



**HAWASSA UNIVERSITY, COLLEGE OF EDUCATION
SCHOOL OF TEACHERS EDUCATION
MA IN CURRICULUM AND INSTRUCTION**

**INTEGRATING INDIGENOUS KNOWLEDGE INTO GENERAL SCIENCE: CONCEPTION
AND IMPLEMENTATION OF DAWURO ZONE PRIMARY SCHOOL TEACHERS IN LOMA
BOSA WOREDA, ETHIOPIA**

MA.THESIS

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**May, 2024
HAWASSA, ETHIOPIA**

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AND IMPLEMENTATION OF DAWURO ZONE PRIMARY SCHOOL TEACHERS IN LOMA
BOSA WOREDA, ETHIOPIA**

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF HAWASSA
UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTERS IN CURRICULUM AND INSTRUCTION**

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DECLARATION

Marta Jingaw Tenku the under signed declare that this MA thesis entitled on “**Integrating indigenous knowledge into general science: conception and implementation of Dawuro Zone primary school teachers in loma bosa woreda, Ethiopia**”

Is my own work and that all sources that I have used or quoted have been cited and acknowledged by means of references.

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Name of Researcher

Signature

Date

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This is to certify that the thesis entitled “**Integrating indigenous knowledge into general science: Conception and implementation of Dawuro zone primary school teachers in Loma Bosa Woreda, Ethiopia**” Submitted in partial fulfillment of the degree of Master with specialization curriculum and instruction the graduate program of department of teachers’ education and has been carried out by Marta Jingaw Tenku under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence here by can submit the theses to the school

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Date

EXAMINERS APPROVAL SHEET

We, the undersigned, members of the Board of Examiners of the final open defence by **Marta Jingaw Tenku** have read and evaluated her thesis entitled “**Integrating indigenous knowledge into general science: Conception and implementation of Dawuro zone primary school teachers in Loma Bosa Woreda, Ethiopia**”, and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfilment of the requirements for the degree of Master of Arts in Curriculum and Instruction.

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ACKNOWLEDGEMENTS

Numerous individuals have contributed to this uncharted journey. I express gratitude to God for granting me the inspiration and courage to persist in completing this study. My sincere appreciation extends to my advisor, Mehadi Abdo (Assistant Professor, PhD Candidate) for ongoing guidance, insightful feedback, professional demeanor, and willingness to engage in discussions about various study aspects. I also acknowledge the teachers who participated in the study. Lastly, I am thankful to my family for motivating and encouraging me to continue working on this thesis, even as it required time away from them.

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LIST OF ACRONYMS

IK: Indigenous knowledge.

UNESCO: United Nations Educational Scientific and Cultural Organization.

SADTI: South Africa Department of Trade and Industry.

SWEPRS: South West Ethiopian Peoples' Region state

STEM: Science, Technology, Engineering, and Mathematics

Abstract

The objective of this study was to explore teacher's conception on the integration of indigenous knowledge in general science in the case of governmental primary schools of Dawuro zone Loma Bosa Woreda. Out of 30 governmental primary schools in the Woreda 10 primary schools were selected by using simple random sampling technique and all teachers teaching General science were purposively sampled. School principals, cluster supervisors and department head teachers were also purposively included in the study. The instruments used to collect data were questionnaire, interview and actual classroom observation. The finding of the study revealed that teachers have a positive perception on the integrating of IK into General Science. The sum mean score was 3.56 (with a standard deviation of 0.72), reflecting favorable perceptions. This finding was supported by interviews with cluster supervisors, school principals, and department heads. The other issue addressed in this study was about the level of awareness of teachers on the integration of indigenous knowledge. As the result, the study exposed those teachers demonstrated moderate level of awareness regarding the integration of IK in General Science teaching. The average score was 2.52 (with a standard deviation of 1.1), interview data and classroom observations further supported this finding. Teachers actively engaged with Indigenous knowledge during General Science instruction, resulting in an overall mean score of 2.92 (with a standard deviation of 0.87). Even though, the observation data showed that the teachers' practical implementation of integration of IK was assessed as poor. The other question focused in the present study was about the major challenges teachers were facing during integrating the indigenous knowledge in teaching General science. Despite positive perceptions and awareness, challenges persisted in the study; for instance, insufficient well-documented resources and inadequate training in IK hindered successful integration into the General Science curriculum. The scarcity of relevant national and local resources, including IK-focused textbooks for students and teachers' guides, posed additional obstacles. Depending on the finding of the study it was recommended that, addressing resource gaps and enhancing training opportunities are crucial for effective integration of IK in General Science teaching.

Keywords: *Indigenous knowledge, general science, conception, implementation.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Indigenous knowledge, deeply rooted in the cultural heritage of diverse communities worldwide, encompasses beliefs, practices, and traditions transmitted across generations. Recently, there has been increased awareness of the significance of incorporating indigenous knowledge into national curricula across various countries. Schools serve as a natural platform for integrating this valuable knowledge, bridging the gap between communities and formal education systems (Batib], n.d.; Mavhunga, 2008; Chiromo; 2004).

If teaching and learning are to accommodate indigenous knowledge, then teachers' perception of it is critical since, they are the vehicle through which the importance of indigenous knowledge can be transmitted and get recognized by students as a vital component of the livelihood of traditional societies. According to Mavhunga (2008), integrating the native indigenous knowledge into the conventional school curriculum would enhance curriculum relevance and better understanding of concepts through the use of local languages, among other aspects of indigenous knowledge. It would also form a basis for connecting what students learn at school with their daily life at home.

The achievement of the science for all approach throughout the world and total rebirth of science education in Africa has brought about considerations on how African learners move from their indigenous community knowledge to the scientific knowledge learnt in formal schools Abah, Mashebe, & Denuga, 2015). Learning of scientific knowledge at school could help learners in solving problems and better understanding of their daily life experiences (Herbert, (2006). This can only be achieved if learners effectively and significantly learn scientific ideas. For learners to effectively and importantly learn science, the school science has to connect to the learners' prior knowledge of which indigenous knowledge is part. As a result of this necessity, different educational systems in different countries have included indigenous knowledge in their formal school learning. For example, the South African educational system has developed curricula which are based on the principle of inclusion of indigenous knowledge in education.

As Grange (2007), explains that a multicultural state has different indigenous "knowledge's" that are important to the majority of its nations, hence the integration of indigenous knowledge is a positive development which could provide chances for the interaction of indigenous ideas with the dominant western ideas learnt at school.

Mosimege, M. (2005) and Nel, N. (2005). Argue that the integration of indigenous knowledge in the African education curriculum is still at a rhetorical stage and as a result needs to be monitored and evaluated. Grange (2007), again explains that successful and effective integration of indigenous knowledge in science learning can only be achieved if educators understand what integration of indigenous knowledge means and have the ability to properly integrate indigenous knowledge in their teaching. If the educators have no well understanding about the way of integrating indigenous knowledge in classroom instructional process it is not effective.

According to Ministry education Ethiopia in 2020, new national education curriculum has been developed for all grade level. This newly developed curriculum combined three science subjects namely Biology, Chemistry and Physics together for grade seven and eight which is quite different from the previous approach. These curricula emphasize the notion of integrating indigenous knowledge into science education. This recently developed curriculum of General science for grades 7 to 8 has been implementing since in 2022. This curriculum has three learning outcomes which stipulate the knowledge, skills and values that learners are to acquire at the end of the learning process of the further education and training band. Learning outcome of the General science curriculum focuses on indigenous knowledge and its importance to teach science concepts. This learning outcome explains indigenous knowledge as one of the ways of thinking and knowing apart from western knowledge and emphasizes the need to recognize the scientific ideas of indigenous people by rediscovering indigenous knowledge in the present day MoE, 2020.

