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Engaging Indigenous Elders in Co-Teaching to Support Pre-Service Life Sciences Teachers' Integration of Indigenous Knowledge on Medicinal Plants: A Qualitative Ethnobotanical Study in KwaZulu-Natal

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ABSTRACT

This study explores how co-teaching with Indigenous elders can support pre-service Life Sciences teachers in meaningfully integrating Indigenous Knowledge (IK) about medicinal plants into their classroom practice. Set in KwaZulu-Natal, where plant-based healing remains deeply embedded in cultural life, the research recognises elders as custodians of generational wisdom and essential partners in science education. Guided by a qualitative ethnobotanical approach framed within an interpretivist paradigm. The study engaged traditional healers, community elders, and pre-service teachers through semi-structured interviews, focus group dialogues, and collaborative teaching sessions. Field observations complemented these engagements to capture both pedagogical interactions and cultural nuances surrounding medicinal plant use. Data were analysed thematically to uncover patterns of knowledge exchange, perceptions of legitimacy, and the pedagogical value of elder involvement. Findings reveal that co-teaching created spaces of epistemic respect, where scientific and Indigenous ways of knowing could coexist and inform each other. Pre-service teachers reported a deeper appreciation of local biodiversity and cultural dimensions of health, which strengthened their understanding of Life Sciences content and its community relevance. The study concludes that involving Indigenous elders in teacher education enriches pedagogical practice, enhances cultural responsiveness, and contributes to the decolonisation of science education. It further advocates for sustained partnerships between universities and Indigenous knowledge holders to preserve, validate, and teach the rich medicinal plant heritage of KwaZulu-Natal.

Keywords: Indigenous Knowledge, Co-Teaching, Life Sciences Education, Ethnobotany, Medicinal Plants, Pre-Service Teachers, Kwazulu-Natal, Decolonising Education

INTRODUCTION

Traditional medicine remains a cornerstone of primary healthcare for many Indigenous communities in South Africa (Mbelebele, Mdoda, Ntlanga, Nontu & Gidi, 2024) In KwaZulu-Natal, the use of medicinal plants is deeply embedded in Zulu cultural heritage. Despite rapid modernization and the growing influence of Western biomedicine, Indigenous Knowledge Systems (IKS) continue to shape health-seeking behaviours, particularly in rural and peri-urban areas where access to formal healthcare is limited. Within these communities, the preparation and use of medicinal plants are not merely therapeutic acts but are intertwined with spirituality, ancestral guidance, and ecological understanding. This study seeks to examine the traditional uses and reported efficacy of 11 medicinal plants known for their frequent use in local healing practices. By grounding the research in the lived experiences and oral histories of Indigenous knowledge holders, this work also aims to contribute to the decolonization of Life sciences curriculum, ethnomedicine and the preservation of biodiversity.

However, despite the depth of this Indigenous wisdom, its representation within formal Life Sciences education remains limited (Sunzuma et.al, 2025). The dominant Western science curriculum often marginalises Indigenous ways of knowing, thereby distancing pre-service teachers from the cultural contexts that shape learners' understandings of the natural world. This disconnection risks reproducing epistemic hierarchies that privilege Western scientific knowledge over local knowledge traditions. To address this gap, the author Gugulethu (2025) posits a need for pedagogical models that honour both Westernized science and IK epistemologies. Acknowledging that the study of medicinal plants provides a rich interface where biology, culture, and traditional healing converge.

One such model is co-teaching with Indigenous Elders, where Elders are positioned as co-educators and knowledge partners in teacher education (Nsuzuma et.al., 2025). Their participation not only enriches the scientific understanding of medicinal plants but also offers pre-service teachers' authentic insights into the cultural, ethical, and ecological dimensions of Indigenous Knowledge. Through shared teaching experiences, pre-service teachers learn to value oral knowledge systems, recognise the science embedded in traditional practices, and cultivate respect for the communities they will one day serve as educators.

Research Problem

Although Indigenous Knowledge of medicinal plants is widely practiced and valued within KwaZulu-Natal communities, it remains underrepresented in formal Life Sciences teacher education. Pre-service teachers often graduate with limited understanding of how to integrate Indigenous perspectives into scientific curricula, leading to teaching that overlooks the cultural realities of learners. The absence of structured collaboration between universities and Indigenous knowledge holders perpetuates this divide. There is thus a pressing need to explore how engaging Indigenous Elders as co-teachers can facilitate the integration of Indigenous Knowledge into Life Sciences education and foster culturally responsive pedagogical practice.

Research Aim

This study aims to explore how co-teaching with Indigenous Elders can support pre-service Life Sciences teachers in integrating Indigenous Knowledge of medicinal plants into their teaching practice.

Research Objectives

a. To document the traditional uses and reported efficacy of selected medicinal plants commonly used in KwaZulu-Natal communities.
b. To explore how co-teaching with Indigenous Elders facilitates the exchange of Indigenous and scientific knowledge about medicinal plants.
c. To contribute to decolonising Life Sciences education by developing culturally responsive approaches that recognise Indigenous knowledge holders as co-educators.

Conceptual and Theoretical Framework

This study is grounded in **Ubuntu philosophy**, **Indigenous epistemologies**, and **decolonial theory**, which collectively frame how knowledge, identity, and pedagogy are understood within Indigenous and scientific worldviews. These lenses affirm that education is not merely a transfer of content, but a relational and moral practice rooted in community, respect, and interconnectedness.

Ubuntu as a Pedagogical Ethic

Ubuntu, expressed in the isiZulu phrase *umuntu ngumuntu ngabantu* ("a person is a person through others"), provides an ethical foundation for this study (Buthelezi, 2025). It emphasises relationality, compassion, and shared humanity as the essence of knowledge transmission. Within an Ubuntu-informed classroom, learning becomes a collective act where Elders, teachers, and students engage as co-learners. Co-teaching with Indigenous Elders thus reflects the spirit of Ubuntu where wisdom is shared, not owned. Where learning acknowledges the humanity and lived experiences of all participants. This approach reclaims education as a communal process that restores respect for Indigenous voices historically silenced in formal schooling.

Indigenous Epistemologies

The authors Gugulethu, (2025) and Melo, (2025) opined that Indigenous epistemologies refer to the ways of knowing that emerge from lived experiences, oral traditions, and the intimate relationships between people, nature, and spirit. In the Zulu worldview, medicinal plants are not seen merely as biological specimens but as living beings with spiritual and ecological significance. Knowledge of these plants is acquired through observation, storytelling, and intergenerational knowledge transmission rather than through laboratory experimentation alone. By situating medicinal plant knowledge within these epistemologies, this study recognises that science exists in multiple forms, including those embedded in Indigenous cosmologies, ethics, and ecological stewardship.

In this framework, co-teaching serves as a bridge between epistemic worlds. It allows pre-service teachers to witness how Indigenous knowledge holders make sense of natural phenomena. Offering insight into how Life Sciences concepts such as plant physiology, ecology, and health can be contextualised within local cultural frames. This approach not only diversifies knowledge but also humanises science education by situating it within community experience.

