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Article

Indigenous knowledge and its infusion into Ordinary Level Science learning at one secondary school in Zimbabwe

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Abstract

Zimbabwe's curriculum framework (2024 - 2030) stresses the need for science learning activities to be grounded in cultural knowledge. Despite this recognition, the infusion of Indigenous Knowledge (IK) into science learning remains limited at the selected secondary school. In this context, this sought to gain insight into the extent to which the teachers are infusing IK into their Ordinary Level Science learning activities. The study was grounded in a qualitative approach, and data was sourced from the seven purposively sampled participants (teachers). Data was generated through the literature method and interview protocol and analyzed thematically. The findings of the study revealed that the participants (teachers) had a clear understanding of IK as a concept and its relevance in learning activities. It was also acknowledged that the participants were using the student-centred approaches to infuse IK into Ordinary Level Science learning activities. However, the participants encountered numerous challenges when infusing IK into science learning activities. From the highlighted findings, it was concluded that despite the existence of some challenges, the participants were, to a larger extent, infusing IK into Ordinary Level Science learning activities at the selected school. We recommend that further research be conducted into the challenges faced when infusing IK into learning with the view of refining instructional methods.

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Introduction

Science is often considered universal, transcending cultural and geographical boundaries, though the way it is taught and learned varies significantly due to cultural and historical contexts (Jima, 2022; Ndlovu et al., 2019). In Zimbabwe, the curriculum framework (2024 – 2030) offers a unique and enriching opportunity to infuse Indigenous Knowledge (IK) into Ordinary Level Science learning activities (Ministry of Primary and Secondary Education, 2024). Thus, the curriculum framework is characterized by a paradigm shift towards recognizing IK in Ordinary Level Science learning activities. In this context, the acquisition of knowledge, skills, and values is grounded in the students' traditional and cultural knowledge systems (Chitera & Moyo, 2021). This gives emphasis on learning through critical engagement with their surrounding environment, thereby shifting from teachers as providers of information to facilitators of learning and knowledge transfer (Dziva et al., 2012; Nubia & ·

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Blignaut, 2023). In this case, learning gives significance to activities that reflect students' previous knowledge and experiences (Killaway, 2022; Race et al., 2022; Zinyeka et al., 2016).

Despite the purported contributions of IK in learning activities, it has been relegated to the periphery of science learning activities in preference of the 'Western Science' (Chika, 2019). In support of this notion, scholars (Ogunnyi, 2016; Pedzisai, 2013) have acknowledged that science learning represents Western worldviews at the expense of the infusion of indigenous cultural activities and knowledge. It can also be noted that numerous studies (Abebe et al., 2023; Tanyanyiwa, 2019; Teshome, 2017) have attempted to gain insight into the impact of culturally relevant learning on students' engagement and learning outcomes. However, there are limited empirical studies that interrogate how IK can be impeccably infused in science learning activities. This knowledge gap has motivated the researchers to cross-examine this issue guided by the following research question: To what extent was IK being infused into Ordinary Level Science learning activities?

Method

This study was grounded in a qualitative approach as it focused on capturing and interpreting (Creswell & Plano-Clark, 2017) the participants' experiences concerning the infusion of IK into Ordinary Level Science learning activities. It is in this context that this approach was selected to gain an in-depth understanding of the selected participants' experiences regarding the issue at the center of this study. The seven (7) participants were purposively sampled to participate in this study. Despite this small sample size, the insights gained from the selected participants offered valuable context-specific data to provide depth to the study (Creswell & Creswell, 2018). In this study, the aim was not necessarily to achieve the generalisability of the findings but instead to attain a rich and detailed description of the participants' experiences regarding the issue under investigation. In this case, the researchers employed document analysis and interview protocol to enhance all-inclusive insights. The researchers had a thorough interrogation of the relevant documentation and methodically scheduled the interviews with the participants. Each participant was engaged in an individual interview lasting approximately (10 - 15 minutes), to ensure an engrossed search of their experiences (i.e., the conceptualization of IK, approaches used in infusing IK into science learning activities, and challenges encountered when infusing IK into science learning activities). Thematic analysis was employed to articulate meaningful patterns within the generated data (Maree, 2016). Ethical considerations formed the core of data generation, presentation, analysis, and discussion in this study.