Thus, the intention of this study was explored the Perception of teachers in integration of indigenous knowledge in the general science and identify the challenges that affect its integration.

1.2. Statement of Problem

The integration of indigenous knowledge (IK) into the educational process has garnered significant attention in both social and academic spheres. Scholars have debated the successes and failures of this integration, particularly following the implementation of national curriculum statements in various African nations. Mosimege, M. (2005) and Nel, N. (2005) argue that, despite these efforts, the integration of IK remains largely theoretical in many African countries. They emphasize the need for robust monitoring and evaluation to ensure that educators are effectively incorporating IK into the curriculum.

Grange, G. (2007) posits that the successful integration of IK in schools' hinges on educators' understanding of what this integration entails and their ability to embed IK within the curriculum and teaching practices. He also notes the importance of educators confronting and overcoming the challenges they encounter during implementation.

Further, Thaman, T. (2009), observed that teachers, as cultural mediators, hold a pivotal yet complex role in the African educational landscape. Their professional training is often aligned with Western educational practices, which can conflict with the cultural identities and traditions of their students. This dichotomy can lead to the marginalization of students' home cultures within the school environment. Moreover, the lack of training in culturally relevant pedagogy presents additional challenges for teachers attempting to indigenize their curricula, as highlighted by Herbert, H. (2006). According to Herbert languages and teacher's pedagogical knowledge and theoretical frameworks are likely to pose challenges to those who are just joining the process of indigenizing their curriculum.

When we study this condition in the Ethiopian context, the education system has historically not reflected the nation's cultural, social, and economic realities, often emulating Western educational models. This has led to a predominantly negative perception among teachers regarding the integration of IK, as evidenced by the work of Sobha B. Nair and Teshome Abera (2017). While their research concentrated on the curriculum's influence on IK integration, the current study shifts focus to teachers' perceptions, the challenges they face, their current practical experiences and their level of awareness concerning the integration of IK in teaching General Science

1.3. Objective of the Study

The present study has both general and specific objectives. In the following section both these objectives were mentioned.

1.3.1 General Objective

The general objective of this study was:

- To explore the teacher's conception and implementation of on the integration of indigenous knowledge in General science curriculum in governmental Primary Schools of Dawuro Zone Loma Bossa Woreda.

1.3.2 Specific Objectives

The specific objectives of the study were:

- To examine the conception of General sciences teachers about the integration of indigenous knowledge.
- To examine the teachers' current practical experiences of integrating indigenous knowledge in teaching general science
- To identify the major challenges General science teachers are facing in the integration of indigenous knowledge in teaching General science

1.4. Research Questions

1. What is the conception of general sciences teachers regarding the integration of indigenous knowledge into the General science curriculum?
2. What are the current teachers' practical experiences of integrating indigenous knowledge in teaching general science?
3. What are the major challenges teachers are facing during integrating the indigenous knowledge in teaching General science?

1.5. Significance of the study

This research study aims to benefit primary schools by focusing on the integration of indigenous knowledge into the instructional process for children. It provides clarity to school leaders, teachers, and other stakeholders regarding indigenous knowledge, how to incorporate it alongside prior knowledge, and it's potential to enhance children's learning. Additionally, the study emphasizes the crucial role of teachers and facilitators in integrating this knowledge effectively during instruction.

The beneficiaries of this research include primary school leaders, teachers, students, supervisors, curriculum developers, and families in the research study area within Ethiopia, as well as educators and researchers in other rural regions. Furthermore, the research findings can serve as a valuable benchmark or reference for related studies that would be conducted by other researchers.

1.6. Delimitation of the study

The study was conducted in Dawuro zone Loma Bosa Woreda governmental primary schools. In Dawuro zone Loma Bosa Woreda there are 30 governmental primary schools. To make the study manageable it was delimited to ten primary schools of Dawuro Zone Loma Bossa Woreda. The study also, conceptually delimited to explore the teacher's perception on the integration of indigenous knowledge in General science curriculum.

1.7 Limitations of the study

The researcher observed the following as the limitation of the study. Concerning sample Composition, the study's insights might be constrained by the representativeness and scale of the sample since the teachers on the sampled teachers were not that much. Regarding the Perception-Based Subjectivity given the study's reliance on teachers' personal views, a subjective bias is inevitable, potentially obscuring the factual efficacy of indigenous knowledge integration. The other limitation was related with Time. The study's timeframe may limit the depth and extent of the investigation.

1.8. Operational Definition

Integration in the context of education: the intentional inclusion and incorporation of indigenous knowledge and perspectives into the general science curriculum. It involves bridging the gap between indigenous knowledge and mainstream scientific knowledge, creating connections and meaningful interactions between the two

Indigenous Knowledge in education: The knowledge, skills, practices, and beliefs that have been developed and passed down through generation within a particular community or culture.

General science: Is a course of study incorporating elements of different sciences, such as biology chemistry and physics.

Curriculum: The planned and organized set of educational experiences, learning goals, content, and instructional strategies that are designed to guide teaching and learning in an educational institution or system. It encompasses the knowledge, skills, attitudes, and values that students are expected to acquire throughout their educational journey.

1.9. Organization of the paper

The research is structured into five sections. Chapter One provides an overview, including the study's context, problem statement, goals, research inquiries, and terminology definitions. Chapter Two examines the existing literature. Chapter Three outlines the methodological approach, encompassing the research framework, demographic and sample details, tools for data gathering, procedural steps, and analytical methods. Chapter Four addresses the findings, presenting and analyzing the data, followed by a discussion of the results. Chapter Five concludes the study with a summary, suggestions, and concluding remarks. Finally, the list of reference materials were indicated under the reference as per APA style and the important information annexed in the appendixes.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. INTRODUCTION

The core principles of science involve understanding the fundamental concepts that govern scientific inquiry. To improve our grasp of STEM disciplines, it's essential to incorporate them into educational curricula. The way we understand and respond to these subjects is deeply influenced by our personal backgrounds, viewpoints, and cultural settings. Often, the perspectives offered, particularly in places like the USA and Canada; reflect dominant Western ideologies and values, which may differ from indigenous perspectives. This is highlighted in the work of Simpson and colleagues in 2023.

Science provides distinct understanding through systematic investigation of our environment. An integrated STEM education encourages a comprehensive view that recognizes the complexity of these subjects, going beyond traditional limits. In education, it's important to focus on cultural diversity, as different perspectives greatly shape our interaction with and interpretation of science, enriching the educational process.

The importance of STEM fields in promoting economic growth is widely acknowledged, leading to significant changes in educational programs around the world, including in South Africa. Educators are tasked with the challenge of incorporating STEM learning alongside conventional wisdom on a worldwide scale. It is argued that native knowledge is essential for both socio-economic development and the progress of Science and Technology. This steadfast dedication highlights the revolutionary impact of merging STEM learning with native insights, laying down a base that enriches both culture and science.

In nations like Zimbabwe, the Ethiopian educational system requires the inclusion of Indigenous Knowledge Systems (IKS) in science education, following the directives of Abdisa Olkeba in 2022. Research indicates that integrating IKS into the school syllabus enhances the STEM curriculum and is beneficial due to its long-standing practice by communities, as noted by Abera in 2020 and Barnhardt & Kawagley in 2008. However, educators encounter difficulties in incorporating IKS into science teaching, despite its considerable potential advantages, as discussed by Diwu & Ogunniyi in 2012 and Zidny et al. in 2020.

