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Barriers to the Effective Integration of Indigenous Epistemologies in Life Sciences Teaching Practices

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Abstract. This research investigates the challenges that pre-service educators face when incorporating Indigenous Knowledge Systems (IKS) into their Life Sciences classroom practices during teaching practice sessions in schools. Although the CAPS curriculum encourages the incorporation of traditional knowledge into Life Sciences pedagogies, little effort has been made to meet that expectation due to a variety of variables that this study seeks to explore. To do this, the study employed a qualitative methodological approach. This comprises semi-structured interviews with ten (10) Life Sciences pre-service teachers from randomly selected Life Sciences education exit modules. To analyze data and discover recurring patterns of barriers encountered during teaching practicums and themes, a qualitative research technique was used. The study's findings revealed that several student teachers' concerns included a lack of IK integration module training in their pedagogies, concerns about limited time to explore this pedagogy within the Life Sciences curriculum, a lack of materials, a limited understanding of merging IK with Western perspectives, and fear of being unable to represent IK sensitively. Despite these obstacles, the student teachers recognized the need for incorporating IK into Life Sciences content but lacked the necessary preparedness and curricular approval. This gap between the CAPS curriculum and subject practice highlights the necessity for teacher training that focuses on IK integrated resource tools such as lesson plans and collaborations with indigenous communities.

1. INTRODUCTION

There is a growing recognition of studies like Sitsha (2023) and Ahanonye et.al., (2024) valuing the integration of Indigenous Knowledge (IK) in promoting relational learning in Life Sciences. Grounded by ancestral wisdom, spirituality, natural environment, Indigenous viewpoints the study offers a cultural-linked epistemology that complements Euro-scientific perspectives in Life sciences teaching. Life Sciences CAPS curriculum has called for incorporation of IK content within the scientific curriculum (Department of Basic Education, 2011); however, limited efforts are currently in place to empower pre-service teachers with this strategy.

A growing number of studies like Mkhwebane, (2024) identifies barriers linked to Life sciences curriculum and IK integration pedagogy, that is, merging IK and Western epistemologies. Euro-scientific content overshadows IK ways of learning in Life Sciences. Teachers often lack insights on cultural knowledge and empowerment on effectively embedding traditional wisdom in scientific content (El Yazidi & Rijal, 2024). Implying that co-teaching with indigenous community elders ranges from underdeveloped to non-existent. Due to empirical nature of Euro-scientific nature that differs with relational learning of indigenous epistemology arises tensions when they are integrated in the Life Sciences instructions. This complicates teachers' integration efforts in their teaching practices.

With the goal to develop initiatives for the more equal and valuable integration of Indigenous viewpoints in scientific education, this study critically examines these impediments using contemporary educational studies.

1.1. Background to the Study

In the framework of decolonizing science curriculum and encouraging equitable instruction, the incorporation of traditional knowledge systems into scientific education according to authors Baptista & Molina-Andrade, (2023), has attracted growing interest on a worldwide scale. IKS integration with scientific views is specifically encouraged to be included in South Africa's Curriculum and Assessment Policy Statement (CAPS) for Life Sciences with the goal to enhance students' comprehension and enjoyment of Life Sciences in traditional settings (Department of Basic Education, 2011). The actual use of IKS in Life Sciences lessons is still a handful to none, and difficult to implement, given the CAPS policy mandate.

A number of obstacles to the successful integration of IKS in Life sciences education have been brought to light by recent research studies. These include inadequate instructional materials, a lack of IKS-focused pre-service and in-service teacher education and professional development, and a poor comprehension of how to combine Native and European perspectives on science (Mkhwebane, 2024; Bhaw, de Beer, & Kriek, 2025). The incorporation of IKS into classroom practice is further complicated by teachers' frequent worries about the degree of caution needed to convey it truthfully, appropriately with dignity (Mkhwebane, 2024).