Findings and Discussion

This section discusses the selected participants' experiences concerning the infusion of IK into Ordinary Level Science learning activities at the selected school under the following sub-headings:

Conceptualization of IK in the context of Ordinary Level Science learning activities

This section examines the participants' conceptualization of IK, with the aim of establishing a clear framework for understanding how traditional knowledge can be infused into Ordinary Level Science learning in a meaningful and respectful manner. In this regard, one of the participants noted that:

> To enable students to understand some of the key concepts, principles, etc. better, we use resources or information (i.e., historical contexts) that are readily available at their school or community. In other words, it enables a hands-on approach to their learning (Participant 4)

Another participant indicated that:

> In some of our Ordinary Level Science learning activities, we involve community members around the school (i.e., traditional leaders and traditional healers) as resource persons. They bring to the fore relevant Indigenous knowledge systems that are not documented but relevant to students' understanding of some scientific principles (Participant 7)

In addition, one of the participants acknowledged that:

> At this school, we don't have resources [textbooks] with IK material/content. Hence, there is a need to consult some of the members of the community. These provide oral information about their practices, beliefs, or culture that can enhance students' comprehension of concepts in Ordinary Level Science (Participant 2)

From the participants' contributions, it can be acknowledged that IK is a knowledge system, practices, and beliefs of people rooted in their cultural and historical contexts. Thus, the participants considered it as the infusion of traditional knowledge systems with Western scientific education. In this context, IK encompasses the local traditional understanding of nature, the environment, and the universe, which has developed over generations through observations and experiences. When it comes to Ordinary Level Science, this infusion can be of relevance in bridging cultural knowledge with Western scientific principles, enriching students' learning process. This concurs with Chikoko (2016), who postulated that the existence of an integrated science curriculum creates a meaningful connection between the traditional experience that the students bring from their local environment and Western scientific principles.

In other words, it permits the rearrangement of knowledge to go beyond being grouped according to subject sequence to one that follows the rhythms and patterns of students' minds (Jensen, 2016; Matsika, 2012). In support of Ugwu and Diovu (2016), this allows students to learn best in real-life immersion style and multi-path learning, thereby avoiding fragmented and piecemeal presentation, which can affect their joy and love to participate actively in science learning. In this regard, students have the potential to acquire relevant knowledge and skills within a meaningful context and not in a restricted manner (Shizha, 2007). This approach recognizes the diverse backgrounds and experiences of students and its relevance to the creation of a firm foundation for its infusion into Western science learning activities (Mudaly & Chirikure, 2023; Gay, 2010). Therefore, when the content and practices resonate well with the students' cultural contexts, they are most likely to be motivated to participate actively in learning activities.

It is against this background that Abah et al. (2015) and Photo and McKnight (2024) advanced the need to infuse students' cultural contexts into Western science so as to create more meaningful and relatable learning experiences. This concurs with Rodrigues-Silva and Alsina (2023), who highlighted in their study that IK develops students' knowledge, values, agency, and actions, which can promote the creation of a sustainable society. This is made possible by nurturing students with a more inclusive and holistic perspective that acknowledges the value

of traditional knowledge while fostering critical thinking and scientific inquiry. In support, Abera (2020) and Ohenhen et al. (2024) opined that the infusion of IK into the curriculum increases the inculcation of norms and values in students' minds through science learning activities.

The conceptualization of IK is fundamental to understanding its value and relevance in the context of Zimbabwe's curriculum framework 2024 - 2030. Therefore, the participants conceptualized IK as a body of knowledge, practices, and beliefs that are developed over generations by Indigenous communities and are rooted in their interactions with the natural environment, culture, and traditions (Zimu-Biyela, 2019). This knowledge encompasses a wide range of areas that promote the development of a well-rounded scientific inquiry. Through the involvement of students in these activities, they learn to respect local cultures, support environmental sustainability, and understand the world in all its complexity (Kugara et al., 2022; Mudaly & Ismail, 2013). In the context of education, the conceptualization of IK goes beyond simply recognizing its existence; it involves understanding how this knowledge can be infused with formal scientific learning to enrich students' educational experiences.