Decolonial Theory

Decolonial theory provides the critical lens through which this study interrogates whose knowledge counts in science education. Rooted in scholars such as Fúnez-Flores et.al., (2025) and Joshi, Mansfield, Ting & Hubbard, (2024), decoloniality challenges the dominance of Eurocentric epistemologies and calls for the re-centring of Indigenous knowledge systems within education. It recognises that colonisation has not only dispossessed Indigenous peoples of land but also of epistemic agency, the right to define, validate, and teach one's own knowledge. Through this lens, co-teaching with Indigenous Elders is viewed as an act of epistemic justice. It challenges the notion of the teacher as the sole authority and acknowledges the Elder as a living archive of knowledge. In this sense, the classroom becomes a decolonial space, one that validates oral traditions, reclaims cultural dignity, and bridges Indigenous and Western scientific knowledges in mutually respectful dialogue.

Together, these frameworks position this study within a transformative pedagogical paradigm. Ubuntu provides the ethical foundation of relational learning. Indigenous epistemologies ground the content in cultural and ecological authenticity. Decolonial theory provides the critical lens for unsettling hierarchies of knowledge. The intersection of these lenses supports an integrative Life Sciences education. One that values both scientific inquiry and Indigenous wisdom as coexisting and complementary pathways to understanding the natural world.

Literature Review

Previous ethnobotanical studies in Southern Africa have documented the therapeutic use of local flora, yet often from a biomedical or pharmacological perspective, marginalizing the indigenous worldview. Scholars like Buthelezi (2025) draws attention to the importance of situating plant use within socio-cultural and spiritual contexts that support the decolonial transformation of the Life Sciences curriculum. Furthermore, the World Health Organization (WHO) recognizes traditional medicine as a vital component of global health care, advocating for integrative approaches that respect indigenous systems.

1. Indigenous Knowledge and the Teaching of Life Sciences

Indigenous Knowledge Systems (IKS) represent rich cultural practices, ecological insights, and moral values that have sustained African communities for generations. In South Africa, IKS forms an integral part of the national education agenda, recognised in policy frameworks such as the National Curriculum Statement (NCS) and Curriculum and Assessment Policy Statement (CAPS), which call for the inclusion of Indigenous perspectives in science and Life Sciences education. However, despite this policy recognition, research shows that implementation remains fragmented and superficial (Lefora, 2024).

Many pre-service and in-service teachers express uncertainty about *how* to integrate Indigenous Knowledge into science classrooms meaningfully (Mkhwebane, 2024; Mavuru, 2025). This uncertainty often stems from a lack of exposure to authentic Indigenous knowledge holders during their teacher preparation. Consequently, Indigenous knowledge tends to be treated as an "add-on" to scientific content rather than as an epistemology (Baker, Ataria, Ankeny & Bray, 2024).). In Life Sciences education, this disconnection is particularly visible in topics such as human physiology, plant biology, and health, where the study of medicinal plants offers a natural bridge between Indigenous and scientific knowledge domains.

2. Medicinal Plants as a Site of Knowledge Integration

Medicinal plants serve as living texts through which the relationship between humans and the environment can be explored. In Zulu traditional healing, plants such as *Sutherlandia frutescens* (cancer bush), *Hypoxis hemerocallidea* (African wild potato), and *Artemisia afra* (African wormwood) are valued not only for their biochemical efficacy but also for their symbolic and spiritual roles in maintaining health and harmony. Ethnobotanical studies in

KwaZulu-Natal (Khoza, 2024; Madlala & Shange, 2025) affirm that such plants hold both medicinal and cultural significance.

Integrating this knowledge into Life Sciences teaching invites learners to view plants as more than biological specimens, they become agents of heritage, ecology, and identity. This aligns with the call by scholars like Gugulethu,(2025) for contextually relevant science education that values the lived experiences of learners and their communities. When learners recognise their community knowledge reflected in the curriculum, science becomes more meaningful and less alienating.

3. Co-Teaching and the Role of Indigenous Elders

Co-teaching, broadly defined as a collaborative teaching arrangement between two or more educators, has been widely used in inclusive education (Vembye,Weiss & Hamilton, 2024) but has gained new relevance in Indigenous and decolonial pedagogy. In the context of IKS integration, co-teaching with Indigenous Elders allows for reciprocal learning between Western-trained educators and Indigenous knowledge holders. Elders embody community wisdom, cultural authority, and lived experiences that cannot be replicated through textbooks or secondary sources (Adjei & Dei, 2025).

Studies in teacher education show that co-teaching with Elders helps pre-service teachers move beyond tokenistic inclusion of IKS by situating learning in *relational practice*. Elders' storytelling, ritual demonstrations, and explanations of medicinal plant use model holistic ways of knowing that integrate biological, spiritual, and ethical dimensions. This form of co-teaching also helps dismantle epistemic hierarchies, allowing Indigenous knowledge to stand besides, rather than beneath Western science.

4. Decolonising Science Education

Decolonisation in education involves more than content substitution; it requires the transformation of pedagogy, power relations, and epistemic assumptions. In Life Sciences, decolonising the curriculum means recognising that knowledge about living systems is not the sole domain of Western science. But is embedded in Indigenous cosmologies that are ecological, spiritual, and moral (Gugulethu, 2025).

Integrating Indigenous Knowledge through co-teaching with Elders thus becomes a pedagogical act of decolonisation, one that restores Indigenous agency in defining, teaching, and validating knowledge. This approach also aligns with the Fourth Industrial Revolution (4IR) demands for culturally responsive, sustainable education that values local ecological intelligence (Kruger, 2024). When pre-service teachers engage in such decolonial spaces, they not only learn *about* Indigenous Knowledge but also *from* it, developing humility, empathy, and cultural competence.

METHODOLOGY

Research Design

This study adopted a qualitative ethnobotanical design (Dean, 2024), framed within an interpretivist paradigm (William, 2024). The ethnobotanical approach was chosen for its strength in exploring how people understand, use, and value plants within their cultural context. By combining ethnobotanical documentation with educational inquiry, the study sought to uncover both the *scientific and pedagogical dimensions* of Indigenous medicinal plant knowledge.

Research Setting, Sampling and Participants

The study was conducted in selected rural and peri-urban communities of KwaZulu-Natal, South Africa. Indigenous Elders and traditional healers (izinyanga and izangoma) participants were recruited through community networks, local traditional healer associations, and referrals (*snowball sampling*). Prior community engagement meetings were held to establish trust and clarify the study's purpose, ensuring cultural appropriateness and consent. A purposive sampling strategy was also employed to select participants with deep, experience-based knowledge of medicinal plants alongside pre-service Life Sciences teachers enrolled in a Bachelor of Education programme at a loca university as well as the Life sciences education lecturer (researcher) who facilitated the co-teaching sessions (Nyimbili & Nyimbili, 2024). Furthermore, purposive sampling was employed based on willingness to engage in knowledge-sharing processes.