Moreover, the Ethiopian science curriculum lacks explicit instructions for teachers on how to effectively blend IKS with their teaching methods, a gap identified by Abdisa Olkeba in 2022. The curriculum also does not provide educators with extensive knowledge of a various indigenous knowledge could be included in their instruction. Therefore, it is essential to explore how IKS is perceived and applied in scientific education, especially from the viewpoint of teachers in rural areas. Considering IKS's vital contribution to sustainable development, such research should also consider the obstacles to its application.

2.2. Indigenous Knowledge

When trying to define Indigenous knowledge, there is a danger of creating a simplistic definition that fails to honor the unique histories and geographies of peoples; however, there are similar themes across peoples. Indigenous knowledge can be understood to include language, culture, and ways of knowing and being that are tied to place. This knowledge is passed down generationally and benefits the entire community.

A connection to the land is at the heart of Indigenous knowledge and is linked to the interconnectedness of the natural world (Ahenakew, 2017). However, Indigenous students live with a tension in trying to navigate two different and often competing knowledge systems. The dominant Western culture sees land as property and a source of resources to be extracted.

In contrast, Indigenous cultures see the land as the first teacher (Ahenakew, 2017). In addition to this land-based focus, Indigenous language and culture are central to Indigenous knowledge and are tied to creating better personal and educational outcomes for Indigenous students (Munroe et al., 2013).

In this way, Indigenous education can be viewed as needing to be grounded in the teachings and knowledge of local culture and community. For educators, this becomes a potential challenge because not all school districts have strong relationships with the local Indigenous communities.

Authentically integrating Indigenous knowledge is a challenge raised by Ahenakew (2017), who asserted that having non-Indigenous educators try to integrate Indigenous knowledge was a “tokenistic means to an end” Indigenous knowledge is used to help Indigenous students meet a Western idea of success.

In this way, integrating Indigenous knowledge is seen as a remedy for lower educational achievement levels. Ahenakew acknowledged that classroom teachers are struggling with these tensions as they begin to recognize their part in supporting and perpetuating a system of privilege and inequity:

“We are asking teachers to undo the epistemic certainties that uphold their ontological securities and that provide the justification for their positions of privilege and authority in the perpetuation of sanctioned epistemic violence in mandatory content and pedagogy” (2017).

However, Munroe et al. (2013) provided a different perspective and saw integrating Indigenous ways of knowing as a way to decolonize education. By deconstructing and then rebuilding the education system, where learning is focused on Indigenous knowledge, education can be transformed. For Munroe et al., Indigenous knowledge is rooted in relationships, connected to the natural world, and passed down generationally. Munroe et al. saw alignment between Indigenous knowledge and 21st-century learning principles of respecting and valuing other cultures, understanding and appreciating the interconnectedness of all things, and focusing on place-based learning.

2.3. Indigenous knowledge system

The conceptualization of IKS within the academic dialogue is particularly enhanced by the perspectives articulated by Tanyanyiwa (2019). Twance posits IKS as comprising the complex interaction of specific knowledge, skills, customs, and attitudes inherent to a given culture or society. A key dimension of this framework involves the transmission of knowledge from elder to younger community members across successive generations, an intimate intergenerational exchange facilitated by direct engagement with the environment. The varied expressions of IKS span a diverse spectrum, encompassing cultural rituals, religious ceremonies, agricultural techniques, and healthcare practices, thereby reflecting its involved nature deeply embedded in the basics of community life (Madlela, 2022).

Further highlighting the complex nature of this knowledge system is the terminological interchangeability of IKS with terms such as traditional knowledge, local knowledge, or traditional ecological knowledge, as explained by Tanyanyiwa (2019). This conceptual flexibility allows for a more comprehensive understanding of IKS and how it appears in several types of contexts.

Zidny et al. (2020) provide a similar contribution to this conversation by defining IKS as a type of traditional knowledge, environmental knowledge, local knowledge, or traditional ecological knowledge. Collectively, these definitions highlight the contextual uniqueness and community-rooted nature of IKS, explaining it as a knowledge base that is closely connected to the distinct social, geographic, and environmental background of local communities (Zidny et al., 2020).

2.4. The status of Ethiopian curriculum in integration of IK

The Ethiopian education policies since the 1940s were less concerned with incorporating the historical and traditional values on which the country's culture was built for long years. In this regard, our curricula in the three government systems have been focused on the Western dominated knowledge system (Sisay, 2016).

Most recently, findings in the assessment made on the existing old curriculum for finding gaps and setting goals of the Ethiopian Education Development Roadmap (2018–30) leveled the curriculum as heavily loaded with academic subjects and contents. Problem-solving skills and co-curricular activities in promoting social competence and moral development are not part of this curriculum.

Currently, the country needs citizens who creatively understand the knowledge system integrated with both indigenous and Western best educational practices that solve dilemmas in society (MoE, 2018, 2020, Ministry of Education, 1994). Indigenous peoples have their local rights to protect, innovate, and manage their resources and the available knowledge systems (human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literature, designs, sports, and traditional games and visual and performing arts) together with the ways of their expressions (MoE, 2021, Ministry of Education, 1994; United Nations, 2007).

Regarding the use of IK in the Amhara Region, some research studies looked for the presence of ample context-based IK systems used for solving local problems. For instance, the study related to medicinal animals in West Gojjam Zone attempted to identify animal-derived medicines as an alternative means to treat ailments in rural areas (Manaye et al., 2020). Another study by Bishaw and Wubshet (2020), on the role of IK in agricultural farming practices in the Gondar and Gojjam areas, identified parts of IK systems that play significant roles in farming activity, food production, crop storage, medicinal value to sustain life in the areas of these zones. A study on the indigenous technical knowledge of farmers in North Shoa from the Sheno agriculture research center identified indigenous soil and water conservation practices and pest control with their local name (Negash et al., 2006).

However, all these studies observed that the roles of IK played in these and other daily activities of the local people were not safely guarded in the region. Documentation and giving recognition of these indigenous knowledge systems remain in vain.

Although IK systems serve as a baseline for knowledge constructions in society, they were not properly utilized and are still at risk of extinction due to a lack of institutional support (Tigist et al., 2018) and not properly included in the student's textbooks (Tadesse & Esuyawkal, 2022). These studies also recommended that a better understanding of the experience of the local people and their opinion on tackling constraints have to be considered to be integrated with modern development plans.

Consequently, keeping safe and disseminating these and other indigenous experiences and practices of the region need special attention.

The existence of incompetent workforces in the country is the result of the application of the knowledge systems far from the local real-life situations (predominance of a colonial education system that tends to change the country's socio-cultural aspects into the European image; Wuhibegezer et al., 2015).

To settle these problems, the practice of incorporating IK into the curriculum and classroom structure is promising (Teshome, 2017). In addition, Yoseph et al. (2022) recommended the necessity of searching out solutions to save Ethiopian values from the risk of extinction.

Indigenous education will enter at risk of extinction unless serious attention is given by curriculum developers to support the cultural values of the country (Adeyemi & Adeyinka 2003). Giving due emphasis on the value of IK, the education policies (Ministry of Education, 1994, 2020) and the education sector development plans (ESDPs I–V, 2005, 2010, 2015, 2021) and the 2018 Education roadmap study (MoE, 2018) the tried to address it in their policy documents at least rhetorically.

However, due to the Cartesian dualism of western and Tylerian rationale metanarrative, the practical applications of IK and value system in the Ethiopian curriculum at different times were a challenge (Melesse & Tessema, 2022). Analyses of the education policies of the three successive government systems since the 1940s (Demeke, 2011); education policy analysis since the introduction of the modern education system (Solomon, 2019); and most other previous research works mentioned above concerning indigenous education in Ethiopia seemed incomplete to give clear understanding concerning the inclusion of IK systems even in the then primary school curriculum.