Cultural elements and structural problems with the educational system in South Africa make the task much more difficult. Indigenous knowledge has been neglected by the history of education under colonialism, resulting in a curriculum that mostly follows the theories of the West (de Beer & Kriek, 2021). This has caused a gap between the goals of the educational system and the actual Life Sciences classroom environment, especially in insufficiently supplied and remote educational institutions.

By examining the difficulties Life Sciences educators have when integrating IKS into their lesson plans throughout conducting practicums at educational institutions, this study fills this knowledge vacuum. It uses semi-structured interviews with 10 Life Sciences pre-service teachers from randomly chosen secondary educational institutions in Kwa-Dlangezwa as part of its

qualitative methodological approach. According to the discoveries, there are several persistent obstacles, such as the lack of IKS-specific coursework in student teacher preparation programs, restricted time in the Life Sciences curriculum, a scarcity of suitable instructional materials, and concerns about appropriately portraying IKS. However, instructors see the need of incorporating IKS into Life Sciences curricula regardless of these hurdles (Modi, 2025), although many may feel ill-prepared and unguided, and left on their own to accomplish so.

By offering real-world evidence of the difficulties experienced by teachers in the South African setting, this study adds to the expanding field of research on the integration of IKS in scientific instruction. It emphasizes the necessity of thorough pre-service teacher training modules that provide instructors the tools, materials and support they need to successfully integrate IKS into their Life Sciences lesson plans. It also emphasizes how crucial it is to create culturally relevant and respectful Life Sciences curricula that close the disconnect between policies and teaching practices to promote a more diverse and inclusive environment for scientific education.

1.2. Problem Statement

The practical implementation of Indigenous Knowledge Systems (IKS) in Life Sciences classroom teaching pedagogies is still sparse and uneven, despite the South African Curriculum and Assessment Policy Statement (CAPS) encouraging its inclusion in instruction. Whenever trying to integrate IKS into their lessons, Sitsha (2023) posits that numerous Life Sciences instructors, especially student teachers in training, face considerable obstacles. Attempts of decolonizing scientific education and advance culturally appropriate teaching are hampered by this misalignment between policy and implementation.

1.3. Purpose of the Study

Investigating the challenges aspiring and in-service educators possess while incorporating Indigenous Knowledge Systems (IKS) into the classroom instruction of life sciences during their teaching practice assignments in Kwa-Dlangezwa secondary educational institutions is the aim of this study. To close the gap between curricular goals and classroom reality, the research intends to pinpoint difficulties, investigate Life Sciences teacher perspectives and their readiness for the strategy, and offer suggestions.

1.4. Research Questions

What difficulties do educators in the Life Sciences have when incorporating and presenting Indigenous Knowledge into their lesson plans?

What kinds of tools or assistance do Life Sciences educators think are essential for successfully incorporating IKS into their lessons?

2. THEORETICAL FRAMEWORK

This research is based on Decolonial Theory and Culturally Responsive Pedagogy (CRP) theoretical frameworks. Teaching that acknowledges and honours students' cultural understanding, encounters, and instructional methods is emphasized by a culture-responsive approach to teaching (Yuliantari & Huda, (2023) Azis, Maharani & Indralin, (2024).

It promotes classroom environments that represent the diverse cultural backgrounds of students and encourages the inclusion of indigenous wisdom as a valid and meaningful component of the Life Sciences curriculum. The prevalence of European-focused theories of knowledge within the classroom may be criticized via through the perspective of decolonial theory (Dlamini et al., 2024; Govender & Naidoo, 2023). By honouring Native methods of understanding the content advances epistemic justice and demands the destruction of dominating colonial legacies in knowledge production and educational systems. When combined, these theoretical frameworks according to the study enable this research to investigate how educators may be assisted in providing diverse and decolonized Life Sciences instruction, as well as how educational systems might be reorganized to incorporate disadvantaged knowledge systems like Indigenous Knowledge.

3. LITERATURE REVIEW

Growing support for the incorporation of traditional knowledge in science curriculum throughout the globe has resulted from the movement towards decolonizing Life sciences instruction in the past few years. The CAPS regulations, which prioritizes intellectual versatility and cultural inclusiveness, and following apartheid changes in South Africa, are in line with this trend (Mkhwebane, 2024). Nevertheless, there are still issues with the application of this epistemology in the classroom teaching of Life Sciences.