Participants in the study were carefully identified based on specific cultural and experiential criteria. They were recognized by the community as traditional healers, herbalists, or elders possessing extensive medicinal plant knowledge. Each participant was actively involved in the preparation, use, or teaching of traditional remedies and demonstrated a willingness to engage in open, respectful dialogue within cultural and ethical boundaries. A total of ten participants were selected, consisting of two Traditional Healers (izinyanga/izangoma) with formal initiation and practice under ancestral or mentor guidance; three Herbalists who specialized in plant-based remedies without

necessarily engaging in divination; and five Community Elders (abantu abadala) who served as custodians of oral knowledge, offering generational insights into the use of plants and their broader cultural context.

Data Collection Methods

Data were gathered through a combination of qualitative methods that allowed for rich, contextual insights into the integration of Indigenous Knowledge in Life Sciences education. Semi-structured interviews were conducted with Indigenous elders and traditional healers to document the traditional uses, methods of preparation, and perceived therapeutic efficacy of selected medicinal plants. These interviews provided deep cultural and experiential understandings of plant-based healing practices within Zulu communities. To capture the educational dimension, focus group discussions were held with pre-service Life Sciences teachers, enabling them to reflect on their experiences and learning processes during co-teaching sessions with elders. Complementing these interactions, field observations were conducted during co-teaching activities and community field visits, where attention was given to classroom interactions, pedagogical strategies, and the expression of cultural knowledge. Additionally, photographic documentation and detailed field notes were used to record the ecological settings of the medicinal plants studied, providing visual and descriptive evidence that enriched the interpretation of both the ethnobotanical and pedagogical findings.

Researcher Positionality

As a Life Sciences education researcher working within the decolonial turn, the researcher occupied a reflexive position, balancing the roles of learner, observer, and participant. Acknowledging the privilege of academic authority, this study consciously sought to create spaces where Indigenous Elders' voices were central, respected, and not translated merely into Western scientific terms. This relational stance echoes the Ubuntu ethic that underpins the study.

Trustworthiness

To ensure trustworthiness, data triangulation, member checking, and reflexive journaling were employed. Ethical approval was obtained from the university's research ethics committee, and cultural protocols were observed when engaging with elders, including seeking permission from traditional authorities and offering customary tokens of respect (Ahmed, 2024).

Data Collection and Presentation

Research Objective 1: To document the traditional uses and reported efficacy of selected medicinal plants commonly used in KwaZulu-Natal communities.

Documentation of the plant medicinal uses and reported efficacy of selected medicinal plants commonly used in KwaZulu-Natal communities was implemented to address the first objective of the study. Below is a curated list (Fischer et.al., 2025) and IK keepers' narrations of indigenous medicinal plants found around KwaZulu-Natal highlighting their traditional uses and significance within local communities. These plants are integral to the region's ethnobotanical heritage and are utilized for various health-related purposes.

Indigenous Medicinal Plants of KwaZulu-Natal

(i) Siphonochilus aethiopicus *(Wild Ginger / Isinuka)*
Narrator: Mkhulu Mkhwanazi, Traditional Healer
Date of Recording: May 2025
Location: KwaDlangezwa, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Isinuka / Wild Ginger
- **Scientific Name:** *Siphonochilus aethiopicus*
- **Family:** Zingiberaceae
- **Plant Type:** Perennial herb with aromatic rhizomes and broad, lance-shaped leaves

Figure 1. Visual Diagram of.

Narrative account of "Isinuka—Our Healer, Our Memory" from Cultural and Medicinal Context

"My name is uMkhulu Mkhwanazi. I was born and raised here in Kwa-Dlangezwa, where the hills are green and the fog knows our names. I want to speak of a plant that lives in our hearts and has served our people long before my beard turned white. We call it isinuka. The world of science calls it Siphonochilus aethiopicus. But we know it by its work, not its name. Isinuka is found in the shaded woodlands, where the ground is soft and the air is damp. It grows low, from the earth, with a sweet scent and purple flowers that bloom when the time is right. We use its rhizome, that is the root beneath, for healing many things. When one of our children is coughing, when the breath is trapped in the chest, or when the winter winds bring the flu, we boil the root. The steam opens the chest. The tea clears the head. Our women use it when their bellies cramp or their heads throb. We chew it for toothache. We rub it on swollen joints. But we do not only use it for pain of the body. Isinuka is also a cleanser of the soul. When darkness visits the homestead, bad dreams, unexplained sickness, or heaviness in the air, we burn it. The smoke is not just for the nose. It carries our prayer. It calls the ancestors to see us and guide us. If someone is bitten by a snake, we make a quick paste from the fresh root. But even then, we do not treat the wound without prayer. Healing is not just science. It is relationship with the earth, with the plant, with the ancestors. This plant was once common. But now, because of greed and forgetting, it is vanishing. We used to take only what we needed, and only after giving thanks. Now the forests are emptying. That is why we have begun to grow isinuka in our homesteads. It is not only for healing. It is for remembering. Teaching the young ones that isinuka is not just medicine, it is heritage. It is who we are. So, I give you this story, not just to tell, but to keep. To keep for those who will come after me, when I too am smoke in the wind".

(ii) Lessertia frutescens *(Cancer Bush / Umnwele)*

Narrator: Traditional Healer gogo MaXulu, Ongoye Mountains
Date of Recording: My 2025
Location: Ongoye Mountains, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Umnwele / Cancer Bush
- **Scientific Name:** *Lessertia frutescens* (formerly *Sutherlandia frutescens*)
- **Family:** Fabaceae
- **Plant Type:** Small, soft-wooded shrub with bright red flowers and inflated bladder-like seed pods.

Figure 2. Visual Diagram of.

Narrative Account of Unwele from Cultural and Medicinal Context

"I greet you. I am gogo MaXulu, a healer from the Ongoye Mountains, where the air is thick with stories of our ancestors and the plants they trusted. Today, I speak of a special shrub we call umNwele (Lessertia frutescens). It is a small, humble plant, growing no taller than a man's knee, with silvery leaves that shimmer in the sun and bright red flowers that bloom when the rains begin to fall. UmNwele is bitter to the tongue but sweet to the body. It has long been used by our people—not only to open the appetite when it fades, but also to strengthen the stomach and help digestion. When someone is weary, troubled by sickness or anxiety, this plant supports the

spirit as well as the body. It calms the mind, easing stress and sadness. Our elders teach us that umNwele protects the body's defenses—it is a shield for the immune system, especially for those who walk the difficult path of chronic illness or cancer. They call it "cancer bush" for this reason. We use it alongside other medicines to help lessen pain, improve appetite, and slow the wasting of the body. This plant's strength was known even by the first settlers and the Khoi and Nama peoples. They used it to heal wounds, to bring down high fevers, and to treat many ailments like chickenpox and eye troubles. UmNwele reminds us that healing is not just the work of one plant, but the care of many—body, mind, and spirit all together. It is a gift from our land, and we must protect it as carefully as we protect our tradition"s.