Strategies used to infuse IK into Ordinary Level Science learning activities

This section explores the various approaches used to infuse IK into Ordinary Level Science learning activities at the selected school in Zimbabwe. These approaches not only provide students with a more contextualized understanding of scientific principles but also foster a deeper understanding of a deeper connection to their cultural heritage. In this regard, one of the participants advanced that:

> For effective infusion of IK in Science, teachers select students' practices and experiences (e.g., plant-based medicines, etc.) that they face on a daily basis at home or in the community. (Participant 1)

In support, a participant pointed out that:

> In the Biology component of the subject, during the learning activities, we use locally available ecosystems to enhance student-student/teacher-student/student-environment interaction. Also, it advocates for outdoor activities to allow students to marry theoretical and practical (Participant 3)

From the above contribution it can be acknowledged that the infusion of IK into Ordinary Level Science can be done through the contextualisation of scientific concepts. For instance, local knowledge can be linked to Western scientific ideas, students' everyday knowledge, experiences, and practices can be identified, and they can be aligned with the Ordinary Level Science content or material. In addition, in Ordinary Level Science learning activities, students can study local ecosystems, plants, and animals, which are part of the society's traditional knowledge (Seehawer, 2018). Thus, local resources are used in Ordinary Level Science learning activities as case studies on classification, adaptation, and biodiversity. Further to this, a participant indicated that:

> We, at times, organize outdoor learning activities or educational trips to local communities such that students can interact with the community elders on issues related to Indigenous science (Participant 5)

In this regard, the students have a chance to interact with community elders who have a deep understanding of traditional practices. These interactions help the students explore how IK practices support sustainable practices in the ecosystem (Opoku & James, 2021). In this context, the student can observe and document the application of IK in their environment. For example, local plant species can be used for culinary purposes. In addition, one of the participants highlighted that:

> In this case, the community is seen as a key source of IK. Hence, at times in my learning activities, I invited guest speakers to share their experiences with the students. In this way, students are accorded the opportunity to ask questions (Participant 6)

In this instance, the participant advanced the need for collaborative learning with IK holders who would share their experiences with the students. In other words, this facilitates opportunities for students to engage with community members who possess traditional knowledge. This fosters respect for local practices while also helping to deepen students' understanding of Ordinary Level Science concepts and principles. These interactions can act as the basis for the students' involvement in community-based research (Opoku & James, 2020). Thus, it encourages students to undertake research projects based on indigenous practices, such as studying local plant species. The research projects can be linked to scientific concepts such as classification, ecosystem dynamics, plant anatomy, and physiology (Padmasiri, 2018). In addition, it can be acknowledged that traditional narratives as educational tools are rich in oral traditions, which explain natural phenomena, life cycles, and ecosystems. Hence, these can be used to introduce scientific concepts (biodiversity, ecological balance, etc.).

The infusion of IK into Ordinary Level Science learning activities represents an innovative approach to bridging the gap between traditional knowledge systems of formal education. In the context of Zimbabwe's curriculum framework for 2024 - 2030, where local cultural practices and scientific concepts are considered to complement each other. Therefore, the infusion of IK into Ordinary Level Science learning activities offers unique educational benefits. However, the infusion of IK into Ordinary Level Science learning activities requires a thoughtful, multi-faceted approach, which respects and highlights the value of both traditional Western scientific knowledge. This concurs with Fateye et al. (2022) and Kaziya et al. (2023), who advanced that this provides culturally responsive, student-centered learning opportunities. Thus, through strategies such as infusing local knowledge with scientific concepts, organizing field trips, engaging in hands-on projects, and fostering collaboration with local knowledge holders, students can better understand the interconnectedness between culture, science, and the environment (Le Grange, 2023). In other words, these strategies not only enrich students' Ordinary Level Science experiences but also contribute to more holistic and inclusive learning.