Certainly, findings of some other local research studies, for example, Wuhibegezer et al. (2015); Teshome (2017); Yared et al. (1987) have some indications about the importance of IK for the local people if it is considered in the curriculum development process. Although recently much attempt is made to involve IK and integrate it with 21st century skills in the newly designed curriculum framework (Melesse & Tessema, 2022), its actual draft and execution in the textbooks require revisiting the new curriculum on trial thoroughly.

Since the then-existing old curriculum was suspected as it had included little or no IK elements (Damtew & Heinz, 2010; Teshome, 2017) and not repeat the same mistake, an intensive look into the new Ethiopian primary and secondary school curriculum may help the new education road map and other policy documents to obtain specific, actual, and supportive immediate solutions about the status of inclusion of IK systems since the new curriculum was in the pilot phase.

So far, cases like the involvement of indigenous experiences and authentic verification of the level of IK inclusion in the curriculum were the main issues in the current study.

2.5. Teachers understanding about Integrating Indigenous knowledge

Into Curriculum Within the BC education system, there is a call to integrate Indigenous knowledge, perspectives, and practices into classrooms and curriculum. The difficulty for non-Indigenous educators is the confusion in regard to what Indigenous education includes and how best to deliver it.

Many educators see Indigenous education as a series of lessons to add into the existing curriculum. However, this add-on approach is at odds with Indigenous ways of knowing and being (Battiste, 2013).

If non-Indigenous educators are to be successful in integrating Indigenous content, it is important that they are supported in exploring what Indigenous knowledge involves and how they might connect to the teachings of Indigenous wisdom (Munroe et al., 2013).

When trying to define Indigenous education it is important to keep intention in mind. The very idea of Indigenous education has been understood within a colonial education system. Chartrand (2012) asserted that an awareness of competing goals is necessary when constructing Indigenous education.

In some educational contexts, Indigenous education is developed with a Western lens, focusing on improving economic drivers linked to attendance, academic achievement, and graduation rates for Indigenous students, as opposed to a cultural lens, which looks at connecting Indigenous students to identity and language (Ahenakew, 2017).

In attempting to define Indigenous education, it is important to keep Indigenous students at the center and to shine a light on the value of Indigenous knowledge systems and ways of being.

Yet it is also important that there is some common understanding of what constitutes Indigenous education if educators and the education system are to successfully integrate Indigenous perspectives into the school curriculum.

In her study of Manitoba secondary teachers integrating Indigenous perspectives into the Grade 9 curriculum, Kanu (2011) defined Aboriginal perspectives as “curriculum content/ materials, instructional and assessment methods/strategies, and interaction patterns that Manitoba’s Aboriginal peoples see as reflecting their experiences, histories, cultures, traditional knowledges and values. This definition of Indigenous education highlights the importance of acknowledging that there is not one Indigenous perspective but many and that perspectives, histories, and experiences are specific to the Nation or peoples of a place.

2.6. Science curricula and Indigenous Knowledge Systems

A wide range of scholarly perspectives converges to confirm the significant influence of incorporating IKS into education specifically sciences (Canevez et al., 2022; Kugara et al., 2022; Naidoo, 2010; Woldegiorgis & Turner, 2023 etc.).

McKinley (2005) illuminates the transformative potential by explaining how the practice of inclusion not only increases motivation but also helps Curriculum Perspectives students develop a strong sense of esteem. This highlights the essential motivational value connected throughout IKS's cultural content and illustrates how it can motivate and inspire people interacting with it in an educational setting.

An interesting perspective to this discussion is provided by Brayboy and Castagno (2008), who highlight the relevance and awareness of culture that are integral to the use of IKS. Beyond merely providing information, this integration serves as a means for students to establish a connection with their cultural heritage, which enhances their overall educational experience by creating a sense of identity and belonging.

Research by Bang and Medin (2010) and Diwu and Ogunniyi (2012) explores deeper into the transformative potential of IKS in education and emphasizes the development of positive learning experiences. These encounters are distinguished by an advanced understanding and recognition of the various cultural characteristics and modes of knowledge embedded in IKS. As a result, the educational landscape is enhanced and becomes a dynamic place where students participate actively in a pedagogical environment that is inclusive and culturally sensitive, in addition to being knowledge recipients. Understanding teachers' approaches to integrating IKS requires a clear understanding of the intended and conceptual meaning of IKS as stated in science curriculum policy documents.

2.7 Teachers conception of Integration of IK

Non-Indigenous teachers are increasingly aware of their moral and professional responsibility to embed Indigenous content and perspectives into their practice. The challenge lies in how to do this authentically and effectively within a system that often appears to be at odds with the philosophies and practices of Indigenous knowledge.

In a critical ethnographic study, Verna St. Denis (2010) sought to provide recommendations on how to better promote and support the success of Indigenous education in public schools. She gathered data from open-ended questionnaires and focus group interviews with 59 Indigenous teachers from across Canada. Her findings point to the need for ongoing professional development and daily authentic integration of Indigenous perspectives that are relevant to the lives of students. St. Denis' findings also highlight the need for educators to use resources from local nations when integrating Indigenous content and perspectives. Kanu's (2005) ethnographic study of 10 non-Indigenous high school teachers in Winnipeg explored teachers' perceptions of integrating Indigenous cultural knowledge and perspectives into their practice.

Using interviews, teachers' journals, and classroom observations, Kanu (2005) looked at what teachers integrated into their curriculum and how they achieved this. To help make sense of the differences between how teachers were approaching integration, she used Banks' (1989) work on the inclusion of multicultural perspectives in the classroom.

This work highlights four approaches to inclusion: (a) the contribution approach, where students learn about the contributions made by those from other cultures; (b) the additive approach, where perspectives, content, and beliefs from other cultures are sometimes added to a predominantly Eurocentric curriculum; (c) the transformational approach, where the curriculum is taught from multiple perspectives; and (d) the social action approach, where students are encouraged to take their new understanding and create social change (Kanu, 2005).

Although all participating teachers thought integration was important, there were differences in regards to their understanding and approaches to integrating Indigenous content and practices. Teachers perceived their lack of knowledge of and experience with Indigenous content as a challenge to integration.

In addition to their lack of knowledge, the teachers were concerned about their "right" to teach Indigenous perspectives and content. Kanu (2005) asserted that trends in cultural theory suggest that there needs to be a shift away from the idea of cultural possession and a move towards seeing the integration of Indigenous perspectives as a "new scene of learning" Kanu's, (2005) findings also highlighted racist attitudes among non-Indigenous colleagues and students, lack of funding for resources, and lack of interest by school administrators as barriers to authentic integration.

2.8. Science teachers and IK

Ogunniyi (2004, 2007) observed a change in teachers' understanding and respect of IKS and the dynamic relationship between science and IKS in a series of studies focused on the connection between science teachers and IKS. This profound shift emerged after the teachers received university courses that were carefully designed to equip them with the knowledge and abilities needed for the smooth fusion of science and IKS. The findings highlight the critical role of targeted educational interventions in shaping teachers' perspectives, highlighting the effectiveness of university courses designed to equip teachers with the necessary tools for integrating science and IKS.

The studies suggest that such professional development initiatives contribute not only to an enhanced understanding of IKS but also foster an increased appreciation for the complex relationships that exist between traditional scientific knowledge and the extensive history of Indigenous wisdom (Ogunniyi, 2004, 2007). However, the research in the literature lacks any guideline on how teachers could incorporate IKS into their teaching of science.