Artemisia afra *(African Wormwood / Umhlonyane)*

Narrator: Elder Ndlovu, Mthunzini community
Date of Recording: May 2025
Location: Mthunzini, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Umhlonyane / African Wormwood
- **Scientific Name:** *Artemisia afra*
- **Family:** Asteraceae
- **Plant Type:** Perennial shrub with aromatic silver-grey leaves

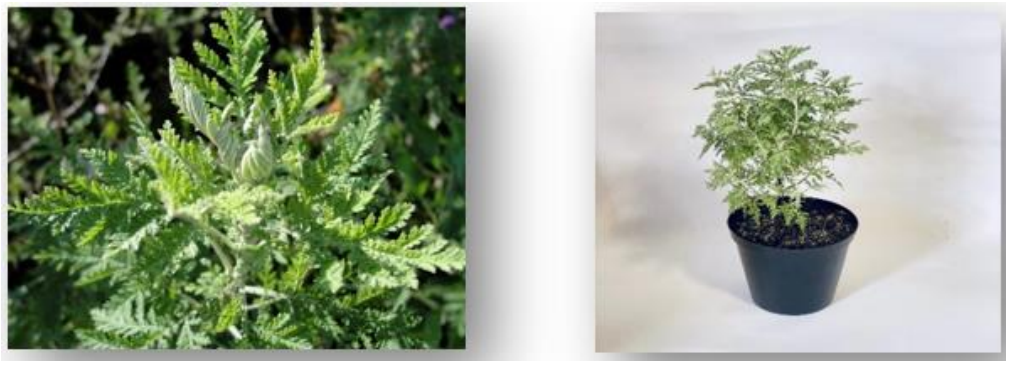

Figure 3. Visual Diagram of Umhlonyane / African Wormwood.

Narrative Account of Umhlonyane from Cultural and Medicinal Context

"Ah, my child, let me speak to you about Umhlonyane. It's one of the oldest healers we know. This plant grows freely here in the hills of Mthunzini. When you see its soft, feathery leaves and smell that strong scent—it's like the land is speaking to you. That smell, it tells you there's medicine inside. Our elders passed it to us. When someone in the family has a cold, fever, or blocked chest, we boil the leaves. Sometimes, we make them inhale the steam. It works quickly clears the lungs, eases the coughing. If a person's appetite is gone, we give them Umhlonyane to wake the stomach. It is also good for headaches and ear pain, even for stomach cramps. And when we collect it, we don't just pull it from the earth. No, we go early, when the sun is still quiet, and we greet the plant. Some of us speak a prayer, thanking it for what it gives. To us, Umhlonyane is more than a plant. It's part of our way of knowing, a companion in our healing. We keep it close, like the stories of our ancestors. When one of the children wakes up with a heavy chest or a hot forehead, I know it is time to go fetch some Umhlonyane. I do not just pull the plant. No, I go early, before the sun is too high. I speak to it softly, ask for its help, and thank it. That's how our elders taught us. These plants, they listen if you show them respect. Now, when I get home, I take a handful of the fresh leaves, just enough and I rinse them gently. If the sickness is in the chest or stomach, I boil the leaves in water until the smell fills the room. That water, I give it warm, like tea. It is bitter, yes, but it clears the body. If the nose is blocked or the coughing is deep, I pour that same boiled water into a bowl, cover the child with a blanket and let them breathe the steam. They sweat, they cry, but after that, they sleep easy. Sometimes, when there is headaches or paining ears, I crush the warm leaves, wrap them in cloth, and place the bundle where it hurts. The warmth and the medicine soak in slowly. We do not only heal with the body, but my child also, we heal with the spirit too. That's why when I harvest, I talk to the plant. I give thanks. This is not just medicine. It is memory. It is home."

(iii) Centella asiatica *(Pennywort / Icudwane)*

Narrator: Gogo Masondo, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: Dlangubo, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** iCudwane / Pennywort
- **Scientific Name:** *Centella asiatica*

- **Family:** Apiaceae
- **Plant Type:** Low-growing, creeping herb with rounded, fan-shaped leaves and small white or pinkish flowers.

Figure 4: Visual Diagram of iCudwane / Pennywort.

Narrative Account of Icudwane from Cultural and Medicinal Context

"Ah, yes... Icudwane. That little creeping herb that loves the damp ground near the riverbanks we know it well here in Dlangubo. The world may call it Centella asiatica, but to us, it's the plant that speaks gently to the skin and whispers healing into our wounds. This plant has small round leaves, like tiny shields, soft and green, sometimes with a reddish tinge. It grows close to the earth, weaving its stems along the ground. The flowers are very small, you might miss them unless you kneel and look closely, but do not be fooled by their size. Inside those tiny blooms is medicine passed down from the ancestors. We use Icudwane to clean wounds, to help the skin close and heal nicely, without leaving marks. When children come with sores or teenagers struggle with pimples, I crush the fresh leaves and mix them with clean water to make a soothing balm. It helps with eczema, psoriasis, and even those deep itches from heat or spirits. This plant also helps the body from within, giving strength to the tissues that hold us together, helping the skin stay strong and elastic as we age. It is not only medicine, it is food too. Some of our people cook it with spinach or add it to porridge. In other cultures, far away, they also know it and use it. But for us, Icudwane is part of our healing ways. It is soft, but powerful. Quiet, but wise. A gift from the earth, for those who know how to listen".

(iv) Plectranthus ambiguus *(Iboza)*

Narrator: Mama Mthethwa, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: eSikhawini, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Iboza / Ginger bush / Fever bush
- **Scientific Name:** *Tetradenia riparia*
- **Family:** Lamiaceae
- **Plant Type:** Aromatic shrub with soft, hairy leaves and pale purple or mauve flowers that bloom in winter

Figure 5. Visual Diagram of Ginger bush.

Narrative Account of Iboza from Cultural and Medicinal Context

"I am Mama Mthethwa from eSikhawini, and I speak of the plant called Iboza, or Misty Plume Bush, known in science as Tetradenia riparia. This is a fast-growing shrub with soft, velvety leaves that smell strong and sweet. It grows tall up to three meters and in winter, it blooms with beautiful mist-like flowers that range from white to pale purple, filling the air with their gentle fragrance. Our people have long used Iboza for many ailments. When a cough or chest problem troubles you, or if malaria or stomach pain comes,

we turn to this plant. The leaves and young stems are crushed and made into teas or inhaled as medicine. When the scent fills the air, it helps ease headaches and bring relief. The leaf extracts fight bacteria, and many trust its power to heal fever and other illnesses. In our Zulu culture, Iboza is a trusted healer, a gift from the land that brings health and comfort. It is widely used, and its healing strength is known beyond our home, even in distant places like Rwanda. This plant is a reminder of the deep knowledge passed down through generations, how nature cares for us if we listen and respect her gifts".

(v) Ziziphus mucronata *(Buffalo Thorn / Umphafa)*

Narrator: Mama Khanyile, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: eNkandla, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Umphafa / Buffalo Thorn
- **Scientific Name:** *Ziziphus mucronata*
- **Family:** Rhamnaceae
- **Plant Type:** Deciduous tree with zig-zag branches, paired thorns (one hooked, one straight), and small edible fruits

Figure 6. Visual Diagram of Buffalo Thorn.