Challenges encountered when infusing IK into Ordinary Level Science learning activities

Infusing IK into Ordinary Level Science learning activities can offer significant educational benefits but also presents numerous challenges. Hence, this section centers on some of the challenges encountered when infusing IK into Ordinary Level Science learning activities at the selected secondary school. In this regard, one of the participants highlighted that:

> The Ordinary Level syllabus is designed in a way that leaves us [teachers] with limited room to include alternative knowledge systems in learning activities (Participant 3)

Also, one of the participants asserted that:

> It is important to highlight that the Ordinary Level Science syllabus is tightly packed. Thus, there is so much content to be covered within a short space of time. Remember, a sizeable amount is lost when students are expected to take in various sporting activities during the course of the term [the first and second terms] (Participant 7)

The participant highlighted curriculum rigidity as one of the challenges faced when infusing IK into Ordinary Level Science learning activities. Thus, the curriculum framework 2024 - 2030 (with specific reference to the Ordinary Level science) is designed to adhere to standardized content and instructional methods. This leaves little or no room for the infusion of IK. In other words, the prescribed Ordinary Level Science syllabus may not explicitly support the infusion of IK into its learning activities (Msimanga & Shiza, 2014). In addition, the participants indicated there was limited flexibility as teachers were constrained by time limitations and examination-focused content (Khupe, 2014; Iserbyt et al., 2024). This makes it difficult to infuse IK into learning activities without deviating from the syllabus or compromising the examination preparations. From another angle, one of the participants acknowledged that:

> We have limited knowledge on how best this infusion of IK into Ordinary Level Science learning activities can be tackled. Currently, we are just doing it since it's a policy requirement, but there are some gaps that can be noted in its implementation in real teaching and learning (Participant 4)

In the same vein, a participant revealed that:

> This new approach to teaching and learning just came as a directive from the head office [Ministry of Primary and Secondary Education] with scarce seminars, workshops, training, etc., to equip us with the relevant knowledge and skills (Participant 1)

In addition, it was revealed by one of the participants that:

> This new approach to teaching and learning needs resources and materials, which at the present moment at our school are not easy to come by. In addition, having access to IK community holders can take ages. This makes it difficult to take on board this new approach (Participant 3)

From the above contributions, it can be noted that limited expertise and training negatively impacted the infusion of IK into Ordinary Level Science learning activities at the selected school. Thus, teachers may not have sufficient exposure to or knowledge of IK. This limited familiarity can bring about some limitations when it comes to the infusion of IK into Ordinary Level Science learning activities effectively. It was also advanced that teachers had not received sufficient training on how to infuse both scientific principles and traditional knowledge into their teaching and learning. Therefore, this limited professional development can hinder teachers' ability to deliver a balanced and informed approach to the infusion of IK into Ordinary Level Science learning activities (Nair & Abera, 2017). In addition, it can be acknowledged that limited resources and materials, for instance, the scarcity of textbooks, teaching materials, etc., illustrate the infusion of IK into Ordinary Level Science learning activities (Demssie et al., 2020). Hence, makes it a bit difficult for the teachers to effectively infuse IK into their planned learning activities. Infusing IK into Ordinary Level Science learning activities offers valuable opportunities for enriching the Ordinary Level Science learning activity, but it also presents numerous challenges.

Conclusion and Implications

The infusion of IK into learning activities has proven to be a transformative approach, offering both cultural and educational benefits. By infusing IK into learning activities, students are able to connect their classroom interactions with lived experiences, enhancing both understanding and retention of concepts, principles, and procedures. It is in this context that we concluded that irrespective of the existence of challenges, IK, to a larger extent, was being infused into Ordinary Level Science learning at the selected school in Zimbabwe. This implies that the sustained infusion of IK into Ordinary Level Science learning has the potential to promote a more holistic and inclusive learning environment that nurtures critical thinking, creativity, and a deeper sense of identity among students. Thus, academics and curriculum developers need to take into account IK as a foundation for knowledge in Ordinary Level Science learning activities. This calls for an urgent need to deconstruct the influence of Western science and its consequences, thereby advancing the infusion of IK into Ordinary Level Science learning activities.

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