In addition, participants spoke of a disconnect between school structures and Indigenous cultural values. A rigid timetable and large class sizes were seen as interfering with Indigenous teaching methods like talking circles and experiential learning. In a study of teacher candidates' perceptions of difficulties with integrating Indigenous perspectives, Deer (2013) found the following factors influenced their practice: varying levels of experience and knowledge of Indigenous cultures, teacher attitudes in regards to Indigenous Peoples, varying levels of administration support, availability of Indigenous resources, and compatibility between the institution and Indigenous cultural values. Although Deer's study had similar findings to those of Kanu (2005), Deer did not find the beliefs and attitudes of teachers reflected to the same extent.

2.9. Challenges of integrating indigenous knowledge in teaching

One of the challenges experienced by the teachers understanding of an integrated curriculum and its terminology by teachers: multidisciplinary, inter disciplinary, Trans disciplinary (Daly et al. 2012). These terms explain integrated curriculum at different levels of its process.

For example, multidisciplinary approaches are meant to enhance understanding of a topic or theme while maintaining disciplinary boundaries (Choi & Pak 2006).

Inter disciplinarily refers to common themes being identified, analyzed and synthesized, to produce unified knowledge, in a manner that blurs subject boundaries (Daly et al. 2012).

Trans disciplinarily, in turn, is evaluative in the sense that it seeks to find out if learners can argue their positions from multiple perspectives (Daly et al. 2012). In other words, Trans disciplinary determines if learners can produce and apply knowledge gained from multiple disciplines to solve practical problems.

Other challenges faced by teachers in integrated curriculum implementation include lack of staff training; lack of resources and facilities (Park 2008); lack of will to understand and accept the process of change in curricular matters (Malik & Malik 2011); a possible mismatch between the curriculum taught and assessed (Shankar 2014:), perhaps as a result of lack of cooperation between teachers and departments (Raselimo & Mahao 2015).

Literature reports that successful implementation depends on a thorough understanding of an integrated curriculum (Park 2008, Tankiso-Mphunyane 2014).

Without adequate understanding, teachers think an integrated curriculum is some kind of a teaching method, and so, continue to teach in outdated, traditional ways, rather than using integrated curriculum as a new way of producing knowledge.

On the other hand, the complex nature of indigenous knowledge and practices makes it impossible for integration process in the education curriculum. The complexity of IKs involves its incorporation into individual's way of life, making it invisible and hard to recognize the components that need to be applied in innovations (Owuor, 2007). Ezeanya-Esiobu, (2019) opines that learning materials on indigenous peoples and their ways of life are rare to find. History textbooks that are available have always portrayed indigenous people in negative terms.

Additionally, educational programmes in many cases have failed to offer indigenous people the platform to participate in process of decision making, curriculum design, teacher selection, teaching methods and the definition of standards. Owuor (2007) concurs by stating that 'absence of indigenous personnel in curriculum review process signifies the continued existence of assumptions from the foreign on what constitutes school knowledge that is valid, and how to assess such kind of knowledge.

Owuor (2007) argues that the Kenyan educators and policy makers have been faced with dilemma as a result of the interface between indigenous knowledge and school. The dilemmas are as a result of how to achieve integration which requires both commitment and involvement of all education stakeholders; namely, educators, policy makers, parents, members of the community and teachers.

Ng'asike (2019) noted that Kenyan parents put a lot of emphasis on the performance of their children in national examinations. They believe that good results can be achieved if teaching and learning is done in English from a tender age. Absence of agreement in recognizing the role of indigenous knowledge, innovation and practices remains a big challenge in realizing a successful and practical educational change that addresses needs of learners and communities.

As King and Sabine (2004) opine that Indigenous education is an intercultural and bilingual education system that recognizes the existence of several cultures in a society.

However, the challenge is valuing and recognizing the varied cultures, knowledge systems and languages that apply in education in order to avoid creating language hierarchies and knowledge systems. Owuor (2007) observes that the challenges in Kenya and other African states is defining their own development model capacity to guide them in expanding their own point of authority from the bigger web of dependence on developed nations.

2.10. Western Knowledge

Western knowledge encompasses the prevailing educational framework worldwide, characterized by a dominant epistemological discourse rooted in Western perspectives. This discourse shapes educational discussions both in the global south and north (Jones in Breidlid, 2013). It comprises a multifaceted network of ideas, influence, policies, financial structures, and organizational systems a complex web that defines how education is conceptualized globally (Jones, 2007). Western knowledge, often referred to as Western science, relies on established laws derived from the scientific method. This method involves observation, followed by the formulation and testing of predictions or hypotheses Ngulube, 2007.

2.11. Western science versus Indigenous Knowledge

The qualities identified for both Indigenous and Western systems represent tendencies rather than fixed traits, and thus must be used cautiously to avoid overgeneralization (Gutierrez and Rogoff 2003). Indigenous knowledge systems have been described as ecologic, holistic, relational, pluralistic, experiential, timeless, infinite, communal, oral and narrative-based. Keeping in mind the limitations of a dichotomous framework and recognizing that there is also considerable overlap in some areas, Western science has been described as reductionist, linear, objective, hierarchical, empirical, static, temporal, singular, specialized, and written (Smylie, Martin, Kaplan-Myrth, Steele, Tait & Hogg, 2004).

While Western science and education is viewed to be compartmentalized and decontextualized and taught in structured schools, Indigenous education is said to be holistic and lifelong, that is: from birth to death. For indigenous people, the particulars come to be understood in relation to the whole, and the “laws” are continually tested in the context of everyday survival (Barnhardt and Kawagley, 2005).

Further contrasts between Western thought and Indigenous thought are perceived through the notion of competency.

In Western terms, Barnhardt and Kawagley, (2005) claim, competency is often assessed based on predetermined ideas of what a person should know, which is then measured indirectly through various forms of “objective” tests. Barnhardt and Kawagley, (2005) contend that such an approach does not address whether that person is actually capable of putting that knowledge into practice.

In the traditional native sense, they argue, competency has an unequivocal relationship to survival or extinction. One either has or does not have requisite knowledge, and it is tested in a real-world context (Barnhardt and Kawagley, 2005). With these differences between these two knowledge systems based on different epistemological foundations one wonders whether there can be an “interface between two theoretical models that seem, at first glance, to be diametrically opposed.

Smylie contends that the compatibility between Indigenous and Western models of knowledge generation and transfer relies critically on the system of interactions among researchers and users that, for interface to exist, must be defined by the indigenous context in which the process is occurring” (Smylie, et al, 2004:141).

We have to face reality and look deep into the facts in such a way that we may understand both the traditional and the modern, and make use of both for our survival today” (Odora Hoppers 35 2002). Agrawal critically questions the clear line of demarcation between Western and indigenous knowledges and suggests coexistence between the two epistemological positions (Breidlid, 2013).

Breidlid also reechoes the need for the co-existence of indigenous and western knowledge systems and for the disbandment of the superiority complex of Western knowledge in the quest for a sustainable future and proposes that indigenous knowledges be given space or demand space to query hegemonic epistemology (2013). What then is the current status of indigenous knowledges today in relation to the Western knowledge system? Many scholars today generally see a growing worldwide acceptance among scientists and international aid agencies of indigenous knowledge.