Narrative Account of Umphafa from Cultural and Medicinal Context

"I am Mama Mthethwa from eNkandla. Umphafa is a sacred tree among the Zulu people not just a plant, but a connection between the living and the spirits. It grows strong and tall, with branches that twist like the path of life itself. The tree has both hooked and straight thorns, we say one looks back to the ancestors, and the other points forward to the future. Its shiny, dark green leaves turn golden in autumn. In summer, it gives us small, yellow flowers, and by winter, there are sweet reddish-brown fruits that children and birds enjoy. Here in eSikhawini, Umphafa is treated with deep respect. It is the tree we plant at the graves of our elders especially izinduna or chiefs, to honour their spirits and guide them home. When we perform rituals to bring back the spirit of the departed, we carry Umphafa branches to lead them safely. Medicinally, the roots, bark, and leaves of Umphafa help with many illnesses. We boil the bark for coughs and colds, use the leaves to clean infected wounds, and crush the roots for stomach pain or dysentery. The paste made from its parts is applied to boils, sores, and swellings, it draws out the sickness gently. But always, we harvest Umphafa with care with spoken words, asking for permission, for this is not just a tree. It is a guardian of the home, a link to the ancestors, and a healer of both body and spirit".

(vi) Tulbaghia violacea (Umqonqo / Wild Garlic)

Narrator: Mama Mthethwa, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: KwaMbonambi, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification

- **Common Name:** Umqonqo / Wild Garlic
- **Scientific Name:** *Tulbaghia violacea*
- **Family:** Amaryllidaceae
- **Plant Type:** Perennial herb with strong-smelling leaves and clusters of lilac to purple star-shaped flowers

Figure 7. Visual Diagram of Wild Garlic.

Narrative Account of Umqonqo from Cultural and Medicinal Context

"I am Mama Mthethwa from KwaMbonambi, and I speak of the tree we call Umqonqo, known to many as Ziziphus mucronata. This tree is strong and proud, with thorny branches that twist and turn like the paths of our ancestors. It grows between three and ten meters tall, with shiny green leaves that turn golden in autumn. From October to February, it blooms small, greenish-yellow flowers, and from March to August, it bears reddish-brown fruits that we can eat. Our people have long respected this tree, for it is sacred. We plant it on the graves of our chiefs, to honor their spirits and keep the link between the living and those who have passed. The branches are used in ceremonies to guide the spirit to its resting place, a sign of respect and protection. Medicinally, the tree offers many gifts. The roots are mixed to relieve pain and treat dysentery, while the bark and leaves help with coughs, colds, and skin infections. When boils or sores appear, we make a paste from roots and leaves to heal and soothe. Umqonqo is more than a tree—it is part of who we are, connecting us to our ancestors and healing our bodies and spirits".

(vii) Aloe cooperi *(Cooper's Aloe / Iputumane)*

Narrator: Mkhulu Khumalo, Elder and Traditional Knowledge Holder

Date of Recording: May 2025

Location: KwaDlangezwa, KwaZulu-Natal

Language: isiZulu (translated to English)

Plant Classification:

- **Common Name:** Iputumane / Coopers Aloe
- **Scientific Name:** *Aloe cooperi*
- **Family:** Asphodelaceae
- **Plant Type:** Succulent aloe with tall, slender leaves and vibrant orange-red tubular flowers appearing in spring and summer

Figure 8. Visual Diagram of *Aloe cooperi.*

Narrative Account of Iputumane from Cultural and Medicinal Context

"I am Mkhulu Khumalo from KwaDlangezwa, and I share with you the knowledge of iPutumane, known in English as Cooper's Aloe. This succulent plant has thick, fleshy leaves that grow long and narrow, arranged in a fan shape. The leaves are greenish yellow, with small white teeth along their edges, and tiny white spots underneath. Between December and March, it blooms with beautiful tubular flowers, colored salmon-pink to apricot-orange.In our Zulu tradition, we use the young shoots and flowers of this plant as food; they are cooked and eaten as vegetables. We also burn the leaves in our cattle kraals, believing that the smoke protects our livestock from sickness caused by eating bad or harmful plants. The juice of iPutumane is given to horses to rid them of ticks, helping to keep them healthy and strong. This plant holds great value for us—not only as medicine but also as nourishment, showing how our ancestors wisely used nature's gifts in many ways".

(vi) Cleome gynandra *(African Spider Flower / Icleome)*

Narrator: Mkhulu Zondi, Elder and Traditional Knowledge Holder

Date of Recording: May 2025

Location: Enseleni, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** African Spider Plant / Isicwebe
- **Scientific Name:** *Cleome gynandra*
- **Family:** Cleomaceae
- **Plant Type:** Annual herbaceous plant with slender stems, palmate leaves, and clusters of small purple or pink flowers.

Figure 9. Visual Diagram of African Spider Plant.

Narrative Account of Isicwebe from Cultural and Medicinal Context

"I am Mkhulu Zondi from Enseleni. The African Spider Plant, known as Isicwebe in our language, is a well-known herb in our community here at Enseleni. It grows wild during the rainy seasons and is easily recognized by its thin stems and delicate purple flowers that seem to dance in the wind. This plant is traditionally used both as food and medicine. We harvest the leaves to prepare a nourishing vegetable often served during family meals, especially when fresh greens are needed after a long dry season. Medicinally, the leaves are boiled to make a tea that helps reduce fever, relieve stomach pains, and ease digestive problems. When preparing Isicwebe, we pick the fresh leaves with care, sometimes early in the morning when the dew is still on them, believing this preserves their healing power. The preparation and use are done with gratitude and respect for the plant's spirit. For us, Isicwebe is more than just a plant; it is a symbol of healing, nourishment, and connection to the land that sustains us."

(vii) Agathosma betulina *(Buchu)*
Narrator: Mama Nkosi, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: Kwambonambi, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** Buchu
- **Scientific Name:** *Agathosma betulina*
- **Family:** Rutaceae
- **Plant Type:** Evergreen shrub with small, aromatic, oval-shaped leaves and clusters of pink or white tubular flowers.

Figure 10. Visual Diagram of Buchu.

Narrative Account of Buchu from Cultural and Medicinal Context

"Buchu is a cherished plant in our community here in Kwambonambi. It grows in the wild, often found on rocky hillsides, and is known for its strong, fragrant leaves that carry a healing aroma. We use Buchu in many ways. The leaves are brewed into a tea that helps with urinary tract infections, digestive issues, and to reduce inflammation. It is also used as a steam for cleansing and to ease colds

or flu.When harvesting Buchu, we do so with respect, usually in the early morning, and offer a prayer to thank the plant for its medicine. This connection between us and the plant is very important; it reminds us that healing comes not only from the plant but from honoring nature's gifts.Buchu holds a special place in our traditional medicine and daily life, sustaining both our bodies and spirits."

(viii) African Wild Potatoe

Narrator: Mkhulu Mthembu, Elder and Traditional Knowledge Holder
Date of Recording: May 2025
Location: eBabanango, KwaZulu-Natal
Language: isiZulu (translated to English)
Plant Classification:

- **Common Name:** African Wild Potato
- **Scientific Name:** *Hypoxis hemerocallidea*
- **Family:** Hypoxidaceae
- **Plant Type:** Perennial herb with long, slender leaves and bright yellow, star-shaped flowers

Figure 11. Visual Diagram of African Potatoe.