3.1. Curriculum Mismatch and Teacher Training

Several research studies suggest that Life Sciences teacher education programs and legislation are not aligned. According to Bhaw et al. (2025), indigenous theories of knowledge receive little priority in educator professional growth, leaving teachers feeling ill-prepared to integrate indigenous perspectives in their teaching practices. Similar findings were made by Mavuru and Ramnarain (2021), who discovered that many South African educators view traditional epistemologies as supplementary or inconsistent with European scientific paradigms of thought.

3.2. Lack of Resources and Institutional Support

Blending efforts by Life Sciences teachers are further hampered by an absence of culturally relevant instructional resources (de Beer & Kriek, 2021). In remote locations like Kwa-Dlangezwa, where access to collaboration between indigenous communities and IKS-authentic resource materials is restricted, this issue is more severe.

3.3. IK Epistemological and Life Sciences Pedagogical Challenges

Given the discrepancies in cultural epistemology, educators frequently express uneasiness when introducing and incorporating IKS in their Life Sciences content. Traditional wisdom is frequently relationship-based, context-specific, and verbal, whereas the Western scientific method places more emphasis on rationality and testing through evidence (Bang & Medin, 2010; Mkhwebane, 2024). According to the study educators, therefore, worry that pupils and their families might incorrectly interpret or negate IKS if they are not trained to handle these gaps.

3.4. Call for Inclusive and Contextual Life Sciences Education

An all-inclusive Life Sciences education curriculum which promotes various methods of learning is advocated by recent studies (Bhaw et al., 2025). To foster greater student involvement and genuine depiction of traditional knowledge, academics stress the significance of location-based learning and joint instruction with IK expertise bearers.

4. RESEARCH METHODOLOGY

To examine obstacles to IKS inclusion in Life Sciences teaching throughout practicum, this study used an approach to qualitative research. Ten Life Sciences student teachers were chosen at random from Life Sciences education exit modules to form a purposive sample. Semi-structured interviews were used to gather data throughout the first semester of the 2025 academic year.

Saldaña's coding system (2021), successfully facilitated the arrangement and examination of intricate, subtle data in the overall setting of this study on pre-service teachers' experiences on incorporating Indigenous Knowledge Systems (IKS) into Life Sciences instruction. Saldaña's approach is ideal for this kind of research as it guarantees that the conclusions are based on the insights of those who took part while also exposing more general pedagogical and institutional trends.

5. RESULTS

5.1. Data Presentation

A theme-based approach was used to examine the data, adhering to Saldana coding system. In this qualitative research study, Saldaña's coding system technique was employed for analysing and interpreting raw data, including written replies and observations. To find patterns, themes, and categories, researchers used multiple cycles of coding to assign meaningful "*codes*" to various data points (Saldaña, 2021).

To record important concepts or behaviours, researchers used preliminary codes (such as descriptive codes) in the first cycle. These original codes were sorted and refined into pattern codes that disclose categories in the second cycle. These categories are eventually grouped into *themes* like "I do not possess IKS-specific training" and "anxiety of erroneous representation" were developed from first cycle codes including "lack of training" and "fear of misrepresentation." The systemic and individual difficulties experienced by teachers were then clarified by grouping these themes into more advanced groups like Professional Readiness and Organizational and Structural Restrictions. These themes were examined and improved to represent recurrent themes in the participants' answers, which distilled to *subthemes*, which are facets of those concepts. This method is helpful for this research study in examining complicated pre-service teachers' teaching experiences on IK integration, including their views and attitudes towards the teaching strategy, since it facilitates the transition from unprocessed data to profound, organized understanding. Following is a data presentation with the five main topics that surfaced (Saldaña, 2021).

