominant and recessive traits | Learners form bead pairs to represent parental alleles. By combining beads, they simulate Punnett squares to predict offspring |

| | | | |
|---|---|---|---|
| | | | traits (eye colour, hair type). |
| Ecology (Food Webs) | Green = producers, Red = primary consumers, Blue = secondary consumers, Black = decomposers | Energy flow and interdependence in ecosystems | Learners create a necklace food web, linking beads to show predator-prey and producer-consumer relationships. They can remove a bead to see the effect on the ecosystem. |

**Practical Implementation Tips**

- ***Cell Structure:*** Use different bead sizes to represent different cell types (e.g., small = epithelial, large = muscle).
- ***Genetics:*** Encourage learners to create multiple "offspring" bead strings to observe variation.
- ***Ecology:*** Introduce local plants and animals in bead colours to connect learning to the learners' environment.

Observation notes recorded high engagement and learner collaboration. Teachers noted that learners "saw the science in their culture," resulting in improved participation and deeper conceptual discussion.

**Learner Responses:** Pride, Connection, and Conceptual Understanding

Learners reported feeling a strong sense of pride when their culture was used to explain scientific concepts. Their response analysis showed three emergent themes:

- Cultural pride and identity affirmation
- Improved comprehension through visual symbolism
- Greater engagement and interest in Life Sciences

| Learner Responses | Themes | Subthemes | Conceptual Insight |
|---|---|---|---|
| "It made me feel that my grandmother's work has science in it, because the beads reminded me of the patterns she uses when we learn about plants." (Female, Grade 10) | Cultural Pride & Identity Affirmation | Recognition of ancestral knowledge | Learners connect scientific concepts to familial and cultural practices, enhancing relevance and self-esteem. |
| "I felt proud using beads to show photosynthesis. Green beads for leaves, yellow for sunlight and blue for water, it connected what I learned in class to nature around me." (Female, Grade 15) | Cultural Pride & Identity Affirmation | Emotional connection to learning | Learners experience pride and personal relevance, which increases motivation and engagement in Life Sciences. |
| "I could understand the topic of cells better when we used beads, because I saw how each bead connects the parts of the body." (Male, Grade 11) | Improved Comprehension Through Visual Symbolism | Tangible representation of abstract concepts | Visual and tactile aids help learners grasp complex biological structures like cells. |
| "Making DNA models with coloured beads made it easy to see how the sequence works and how traits are passed on." (Male, Grade 27) | Improved Comprehension Through Visual Symbolism | Tangible representation of abstract concepts | Hands-on models clarify abstract concepts such as DNA structure and genetic inheritance. |
| "I could differentiate organelles in the cell when each bead colour represented a different part, it felt like I could touch science." (Female, Grade 23) | Improved Comprehension Through Visual Symbolism | Multisensory learning | Using colour and touch enhances memory and understanding of cell organelles. |
| "Constructing the digestive system with beads in order taught me how nutrients move through the body." (Male, Grade 10) | Improved Comprehension Through Visual Symbolism | Cognitive mapping | Learners map biological processes step by step, improving comprehension of systems-level biology. |
| "Teaching my peers about nerve signals using beads to represent different neurotransmitters made me confident." (Female, Grade 24) | Greater Engagement & Interest | Knowledge sharing and communication | Peer teaching reinforces understanding and builds learners' confidence and communication skills. |
| "I used beads to model the skeletal system, with colours representing different bone | Greater Engagement & Interest | Active participation in learning | Learners develop structural understanding and systemic thinking through hands-on |

| | | | |
|---|---|---|---|
| types. It made me see the structure clearly and understand how everything fits together." (Male, Grade 12) | | | construction. |
| "I noticed patterns in our local environment, like flower petals and matched them with bead arrangements, helping me understand symmetry in biology." (Male, Grade 19) | Improved Comprehension Through Visual Symbolism | Cognitive mapping | Learners connect classroom content to environmental observations, reinforcing pattern recognition and critical thinking. |

Learners who initially viewed science as "Western" began to describe it as "something that lives in us," reflecting a shift toward epistemic inclusion.

## DISCUSSION

The findings affirm that Zulu beadwork operates as a semiotic model (signs, symbols, and meaning making) parallel to scientific systems, reinforcing conceptual interdependence and biological thinking. Integrating such symbolism enhances learners' ability to visualise and contextualise abstract scientific ideas.

This aligns with literature on IKS in science education (Ogunniyi, 2007; Le Grange, 2019), which advocates for co-existence of multiple epistemologies. Elders' insights reveal an indigenous understanding of biology rooted in spirituality, aesthetics, and ethics, offering a holistic view of life that complements reductionist scientific explanations.

## CONCLUSION

Zulu beadwork is both art and knowledge, a living metaphor for life's interconnectedness. When educators draw on such indigenous semiotic systems, they transform Life Sciences teaching from abstract content into culturally grounded meaning-making. This approach validates learners' heritage, supports conceptual understanding, and affirms Ubuntu as a guiding philosophy for decolonial education.

Further research should expand this work into participatory curriculum design, co-created with elders and teachers, to sustain intergenerational knowledge exchange in science education.

## REFERENCES

Biyela, N. G. (2013). Colour metaphor in Zulu culture: Courtship communication in beads. American International Journal of Contemporary Research, 3(10), 40–49.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589–597.

Gay, G. (2018). Culturally responsive teaching: Theory, research, and practice (3rd ed.). Teachers College Press.

Le Grange, L. (2019). Decolonising the Science Curriculum in South Africa. South African Journal of Higher Education, 33(6), 1–15.

Ogunniyi, M. B. (2007). Teachers' stances and practical arguments regarding a science–indigenous knowledge curriculum. International Journal of Science Education, 29(8), 963–986.

Xulu, C. B. S. (2002). Colour coding and its meaning in Zulu women's beadwork in fashion design and decoration. (Master's thesis, University of Zululand).