Narrative Account of African Potato from Cultural and Medicinal Context

"I am mkhulu Mthembu. The African Wild Potato is a powerful medicine that has been used by our ancestors for generations. It grows naturally in the grasslands around Kwambonambi and is known for its healing roots. We prepare it mostly as a decoction from the tuber, which is believed to strengthen the immune system and reduce inflammation. It has been used especially to support people living with illnesses such as HIV/AIDS, cancer, and other chronic conditions. Before harvesting the plant, we perform rituals to show respect, asking for permission from the ancestors and the spirit of the plant itself. This is important to ensure the medicine works effectively and that we remain in harmony with nature. The African Wild Potato is more than a plant; it is part of our heritage, a bridge between the body, spirit, and community. Many people seek alternative forms of treatment, indigenous methods. In South Africa, individuals commonly use traditional medicines like African Potato (Hypoxis hemerocallidea) African potato is used as a remedy against cancer in some forms of traditional medicine".

Traditional Medicines and Healers

Across all human societies, traditional knowledge systems have long guided the use of natural substances and compounds found in the immediate environment. These systems, often rooted in lived experience and deep observation, form the foundation for many community-based healing practices (Dean ,2024).

In South Africa, traditional healers, known variously as *izinyanga ne zangoma* possess not only extensive ethnobotanical knowledge, but also a profound understanding of their communities' spiritual, emotional, and social dimensions of illness. Their practices are not isolated remedies, but part of a larger, holistic worldview. Among the Nguni, Sotho, and Khoisan peoples, the medical systems are orally transmitted, often remaining undocumented in formal scientific literature. This lack of codification, however, does not diminish their complexity or efficacy. Rather, it highlights the need for respectful research collaboration and preservation efforts. Traditional technologies encompass a wide spectrum of therapeutic formulations ointments, decoctions, tonics, teas, compresses, and infusions used to treat a variety of conditions. These are often administered in conjunction with spiritual practices, revealing the interconnectedness of body, mind, and environment. A significant proportion of these remedies are derived from indigenous plant species, many of which are endemic to southern Africa's diverse ecosystems. The role of such flora in providing curative compounds and supporting traditional healthcare systems cannot be overstated. Preserving this knowledge is vital not only for cultural continuity, but also for informing sustainable, integrative approaches to modern healthcare and biodiversity conservation.

Research Objective 2: To explore how co-teaching with Indigenous Elders facilitates the exchange of Indigenous and scientific knowledge about medicinal plants.

To address this objective, data collection focused on capturing the dynamics of knowledge exchange during co-teaching sessions with Indigenous elders. Semi-structured interviews with Elders explored not only the content of their medicinal plant knowledge but also their approaches to teaching by explaining this knowledge to pre-

service teachers. Focus group discussions with pre-service teachers provided insights into how they perceived, interpreted, and integrated the elders' knowledge with their scientific understanding of plant biology, pharmacology, and ecology. Field observations during co-teaching sessions and community visits documented the interactive processes, highlighting moments of dialogue, questioning, and demonstration that facilitated the reciprocal sharing of Indigenous and scientific knowledge. Visual and descriptive data from photographs and field notes further illustrated the contextual and ecological grounding of these learning experiences.

Research Objective 3: To contribute to decolonising Life Sciences education by developing culturally responsive approaches that recognise Indigenous Knowledge holders as co-educators.

To address this objective, the study documented how the inclusion of elders as co-educators disrupted a Westernized Life sciences classroom hierarchies and promoted culturally responsive pedagogical practices. Observation notes and interview transcripts were analysed to identify teaching strategies and interactions that recognised elders' epistemic authority, modelled respect for Indigenous Knowledge, and encouraged pre-service teachers to reframe their understanding of legitimate knowledge sources. This approach enabled the presentation of findings not merely as content knowledge but as evidence of transformative pedagogical practices that contribute to the decolonisation of Life Sciences education, demonstrating the potential for sustained, respectful partnerships between universities and Indigenous knowledge holders.

Data Analysis

The data were analysed using thematic analysis, guided by Saldana Coding System (Saldana, 2024). Coding system according to Nicmanis, (2024) is a qualitative data analysis method that involves assigning descriptive labels, or codes, to segments of textual data to identify meaningful ideas. These **CODES** are then grouped into **CATEGORIES** and broader **THEMES** that are distilled to **SUB-THEMES**, allowing researchers to organize and interpret complex information systematically. This process helps uncover patterns and insights within the data, providing a structured way to understand and present qualitative findings.

In the context of this ethnobotanical study, Saldana's coding system is highly relevant because it helps manage and analyse rich narratives from indigenous healers about medicinal plants. It captures the multifaceted nature of traditional knowledge covering medical uses, cultural significance, preparation methods, and conservation concerns, and reveals common themes and unique practices. This approach ensures rigor and clarity in interpreting oral histories, supporting the preservation of indigenous knowledge and its integration into education, health and conservation policies.

Analysis proceeded inductively, allowing patterns to emerge around three main themes: **(1)** knowledge transmission and cultural meaning, **(2)** pedagogical transformation through co-teaching, and **(3)** perceptions of legitimacy and integration of Indigenous and scientific knowledge. Data were analysed using an inductive thematic approach, allowing patterns, meanings, and insights to emerge naturally from the interviews, focus group discussions, field observations, and field notes. This approach prioritised participants' voices and experiences, ensuring that the findings reflected the authentic interplay between Indigenous Knowledge and Life Sciences education rather than being constrained by pre-existing theoretical assumptions. The analysis focused on three interrelated themes:

Qualitative Data Analysis Framework

Category 1: Knowledge Transmission and Cultural Meaning

Theme	Subthemes	Codes (Emergent patterns)	Analytical Description
Knowledge Transmission and Cultural Meaning	1. Oral and Experiential Learning	"Stories passed through generations"; "Learning by observing rituals and healing"; "Knowledge held and shared by Elders"; "Intergenerational dialogue"	Knowledge is preserved and transferred orally through storytelling, demonstration, and observation. Elders act as living archives of community wisdom, ensuring continuity between past and present.
	2. Spiritual and Cultural Contexts of Healing	"Ritual use of plants"; "Healing as body–spirit balance"; "Sacredness of nature"; "Communal participation in healing"	Medicinal plant use is embedded within a spiritual and cultural worldview where healing transcends the physical to include emotional, spiritual, and communal dimensions.
	3. Ecological Intimacy and Stewardship	"Knowing when to harvest"; "Respect for plant spirits"; "Sustainability and balance"; "Conservation concerns"	Elders demonstrate ecological literacy, teaching sustainable practices and spiritual respect for nature — reinforcing the sacred relationship between people and plants.

	4. Cultural Identity and Continuity	"Healing as cultural practice"; "Preserving Zulu heritage"; "Medicinal knowledge as identity"	The use of medicinal plants reaffirms cultural identity and continuity, linking present generations to ancestral wisdom and practices.

This theme underscores how Indigenous Knowledge systems are holistic and relational, connecting health, spirituality, environment, and identity. Knowledge transmission is both a cultural and moral process, an act of preserving heritage while adapting to contemporary contexts.