1. Insufficient IKS-Specific Life Sciences Teacher Education

The lack of official instruction on the integration of Indigenous Knowledge in Life Sciences teacher education programs in the training institutes was a recurring concern. According to the teacher participants, they required the necessary preparation to include IKS into the teaching of Life Sciences. Traditional wisdom was discussed in fundamental nature, but no one Life sciences researcher specifically demonstrated how to plan the integrated lesson, how to put it into practice and provide relevant sample tools to refer on. Teacher three (T3) participant said,

"*We received instruction on how to deliver the Euro-centred scientific curriculum, but not how to incorporate Indigenous knowledge into a content"*.

This worry was further expressed by another Teacher 1 participant (T1), who stated:

"*IKS was just an idea in our notebooks. No formal workshop or training nor examples provided to demonstrate how it relates to the Life Science lessons we teach"*.

This outcome is consistent with recent studies showing that culturally appropriate instructional approaches and epistemic diversity are seldom given priority in pre-service teacher training programs (Mavuru & Ramnarain, 2021; Bhaw et al., 2025).

2. Time Constraints and Curriculum Overload

A curriculum that is rich on scientific material and time constraints to implement the IK strategy were mentioned by student instructors as major barriers to implementing IKS. The CAPS-mandated Life Sciences program and was perceived as inflexible and test of exam-oriented, with little opportunities to investigate alternate knowledge systems like traditional wisdom epistemology,

"We are currently hurrying to finish the syllabus prior to examinations," said Teacher 2 (T2).

It seems like an unnecessary load that we don't have time for when we try to incorporate IKS.

"*Even if we want to include it, the time isn't there,*" said fifth teacher participant (T5). "*It's more like checking boxes to go through subjects than providing in-depth instruction"*.

The performance-driven "character of Life sciences education, which frequently discriminates against other cultures learning forms, is reflected in this, according to de Beer and Kriek (2021).

3. Lack of IK Resources

The absence of teaching materials and tools like ready-made lesson plans that incorporate IKS in a way that is both culturally sensitive and scientifically adequate was another significant obstacle. Novice teacher participants emphasized that there were no lesson plans samples in prescribed Life Sciences textbooks, or visual aids available for teachers to facilitate this kind of integration. Teacher 4 (T4) raised that,

"*I must do my own research because the Life Sciences textbooks do not provide any IK integration lesson examples or instructions on how to teach the content. Sometimes we want to include IKS, but I don't have the skills, tools and confidence to*

implement it".

Expressed another participant teacher 6 (T6), who was similarly frustrated.

"*Most of us require a skeleton on which to operate on".*

The absence of culturally appropriate teaching materials, according to Madlela (2022) and Malapane et al. (2024), impedes real-world attempts to decolonize the curriculum. This conclusion supports their findings.

4. Fear of Misrepresentation

A lot of teacher participants were concerned about misrepresenting Indigenous Knowledge, especially when they were not personally familiar with the learners' culture. Some were worried about coming across as rude or unauthentic: Teacher 8 (**T8**) remarked,

"I'm afraid I'll say something incorrectly and will be regarded as a rude person. I don't want to upset learners or give them a false impression of their culture because I am originally from Kimberly, and I am a product of cross marriages. Cultural activities are not observed as people from KwaZulu Natal do".

Another teacher 7(T10) remarked:

"Being from a background that is different from learners, I often question if I'm describing things correctly. What if I instruct it incorrectly? That feeling of uneasiness kills me"

These concerns emphasize the necessity of collaborating with local knowledge holders and aiding on culturally sensitive teaching methods (Nhalevilo & Ogunniyi, 2021).

5. Recognition of the Value of IKS

All participants acknowledged the cultural and pedagogical significance of incorporating Indigenous Knowledge Systems in Life Science teaching, despite the difficulties. Many said they wanted improved Life Sciences module training and institutional support: Teacher 9 (T9) pointed that.

"We want to teach traditional wisdom, but we also need assistance from our Life Sciences lecturers. To educate a content that come outside of the prescribed textbook is a doting task for us, we require resources, tools, examples, and curriculum authorization".