2.12. IK and Classroom Science Integration

To achieve effective learning in class, there is the need to fill the gap between western knowledge and IK because Naidoo (2010), reported several cases where teachers believed that IK and classroom science are contrary to each other (Nnadozie, 2009). In addition, even science education researchers acknowledge the existence of the conflict between western and indigenous cultures (Mpofu et al., 2014). Different communities have various IK which in turn makes implementing IK concepts into the science classroom difficult (Khupe, 2014). A point worth mentioning is that it has been described as complex to integrate IKS into classroom science (Mavuru & Ramnarain, 2020; Mpofu et al., 2014) because teachers have been trained with a Eurocentric worldview/framework; therefore, their understanding of IK is considered limited (Khupe, 2014) because it is unexplored.

Furthermore, it is not enough to know which teaching strategy to use, but also the type of learners as well as the community they come from to understand the type of IK they might, in turn, possess (De Beer & Mothwa, 2013). This is to allow teachers to anticipate the conflicts and misunderstandings that learners might experience in learned classes (Molefe & Sanders, 2009). Several strategies and examples have been suggested for IK integration in the teaching and learning of in classroom instruction.

If teachers do not have material to follow up with when integrating IK, they could draw knowledge from their own IK or research their local communities to find which IK they could bring to the classroom and integrate as per curriculum documents (Nnadozie, 2009).

The abundant cultural practices and IK in many Africa countries including the commercialization of indigenous plants and the use of indigenous materials are enough to give learners a good start to classroom science (De Beer & Mothwa, 2013; Fakoyede & Otulaja, 2019).

For instance, the discovery of medicinal plants that have been in use by communities for decades and eventually become commercialized can provide teachers with opportunities to integrate IK into their classroom science. The medical properties of different types of medicinal plants have been recognized by several pharmaceutical companies (De Beer & Whitlock, 2009).

Using the IK from the local communities and the commercialization of the local plant, teachers could use such opportunities to introduce learners to the world of science that supports IKS.

Another way of incorporating IK into the classroom is using argumentation pedagogies (Muza, 2014). Argumentation is a set of declarations compiled to either justify or disprove a claim so that an agreement is reached regarding a contentious subject matter (Ogunniyi, 2007). This method has long been in use since pre-Socratic times including current times by scientists.

Argumentation is the formation of reasons using inductive methods and reaching conclusions from those discussions (Muza, 2014).

CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Research Design

The research design serves as the blueprint connecting philosophical assumptions to specific research methods. In this study, the researcher employed a descriptive survey design with mixed method approach to explore primary school teachers' perceptions regarding the integration of indigenous knowledge (IK) into the General Science.

Because, survey, by its nature, aims to uncover individuals' feelings, attitudes, opinions, and conceptions related to a specific topic. Descriptive surveys are particularly useful when gathering accurate information from a large population using a manageable sample size. This design facilitates the collection of extensive, quantifiable data within a relatively short timeframe.

The choice of a descriptive survey design is based on the assumption that it allows the researcher to access a diverse range of current data relevant to the study topic. By adopting this approach, the study seeks to describe teachers' perceptions of IK integration in the General Science.

3.2 Research Method

For this study, the researcher employed a descriptive survey design that combines both qualitative and quantitative approaches. Qualitative data was gathered through direct observations of teachers during instructional processes and through interviews. Additionally, a quantitative questionnaire was administered to a sample of teachers from ten government primary schools in the Loma Bossa woreda.

3.3. Description of the Study Area

This study was conducted within the governmental primary schools of Loma Bosa Woreda in Dawuro Zone. The term "Dawuro" refers to both the people and their land, situated in the South West Ethiopian Peoples' Region state (SWEPRS). Geographically, it lies between 60°36' to 70°21' north latitudes and 36°068' to 37°052' east longitudes. The Omo River encircles and delineates Dawuro, flowing from the North West to the South West in a clockwise direction.

Dawuro shares borders with various neighboring zones: Konta Zone to the west, Jimma Zone (Oromiya Region) to the northwest, Hadiya and Kambata-Tambaro zones to the northeast, Wolaita Zone to the east, and Gamo-Gofa Zone to the southeast (Alemayehu, 2018). The total land area of Dawuro is approximately 5,000 square kilometers.

The capital town of Dawuro Zone is Tarcha, which lies about 500 kilometers southwest of Addis Ababa via Jimma and approximately 335 kilometers from Hawassa via Wolayita Soddo.

The Dawurotsuwa language, belonging to the Omotic language family, is spoken in this region. According to the 2007 Ethiopian Population and Housing Census, the projected population of the Dawuro nationality in 2014 was 846,199 (Admasu, 2014).

3.4. Population and Sample

In this study, the research population consists of General Science teachers. From a total of 30 governmental primary schools in the Woreda, ten schools were randomly selected for the study. This sampling technique aligns with the purpose of gaining insight and understanding into the chosen phenomenon, as emphasized by Burns (2000).

The selected schools represent 33.33% of the total number of schools, which is sufficiently large to be representative of the target population. This sample size ensures that the results fall within a tolerable error range of 5% (Anderson, 1990).

Considering the newly developed curriculum, the General Science subject for grades seven and eight now integrated three natural science disciplines: Biology, Chemistry, and Physics. Previously, these subjects were taught independently in old curriculum and now aligned as one subject having the name General Science. Consequently, teachers who have graduated with backgrounds in Biology, Chemistry, and Physics are expected to teach General Science.

Based on current information from the Woreda education department, there were 42 teachers specializing in this subject matter across the sampled schools. Among them, thirty teachers were actively teaching General Science in both grade seven and eight, the other eight teachers in the sample were have the same academic qualification with the subject matter whom were teaching in grade five and six. Additionally, school principals, department head teachers, and cluster supervisors were purposively selected for interviews. So, from each of the ten sampled schools, one principal, one supervisor from each of the three clusters, and one department head from each school were included in the study.

3.5. Data source

The data for the study was collected by using primary data source. The primary information sources employed to handle the data were questionnaire for sampled teachers, interview with school principals, department head teachers and cluster supervisors and observation of actual teaching process in class room.

3.6. Data Collection tools

In order to obtain the required data relevant to the study, the researcher used different data collection instruments. The following section elaborates these data gathering instruments more in detail.

3.6.1. Questionnaire

The questionnaire was required teachers to reflect on their conception of the integration of indigenous knowledge by indicating on a five-point Likert scale which was adapted to the context of the present study. The extent of their agreement with conceptual and content statements on indigenous knowledge and as well as the extent to which they are integrating indigenous knowledge while with teaching. The scale from 1 to 5 represents Strongly Agree, Agree, Not Sure, Disagree, and Strongly Disagree respectively was used for this purpose.

The questionnaire also included item which elicits respondents' own challenges they have been facing in integrating indigenous knowledge while teaching, how they were integrating indigenous knowledge in classroom teaching was addressed.

3.6.2. Interview

The interview is one of the data collection tools that were used in this study in order to collect data in depth. An interview was used because it serves as a two-way conversation, requiring the researcher to ask the participants questions in order to learn about their ideas, beliefs, views, opinions and behaviors. The type of interview that was used is structured interview. Therefore, the researcher was developed predetermined questions that allow researcher to ask sampled school principals', department head teachers and cluster supervisors.

3.6.3. Classroom observation

Observation was also used to collect actual teachers' experiences in integrating of indigenous knowledge while teaching. For this purpose, the researcher developed checklist for observation.

3.7. Data collection procedures and administration

First, the researcher was brought cooperation letter from the university and discussed it with Woreda education office about the study and have got permission. Then, visited the selected schools and informed to the principal about the purposes of the study by showing supporting letter from Woreda education department. Then discussion was conducted with principals in detail on the purposes of the study and how the output helps the school.

Then the researcher planned the entire work and before administrating questionnaires for data collection respondents was informed about the purposes of the study and how to fill the questionnaire.