Category 2: Pedagogical Transformation through Co-Teaching

Theme	Subthemes	Codes	Analytical Description
Pedagogical Transformation through Co-Teaching	1. Reciprocal Learning and Co-Construction of Knowledge	"Active co-learners"; "Dialogue and questioning"; "Mutual respect"; "Negotiating meaning"	Co-teaching created a dialogical space where learning flowed both ways between Elders and pre-service teachers, fostering humility and shared meaning-making.
	2. Experiencing Indigenous Epistemologies in Action	"Learning through observation"; "Indigenous ways of knowing"; "Storytelling as pedagogy"	Elders' teaching practices demonstrated relational and experiential knowledge systems, exposing pre-service teachers to holistic modes of inquiry.
	3. Respect for Local Knowledge Systems	"Valuing Elder expertise"; "Appreciating cultural authority"; "Epistemic humility"	Pre-service teachers learned to recognise Indigenous Knowledge as valid, contextually rich, and empirically grounded, reshaping their notions of expertise.
	4. Expansion of Pedagogical Repertoire	"Integrating cultural narratives into science teaching"; "Contextualising biology"; "Culturally responsive pedagogy"	Teachers broadened their teaching strategies to include narrative, experiential, and cultural elements, aligning science education with local realities.

This theme highlights co-teaching as a transformative pedagogical model, fostering equity between Indigenous and academic knowledge systems. It empowered pre-service teachers to teach Life Sciences through a lens that is culturally responsive, participatory, and integrative.

Category 3: Perceptions of Legitimacy and Integration of Indigenous and Scientific Knowledge

Theme	Subthemes	Codes	Analytical Description
Perceptions of Legitimacy and Integration of Indigenous and Scientific Knowledge	1. Shifting Attitudes towards Indigenous Knowledge	"From scepticism to respect"; "Recognising Indigenous Knowledge as science"; "Broadening definitions of evidence"	Pre-service teachers initially questioned the validity of Indigenous Knowledge but gradually acknowledged its empirical depth and contextual logic.
	2. Integrative and Complementary Knowledge Systems	"Indigenous and Western knowledge as partners"; "Blending pharmacological and cultural insights"; "Complementary healing practices"	Participants came to see Indigenous and scientific knowledge as complementary, enriching Life Sciences teaching through interdisciplinary understanding.
	3. Cultural Competence and Ethical Awareness	"Respecting cultural protocols"; "Informed consent and reciprocity"; "Ethical engagement with communities"	Engagement with Elders fostered cultural competence and ethical sensitivity, aligning with decolonising approaches in teacher education.
	4. Redefining Science Education	"Science as relational"; "Integrating ecology, spirituality, and health"; "Contextualising curriculum"	The experience redefined science teaching as a relational and ethical act, broadening its scope beyond lab-based inquiry to include cultural and ecological consciousness.

This theme reflects a paradigm shift in how pre-service teachers perceive knowledge legitimacy. Co-teaching enabled them to move from dichotomous thinking (scientific vs. traditional) to an integrative worldview, embracing Indigenous Knowledge as credible, evidence-informed, and pedagogically enriching.

Across all three themes, a coherent narrative emerges that reflects the deep interconnection between Indigenous Knowledge, pedagogy, and epistemic transformation. The findings reveal that Indigenous Elders, through their active participation as co-educators, play a pivotal role in preserving and transmitting knowledge systems that intricately weave together health, spirituality, and ecology. Their involvement not only sustains cultural continuity but also bridges the gap between traditional wisdom and scientific inquiry. Through this co-teaching process, pre-service Life Sciences teachers undergo a significant epistemic transformation, learning to recognise Indigenous Knowledge as both valid and scientifically grounded. This experience challenges long-held hierarchies of knowledge, encouraging teachers to move beyond viewing science as exclusively Western and instead appreciate its broader, more inclusive dimensions. Ultimately, Life Sciences education becomes a decolonising space—one that shifts from mere content transmission to transformative learning, from exclusivity to inclusivity, and from detached objectivity to culturally rooted understanding. This integration affirms that Indigenous Knowledge is not an addition to science, but rather science itself, richly contextualised within culture, environment, and lived human experience.

FINDINGS

Analysis of the data revealed three interconnected themes that illuminate the ways Indigenous Knowledge and Life Sciences education intersect through co-teaching with elders.

Knowledge Transmission and Cultural Meaning

The study found that Indigenous Elders and traditional healers transmit knowledge in ways that are deeply holistic, intertwining practical, spiritual, and cultural dimensions. Participants consistently emphasised that medicinal plants are not merely tools for physiological healing but are embedded in a broader framework of cultural identity and community health. For example, *Hypoxis hemerocallidea*, frequently used for chronic illnesses, was highlighted as a plant with both practical efficacy and spiritual significance, reflecting high local confidence in its long-term benefits.

All participants reported observable improvements in patients' conditions, attributing therapeutic outcomes to the combined influence of botanical action and spiritual guidance. Beyond human health, plants were also noted for their roles in livestock care, illustrating their multifaceted utility. Rituals, protective ceremonies, and spiritual practices were intertwined with medicinal use, highlighting the inseparability of culture and healing. These findings underscore the importance of oral knowledge transmission by Elders, affirming the need for careful documentation and sustainable management of these resources. Pre-service teachers observed and engaged with these practices, gaining a deeper appreciation for the cultural meaning embedded in the plants they were studying.

Pedagogical Transformation through Co-Teaching

Co-teaching sessions facilitated a transformative learning experience for pre-service teachers. Observations and reflections indicated that the presence of Elders created a relational and participatory classroom environment, where teachers were co-learners rather than authoritative transmitters of knowledge. Through storytelling, hands-on demonstrations, and field engagement with medicinal plants, pre-service teachers witnessed the integration of empirical observation, ecological understanding, and spiritual insight.

Participants reported that these sessions enhanced their pedagogical approaches, providing models for culturally responsive teaching. By observing how Elders contextualised plant use within local cultural narratives, pre-service teachers learned to design lessons that respect both scientific principles and Indigenous epistemologies. The experience fostered reciprocity in learning, encouraging pre-service teachers to value dialogue, observation, and experiential engagement as legitimate teaching and learning strategies.

Perceptions of Legitimacy and Integration of Indigenous and Scientific Knowledge

The study revealed a marked evolution in pre-service teachers' perceptions of knowledge legitimacy. Initially, some teachers expressed uncertainty regarding the scientific validity of Indigenous medicinal practices. However, sustained interaction with Elders, coupled with field observations, led to recognition of the empirical reasoning and ecological knowledge embedded in traditional plant use.

Pre-service teachers came to see that Indigenous Knowledge could complement and enrich scientific understanding, particularly in areas such as plant pharmacology, physiology, and ecology. The integration of scientific and Indigenous perspectives enabled teachers to view medicinal plants through a dual lens: as biologically active organisms and as culturally and spiritually significant entities. This finding demonstrates that co-teaching

with Elders provides a platform for epistemic integration, validating Indigenous Knowledge as credible, complementary, and pedagogically valuable within Life Sciences education.