"*IKS makes Life Sciences more relatable for most learners especially those that are exposed to cultural activities and rituals in their daily lives. We love this strategy because it helps learners appreciate their heritage, but we just need more help to make it work for us and learners. Even though it's a wonderful idea, we can't see it now because we lack this pedagogical skill*", said a different teacher 7 (T7).

This subject is in line with requests in the study literature for a more socially equitable and epistemically varied Life sciences curriculum and reflects novice teachers' increased understanding of the need to adopt inclusive, pluralistic pedagogies (Tarisayi, 2024; Mkhwebane, 2024).

Analysis of results revealed the following key themes.

The table below organize the findings according to Saldaña's coding of categories, themes, and subthemes.

Table 1:

Category	Theme	Subtheme
Teacher professional preparedness	Lack of IKS-Specific Training	Inadequate teacher education pedagogies for integrating Indigenous Knowledge Systems.
	Fear of Misrepresentation of IK	Teachers' anxiety about disrespecting or misrepresenting traditional wisdom during instruction.
Institutional and structural constraints	Time constraints and life sciences curriculum overload	Life Sciences curriculum is overloaded and is exam-oriented to accommodate alternative epistemologies.
	resource scarcity	Shortage of culturally relevant and scientifically valid IKS materials.
Teachers' attitudinal and ideological dispositions	Acknowledgment of IKS Value	Pre-service teachers support IKS inclusion and desire institutional support.

6. DISCUSSION

Investigating the challenges student teachers have while incorporating Indigenous Knowledge Systems (IKS) into Life Sciences education while practicing teaching in Kwa-Dlangezwa was the aim of this study. Although the importance of IKS is widely acknowledged for its benefits, the results showed five interconnected themes that indicate systemic hurdles, institutional barriers, and pedagogical obstacles.

1. Insufficient IKS-Specific Life Sciences Teacher Education

According to the current research, there is a notable lack of pedagogy in Life Sciences teacher development programs that aligns with cultural customs. The results of the authors Mavuru and Ramnarain (2021), who contend that South African pre-service educators' training still primarily focuses on Western-influenced scientific epistemologies, supports this notion. This further aligns with the first research question of this study: What difficulties do Life Sciences pre-service teachers encounter when incorporating traditional wisdom throughout their teaching practicum? In the absence of organized curriculum or chances for real-life learning, novice educators frequently feel ill-prepared for the effective integration of ancient wisdom. Teachers must get epistemological training in indigenous perspectives to satisfy theoretical demands for decolonizing Life Sciences education (Dominguez, 2021).

2. Time Constraints and Curriculum Overload

One major institutional hurdle was Life Sciences curriculum that is overloaded, which is in line with research that characterizes South Africa's Life Sciences curriculum as "densely packed and exam-oriented" (de Beer & Kriek, 2021), allowing no exploration of other epistemologies. This highlights a larger structural conflict between the goals of policies like the CAPS curriculum's support of traditional knowledge and the actual conditions in educational settings, where epistemological diversity is rarely allowed due to performance constraints. The necessity to match CAPS curriculum policy expectations with teaching circumstances is highlighted by the student instructors' statement that, despite their appreciation for IKS, there is not sufficient spare time in the year plan schedule to execute it.

3. Lack of IK Resources/Tools

IKS is still marginalized in Life Sciences classes due to a lack of ethnically inclusive instructional tools. The absence of IK integrated lesson plans, IK graphical representations, and examples that demonstrated how to effectively combine Traditional and European scientific viewpoints in the content was pointed out by the teacher participants. This supports the research results of Madlela (2022), which highlights that when epistemology is not backed by concrete, lacks readily obtainable resources, epistemological access is limited. The goal of equitable learning stays theoretical rather than actionable in the absence of sufficient tools and means.