The questionnaire was distributed and collected back after respondents responded. Likewise, interview and classroom observation was carried out.

3.8. Pilot test

The preliminary data collection tool, also known as the questionnaire, underwent pilot testing in schools that were not part of the current study. The primary objective of this pilot study was twofold: first, to assess whether respondents comprehended the instructions and answer choices within the questionnaire; and second, to gauge the clarity of the items or statements. Additionally, it was aimed to determine the time required for participants to complete the questionnaire. As a result, most participants understood the questions as intended; having slight revision on a few questions. In generally, the pilot test has provided valuable insights into the effectiveness of the data collection instrument.

3.9. Method of Data Analysis

For the current study, researcher gathered both qualitative and quantitative data. The qualitative data, obtained through observations and interviews, was analyzed by narration. The quantitative data, which was collected via questionnaires, was employed descriptive statistics including percentages, frequencies, means, and standard deviations using the Statistical Package for the Social Sciences (SPSS), version 23.

3.10. Ethical Consideration

This study was performed by following all the acceptable ethical behavior. Concerning stakeholders like school directors, supervisors and teachers was informed about the purpose and relevance of the study for the reason of ethical acceptances. Permission letter obtained from expected individuals before collecting data. The researcher was communicated about confidentiality of the information and the respect of the privacy of the participants.

CHAPTER FOUR

4.1. Data Analysis and Discussion of the Results

This section explores on the study's findings. To ensure a coherent structure for the chapter, the researcher presented the results related to the first research question, followed by those pertaining to the second research question and the third research question sequentially. Employing triangulation for data validation, it was incorporated responses obtained from various data collection methods, including questionnaires, interviews, and classroom observations. Additionally, integrating these findings with relevant literature in the form of a discussion that addresses the research questions outlined in chapter one was focused.

Table 1: Demographic information of the teacher respondents

Variable		Frequency	Precent	Valid percent
Gender	Male	25	65.8	65.8
	Female	13	34.2	34.2
	Total	38	100	100
Age	20-30	11	28.9	28.9
	31-40	26	68.5	68.5
	41-50	1	2.6	2.6
	>50	-	-	-
	Total	38	100	100
Experiences	1-10	12	31.6	31.6
	11-20	25	68.5	68.5
	21-30	1	2.6	2.6
	Total	38	100	100
Qualification	Diploma	8	21.1	21.1
	Degree	29	76.3	76.3
	Masters	1	2.6	2.6
	Total	38	100	100
Grade level they are teaching	Grade 6	2	5.3	5.3
	Grade 7	2	5.3	5.3
	Grade 8	2	5.3	5.3
	Grade 5&6	8	21.1	21.1
	Grade 7& 8	24	63.2	63.2
	Total	38	100	100

In the table provided, 25 teachers were male, constituting 65.8% of the total sample. The remaining 13 teachers (or 34.2%) were female. In summary, the majority of the sample identifies as male, with a smaller proportion identifying as female.

The table above highlights the age distribution of the teacher respondents. Among the 38 participants, 11 (representing 28.9%) fall within the 20-30 age groups, while 26 (constituting 68.5%) belong to the 31-40 years category. A single respondent (2.6%) reported being above 50 years old. In summary, the majority of respondents are aged 31-40, followed by those in the 20-30 range.

The subsequent section of the table shows the experiences of teachers. According to the table, 12 respondents (31.6%) have teaching experience ranging from 1 to 10 years. Additionally, 25 teachers (65.8%) fall within the 11 to 20 years category, while only 1 respondent (2.6%) reported having 21 to 30 years of experience. In summary, the majority of respondents have 20 years of experience or less.

In terms of qualifications, 8 teachers possess a diploma, constituting 21.1% of the total sample. Additionally, 29 respondents hold a degree, representing 76.3% of the total participants. Finally, only 1 teacher has a master's degree, corresponding to 2.6%. In summary, the majority of individuals in the sample have a degree.

The final issue highlighted in the table pertains to the grade levels at which teachers were instructing. The data reveals that the combined group of grades 7 and 8 has the highest number of teachers, with 24 respondents (representing 63.2% of the sample) currently teaching these grades. Additionally, the combined group of grades 5 and 6 comprises 8 teachers, accounting for 21.1% of the sampled participants. Furthermore, within the individual grades, Grade 6, Grade 7, and Grade 8 each have 2 teachers reported. This shows that the majority of teachers were teaching in grade 7 and 8.

Table 2: Demographic Characteristic of the Principals, Cluster Supervisor and Head Teachers

Variable	Responses	Frequency	Precent	Valid percent
Gender	Male	16	69.57	69.57
	Female	7	30.43	30.43
	Total	23	100	100
Age	25-35	10	43.5	43.5
	36-45	8	34.8	34.8
	46-55	5	21.7	21.7
	Total	23	100	100
Experiences	1-15	10	43.5	43.5
	16-25	13	56.5	56.5
	26-30	-	-	-
	Total	23	100	100
Qualification	Diploma	-	-	-
	Degree	22	95.7	95.7
	Masters	1	4.3	4.3
	Total	23	100	100
Their role in school	Supervisor	3	13	13
	Principal	10	43.5	43.5
	Department head	10	43.5	43.5
	Total	23	100	100

The above frequency table illustrated the data distribution among various aspects such as age, gender, educational level, and professional experience durations. It highlighted that 69.57% of the survey participants were male, while 30.43% were female. Concerning age-wise, 43.5 % were aged between 25-35 years, 34.8 % fell into the 36-45 years category, and 21.7% were between 46-55 years. In terms of work experience, 56.5.5% of the interviewees had 16-25 years of experience, 43.5 % had 1-15 years.

Educationally, the majority, or 95.7%, held a degree, and 4.3% possessed a master's degree. Lastly, the table addressed the school roles of the respondents; so as 43.5% served as principals or department teachers, and 13 % were cluster supervisors.

Table 3: Teachers' Conception on the Integration of IK

Item	N	Mean	Std. Deviation
Indigenous Knowledge is dynamic knowledge that people in a given community have developed over time	38	4.00	1.013
Indigenous Knowledge is the same as traditional knowledge.	38	3.55	1.155
Indigenous Knowledge is a large body of knowledge and skills that has been developed outside formal educational system.	38	3.58	1.030
Local languages are part of Indigenous Knowledge.	38	3.87	1.119
Indigenous Knowledge is an important part of the livelihood of people in poor nation	38	2.66	1.072
Indigenous Knowledge is an important part of the livelihood of people in rich nation	38	2.50	1.033
Indigenous Knowledge is culture- specific.	38	3.45	1.132
Indigenous Knowledge is a critical part of culture.	38	3.92	1.171
Indigenous Knowledge is knowledge that is not documented.	38	3.08	.912
Indigenous Knowledge is adapted to a specific group of people.	38	3.29	1.313
Each ethnic group has got its own Indigenous Knowledge with their deference	38	3.76	1.149
Indigenous Knowledge is the basis of decision-making in societal issues.	38	4.11	1.008
Indigenous Knowledge is obtained through the scientific method.	38	3.50	1.007
Western science and Indigenous Knowledge are one and the same thing.	38	2.71	1.183
Indigenous Knowledge is documented knowledge.	38	3.21	1.277
Indigenous Knowledge generalizations have rational and logical dimensions	38	3.74	1.083
Facts within indigenous knowledge are tested.	38	3.42	.948
Facts within Indigenous Knowledge are experiential.	38	3.42	1.130
Language is important to the acquisition of Indigenous Knowledge.	38	3.95	.928
All events in Indigenous Knowledge have natural causes.	38	3.42	1.200
Language is an important creative force in Indigenous Knowledge.	38	4.13	.623
Indigenous Knowledge is a wealth of knowledge important for survival.	38	3.92	.850
Knowledge explanations of Indigenous Knowledge relate to traditional beliefs.	38	3.92	1.08
Indigenous Knowledge is based on questioning and discovering answers	38	3.84	.886
Indigenous Knowledge is passed by societies as accumulated, useful or important	38	3.89	.981
Indigenous Knowledge is passed from generation to generation by word of mouth	38	3.92	1.124
Sum	38	3.56	0.72

Table 3 presented teachers' conception on the integration of indigenous knowledge. In order to examine teachers' perception on the issue five-point Likert scale was adapted and the result was interpreted and presented here under. The sum means scores of teacher perception towards the integration of indigenous Knowledge was ($M=3.56$) with standard division of ($SD= 0.72$). This suggests that, on average, the respondents' conception or attitudes tend to lean toward the integration of indigenous knowledge is above average of the scale with relatively small standard deviation with the implication of fairly consistent. The following section provided more detailed explanation of the finding of all questions in the table above.