DISCUSSION OF FINDINGS

The findings of this study underscore the richness and depth of ethnobotanical knowledge among Indigenous communities in KwaZulu-Natal and surrounding regions. The narratives of Indigenous Elders and traditional healers reveal a holistic approach to medicinal plant use, where cultural, spiritual, and therapeutic dimensions are inseparably intertwined (Goyal & Chauhan, 2024). Eleven plants were highlighted, including *Hypoxis hemerocallidea* (Isikhukhukhu), *Lessertia frutescens* (Cancer Bush), *Artemisia afra* (Umhlonyane), *Centella asiatica* (Icudwane), and *Ziziphus mucronata* (Umphafa / Buffalo Thorn), each performing distinctive pharmacological, ritual, and communal functions. Observed improvements in patient outcomes, attributed both to botanical action and spiritual guidance, demonstrate the practical efficacy of these plants, while also highlighting the symbolic and relational elements of healing practices.

Knowledge Transmission and Cultural Meaning

Elders and healers play a central role in transmitting knowledge orally, embedding lessons about ecology, ethics, and spirituality alongside therapeutic practices. Preparation methods, dosage, and timing often align with ritual or purification practices, reflecting a holistic model of health that addresses physical, emotional, relational, and spiritual well-being. For example, *impepho* is used in ancestral rituals to promote mental and spiritual calm, while *Isinuka* serves both medicinal and cleansing purposes. Such practices emphasize that healing is not confined to chemical efficacy alone but involves community, timing, and relational context, reinforcing the importance of cultural meaning in Life Sciences education. Pre-service teachers, through co-teaching sessions, were able to engage with these practices first-hand, gaining an appreciation for how Indigenous Knowledge embodies both empirical observation and cultural wisdom.

Pedagogical Transformation through Co-Teaching

Co-teaching with Indigenous Elders fostered a transformative learning environment. Pre-service teachers participated as co-learners, observing and practicing culturally grounded approaches to plant-based medicine. This engagement highlighted the reciprocal nature of knowledge exchange, where scientific concepts such as plant pharmacology, immunology, and ecology were enriched through Indigenous narratives, ritual context, and practical applications. The pedagogical impact extended beyond content knowledge, encouraging pre-service teachers to adopt culturally responsive teaching practices, recognise the epistemic authority of knowledge holders, and integrate narrative, demonstration, and experiential learning into their own pedagogical strategies.

Perceptions of Legitimacy and Integration of Indigenous and Scientific Knowledge

Exposure to Indigenous healing practices prompted pre-service teachers to reconsider conventional hierarchies of knowledge. Whereas initial scepticism about the validity of traditional medicine was common, repeated engagement demonstrated that Indigenous Knowledge is empirically grounded, culturally coherent, and complementary to Western scientific frameworks. Plants such as Cancer Bush and Isikhukhukhu, used for chronic illness and immune support, exemplify this complementarity, as they are sometimes employed alongside biomedical therapies to enhance health outcomes. By observing how Elders integrate ecological understanding, preparation methods, timing, and ritual significance, pre-service teachers came to appreciate the integrative nature of Indigenous healing, which challenges the biomedical separation of body and spirit and underscores the importance of culturally competent care.

IMPLICATIONS FOR LIFE SCIENCES EDUCATION

These findings have significant implications for Life Sciences teacher education. Understanding not only the biological properties of plants but also their cultural, ritual, and ecological contexts provide a richer, ethically grounded approach to science teaching. Integrating Indigenous Knowledge into Life Sciences curricula through co-teaching with Elders can cultivate inclusive, empathetic, and interdisciplinary scientific thinkers. Moreover, presenting medicinal plants as complex, living entities rather than isolated chemical compounds encourages students to view health and ecology holistically, fostering respect for biocultural diversity and sustainable practices. Sustainability concerns, such as the endangered status of Wild Ginger (*Siphonochilus aethiopicus*), further underscore the need for ethical stewardship and community-based conservation strategies in teaching and research. The narratives of Elders also illustrate the nuanced interplay between pharmacological efficacy and ritual practice. Many plants, including Lessertia frutescens and Hypoxis hemerocallidea, serve dual roles in biochemical treatment and

ritual or social healing. Preparation methods, dosing, and administration often follow spiritual protocols, demonstrating that Indigenous health systems operate on integrative principles where physical, emotional, and spiritual dimensions are inseparable. For Life Sciences education, such examples provide fertile ground for teaching topics such as pharmacognosy, integrative medicine, and culturally competent healthcare.

CONCLUSION AND RECOMMENDATIONS

This study demonstrates that engaging Indigenous Elders in co-teaching offers a transformative pathway for integrating Indigenous Knowledge (IK) into Life Sciences education. Through semi-structured interviews, focus group discussions, and field observations, it became evident that Elders transmit knowledge holistically, embedding medicinal plant use within cultural, spiritual, and ecological frameworks. Plants such as *Hypoxis hemerocallidea*, *Lessertia frutescens*, and *Artemisia afra* were shown to serve multifaceted roles addressing physical health, mental well-being, and spiritual balance, while also supporting social cohesion and sustainable practices. The ethnobotanical narratives collected illustrate that efficacy in traditional medicine arises not only from biochemical properties but also from careful preparation, ritual practice, and the timing of interventions, highlighting an integrative model of healing that contrasts with the often reductionist biomedical approach.

Co-teaching with Elders emerged as a pedagogical catalyst, fostering reciprocal learning where pre-service teachers became co-learners and developed culturally responsive teaching strategies. Exposure to Indigenous practices challenged conventional hierarchies of knowledge, demonstrating that IK is both empirically grounded and complementary to Western science. Pre-service teachers reported increased confidence in integrating cultural, ecological, and spiritual dimensions of plant knowledge into their teaching practice, indicating that this approach enhances both content knowledge and ethical pedagogical awareness.

Recommendations

Universities and teacher training programs should develop formal frameworks to include Indigenous Elders as co-educators in Life Sciences curricula. This would ensure authentic knowledge transmission, respect for cultural authority, and the preservation of oral traditions. Life Sciences curricula should move beyond decontextualised plant biology, incorporating the cultural, spiritual, and ecological contexts of medicinal plants. This fosters interdisciplinary understanding and prepares teachers to deliver culturally responsive lessons. Teacher education programs should emphasise the conservation of medicinal plants, particularly endangered species such as Wild Ginger (*Siphonochilus aethiopicus*), and incorporate community-based cultivation and sustainable harvesting practices into teaching and research. Pre-service teachers should be trained to understand and communicate the complementary relationship between Indigenous and biomedical approaches, fostering respect for holistic health systems and culturally competent care. Further studies should explore long-term impacts of co-teaching on teaching practice, learner outcomes, and community engagement. Collaborative research between universities, Indigenous communities, and health practitioners can enhance healthcare outcomes while preserving cultural heritage. In conclusion, this study affirms that the integration of Indigenous Knowledge through co-teaching with Elders is not only pedagogically effective but also ethically and culturally imperative. By recognising Elders as knowledge holders and valuing the holistic nature of medicinal plant practices, Life Sciences education can cultivate teachers who are scientifically informed, culturally competent, and socially responsible capable of bridging Indigenous and scientific epistemologies in ways that respect both heritage and evidence-based practice.

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