4. Fear of Misrepresentation

The risk of educational instructors distorting indigenous wisdom is a significant emerging subject that has not received much attention in the literature so far. It is challenging for pre-service teachers to incorporate unfamiliar IK epistemology because not all of them are from KwaZulu Natal. This fear is a symptom of a more serious problem with instructional ambiguity and cultural instability. In the Life Sciences classroom settings, it also calls into question who is qualified to provide instruction based on the integration of traditional wisdom, as well as issues of misrepresentation and influence. According to Nhalevilo and Ogunniyi (2021), collaborations with indigenous expertise bearers can aid in closing this gap by providing reciprocal regard, genuineness, and correctness. This study backs these suggestions and emphasizes how important it is for pre-employment education to include culturally inclusive instruction.

5. Recognition of the Value of IKS

Novice teacher participants acknowledged indigenous knowledge as an important aspect of Life Scientific education regardless of the difficulties to implement it. This responds to the second and third study research questions on how people view ancestral wisdom, and the assistance that is required to integrate it. Their openness to traditional knowledge suggests that, with structural limitations removed, there is room for change. According to Tarisayi (2024), including this epistemology in the teaching of Life Sciences promotes fairness and equity, increases student involvement as they interact with community elders, and advances democratic education. However, these principles cannot be completely fulfilled without backing and financial support from institutions, which includes involvement with the indigenous community, accessibility to resources, and curricular change.

7. IMPLICATIONS

The results presented here support the claim that successful IKS inclusion necessitates the following actions:

7.1. Modifications to the South African Science Education Curriculum to Allow for Different Epistemologies

European scientific knowledge is frequently given precedence in established educational institutions, while alternative modes of acquisition like indigenous knowledge are marginalized. Curriculums bring changes that affirm cultural perspectives as authentic bodies of knowledge rather than supplemental information, are necessary for effective cultural expertise inclusion. For instance, learners could investigate traditional herbal remedies and how local Indigenous cultures use them for medicinal purposes in a Life Sciences program. This is in opposition of exposure to modern botany and zoology, that is, combining traditional medical practices with African medicinal plants like Sutherlandia frutescens (cancer bush) which exposes learners to other diverse cultural traditions in a considerate and comparable way. Traditional basketry or beading might be used to teach algebraic maths concepts like symmetry, patterns, and measurements, demonstrating sophisticated mathematical reasoning ingrained in traditional practices.

7.2. Reforming the Training of Teachers to Include IKS Pedagogy-Focused Modules

A lot of in-service teachers don't know how to impart Indigenous Knowledge with understanding in a polite and genuine way. Giving aspiring educators the pedagogical techniques, moral frameworks, and theoretical foundations (e.g. TALSc.) necessary to teach ancient wisdom is a key component of redesigning the Life Sciences training modules of educators. The course “Indigenous Theories of knowledge and Curriculum Design” may be offered as part of exit modules of a Bachelor of Education (4th year) degree and Postgraduate certificates. In this methodology module, aspiring educators interact with local community elders, review case studies, and learn how to develop lesson plans that incorporate IKS. Participating in indigenous community immersion programs allows novice educators to observe and gain information directly from oral tradition bearers. Furthermore, IKS and sustainability in the environment might be included in teacher professional development, IK seminars for in-service teachers, which would assist them in incorporating traditional ecological knowledge into courses like Life and the natural sciences.

7.3. Collaborative Relationships Alongside Knowledge Keepers and Traditional Societies

Traditional wisdom is often centered around local communities and passed down verbally. In addition to strengthening societies, working together with Indigenous seniors, practitioners of healing, and traditional leaders guarantees that this wisdom is conveyed truthfully and morally. For example, as part of a Life sciences studies curriculum, a school would collaborate with the local Khoisan community (abathwa) to host intergenerational learning days when elders would show traditional ways to preserve their food, monitoring techniques, or narratives to take lessons from. Educators and elders co-lead these workshops to guarantee respectful participation and give an understanding of culture. To promote epistemic variety in a classroom, a science unit on astrology for instance, can incorporate lessons on Zulu or San star mythology, where indigenous universes are examined alongside European astrology.

7.4. Creation of Culturally and Scientifically Sound Contextualized Teaching Materials

There aren't many excellent, verified teaching resources that use Indigenous Knowledge. Effective IK instructional integration requires the development of materials that are both educationally sound and culturally appropriate. Real-World example involves Curriculum designers and educational publishers. These structures may work with local Indigenous communities to create engaging instructional modules, audio-visuals, and publications that feature native case studies. A section on soil fertility indigenous methods in rural Empangeni, for instance, may be included in a Life Sciences textbook. It would compare contemporary chemical manure or scientific knowledge based on compost, with Indigenous composting techniques like using

cows' faeces (*ubulongwe benkomo)*. Bilingual glossaries guarantee that Indigenous terminologies are preserved in translation, and visual aids like illustrated storybooks, describing seasonal cycles, can be utilized in language classes. Additionally, internet sites that offer audiovisual experiences that honor the oral aspect of many Indigenous cultural practices may be created, including songs, oral histories, and ceremonies that have been authorized for recording and form part of IK application.

A multifaceted, inclusively, and courteous strategy is needed to incorporate IKS into the Life Sciences teaching environment. These useful tactics support the transition of the educational system from a singular conception of understanding to one that is diverse and based on its local significance. In this way our CAPS curriculum will advance toward a fully decolonized and culturally responsive scientific educational system by incorporating Native ways of learning with understanding into Life Sciences educational program, teaching approaches, indigenous community engagement, and IK tool (lessons) creation.

7.5. Ethical Considerations

According to the university's research ethics policy, this work complied with ethical research requirements. Before any data was collected, ethical approval was acquired. All student instructors who took part in the study gave their informed approval, and their involvement was completely voluntary. Teacher participants were made aware of their freedom to leave at any time without incurring any fees. By using false identities and eliminating any personally identifiable data from questionnaire and secrecy were preserved. Only the researcher was given access to the safely kept information. Discussions about Indigenous Knowledge Systems were conducted with respect for cultures, and participants were urged to thoughtfully consider their lived experiences and convictions.

8. RECOMMENDATIONS

Several strategic actions are necessary to assist the integration of Indigenous Knowledge Systems (IKS) into Life Sciences education. First and foremost, IKS-focused methodological module courses that provide novice educators with the theoretical and pedagogical skills they need to interact with Indigenous epistemologies in a genuine and sensitive way, must be included in educator preparation programs. Schools should simultaneously make culturally suitable instructional materials and IK integrated lesson plans available to students. Which should be in line with Indigenous viewpoints and Life Science CAPS curricular requirements. It is equally important to establish long-term relationships with traditional knowledge holders, so that instructors may jointly develop community-approved and culturally rooted educational opportunities.

9. CONCLUSION

The obstacles that trainee teachers have while trying to include cultural ways of knowing into the teaching of Life Sciences during their practicum experiences were investigated in the present research. Even though the Life Sciences CAPS curriculum takes an active approach to epistemic inclusion, several structural and instructional shortcomings still significantly limit the actual use of traditional knowledge in Life Sciences classrooms. Significant results showed that novice teachers are hampered by the absence of culturally appropriate teaching resources (tools), struggle with deadlines brought on by existing overloaded curriculum, and limited training on Indigenous Knowledge integration. Additionally, the careful approach, which frequently results in a complete omission, is influenced by the concern of distorting traditional wisdom. Nonetheless, teacher participants acknowledged the importance of traditional wisdom and indicated a desire to integrate it if provided with the tools, materials, direction, and institutional backing necessary to do so in a responsible and secure manner.

These results highlight the discrepancy between Life Sciences classroom instruction and CAPS curriculum educational policy. Teacher education institutes must intentionally work to include IKS teaching approaches into their curricula if South African Life Sciences education is to make significant progress toward decolonization. This entails providing hands-on training, creating material toolkits in partnership with Indigenous communities, and modifying evaluation criteria to consider various modes of learning.

In the end, IKS integration into the Life Sciences is a step toward addressing past epistemic marginalization and promoting inclusive, culturally appropriate education for all students, not just a curricular improvement.

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