Teachers' conception on regarding indigenous knowledge dynamics that people in a given community have developed over time, reported as an average mean score ($M=4.00$) with standard division of ($SD= 1.013$). This tells us on average, the observed values in the data tend to cluster around central value.

The other issues addressed was about the conception of teachers' either indigenous knowledge is the same as traditional knowledge or not the data revealed with the mean score of ($M=3.55$) with standard division of ($SD= 1.155$). This indicates that teachers have above average positive perception that indigenous knowledge is the same as traditional knowledge.

The third question in the table above requested teachers to indicate their conception on the indigenous knowledge is a large body of knowledge and skills that has been developed outside formal educational system as the finding showed the mean score of ($M=3.58$) with standard division of ($SD=1.030$). This implies that teachers have positive conception that indigenous knowledge can be developed outside formal educational system.

Concerning local languages are part of indigenous knowledge, the result indicted the mean score of ($M=3.87.58$) with standard division of ($SD=1.119$). This indicates that the role of local languages in preserving and transmitting indigenous knowledge is highly valued by the teachers.

To explore teachers' conception on whether indigenous knowledge is crucial solely for the livelihood of people in poor countries, the findings revealed substantial variation in opinions regarding the socioeconomic importance of indigenous knowledge in less affluent nations. This was exposed with moderate mean score ($M=2.66$) and its standard divination is ($SD=1.072$)

Another inquiry explored by the table pertains to teachers' conception of whether indigenous knowledge is culture-specific. The findings indicate that individuals acknowledge the close connection between indigenous knowledge and cultural context, with an average score of ($M=3.45$) and a standard deviation of ($SD=1.132$.)

The subsequent inquiry centered on whether indigenous knowledge is a fundamental component of culture. In response, teachers expressed agreement that indigenous knowledge significantly shapes cultural identity, with an average score of ($M=3.92$) and a standard deviation of ($SD= 1.171$).

Another inquiry explored whether indigenous knowledge remains undocumented. Based on teachers' conception the result revealed an average score of ($M= 3.08$) and a standard deviation of ($SD=0.912$).

From this we can understand that the mean value represents scores that are higher than the average and teachers perceived that indigenous knowledge is knowledge that is not documented.

It was also examined whether indigenous knowledge is adapted to specific group of people or not, for this question the conception of respondents indicated that the mean score ($M=3.29$) with the standard deviation ($SD=1.313$). Based on this data, it can be inferred that teachers perceive indigenous knowledge as adapted to a specific group of people.

In Table 3, the study explored teachers' conception on whether each ethnic group possesses distinct indigenous knowledge that differs from other ethnic groups. The findings indicate that, on average, teachers perceive that each ethnic group indeed has its unique indigenous knowledge, separate from that of other ethnic groups. The data set's average value ($M= 3.76$), with a standard deviation of approximately ($SD=1.149$).

The study also aimed to investigate teachers' conception regarding whether indigenous knowledge serves as the foundation for decision-making in societal matters like agriculture, education, and health. The findings indicate that a significant majority of teachers hold a positive conception, with an average score of ($M=4.1$) and a standard deviation of approximately ($SD=1.008$).

Among the topics discussed in the table above, one pertains to whether indigenous knowledge is acquired through scientific methods. According to teachers' conception, indigenous knowledge is indeed obtained through scientific approaches, with an average score of ($M=3.50$) and a standard deviation of approximately ($SD=1.007$).

Among the topics discussed in the table above, another point examined whether Western science and indigenous knowledge are equivalent. According to teachers' conception, the average score for this question is relatively low at ($M=2.71$), with a standard deviation of approximately ($SD=1.183$).

These findings suggest that nearly average respondents perceive western science and indigenous knowledge to be closely aligned or nearly identical.

The research also investigated whether generalizations based on indigenous knowledge exhibit rational and logical aspects. In this regard, teachers expressed a notably positive conception, with an average

score of 3.74 (M) and a standard deviation of (SD=1.083). This shows that teachers perceive that generalization based on IK exhibit rational and logical aspects.

The research also examined whether facts within indigenous knowledge undergo testing. In relation to this topic, teachers expressed a positive conception, with an average score of (M=3.42) and a standard deviation of (SD=0.948). The findings suggest that facts within indigenous knowledge are indeed subject to testing.

In the table above, the subsequent question explored the significance of language in acquiring indigenous knowledge. According to teachers' report, the majority expressed agreement with the statement, yielding an average score of (M=3.95) and a standard deviation of (M=0.928). This finding underscores the importance of language in the acquisition of indigenous knowledge.

The question in table aimed to understand teachers' conception regarding whether all events within indigenous knowledge have natural causes. According to their responses, teachers generally believe that all events in indigenous knowledge are indeed influenced by natural factors. The average score for this perception was (M=3.42), with a standard deviation of (SD=1.200).

The subsequent question addressed in the table pertained to whether indigenous knowledge constitutes a valuable wealth of information crucial for survival. In response, the participants perceived that indigenous knowledge indeed holds significant importance for survival, with an average score of (M=3.92) and a standard deviation of (SD= 0.850.)

Another aspect discussed in the table pertained to whether explanations of indigenous knowledge align with traditional beliefs and people's lifestyles. The findings reveal that teachers hold a positive conception, with an average score of (M=3.92) and a standard deviation of (SD=0.942).

Another aspect discussed in the table pertained to whether indigenous knowledge is rooted in inquiry and the pursuit of answers. The findings revealed that teachers hold a favorable conception, with an average score of (M=3.84) and a standard deviation of (SD=0.886).

The table also presented additional matters related to whether indigenous knowledge is transmitted by societies as a valuable and essential resource tied to their existence. Teachers' perspectives were considered, and the findings revealed that indigenous knowledge is indeed passed down by societies, accumulating as a useful and significant body of knowledge. The average score was (M=3.89), with a standard deviation of (SD=0.981).

The last topic discussed in the table pertained to whether indigenous knowledge is transmitted across generations through oral tradition or acquired through direct experience. Teachers provided their insights, and the findings indicated that indigenous knowledge is indeed passed down from one generation to another either verbally or through experiences. The average mean score was ($M=3.92$), with a standard deviation of ($SD=1.124$).

Now in the subsequent section, the study results from interviews with department head teachers, school principals, supervisors, and classroom observations were combined with the findings from questionnaires. These findings highlight the importance of teachers' conception regarding the incorporation of Indigenous Knowledge (IK) concepts into science education. Understanding the concepts of integrating of IK is vital in order to teachers implement it in their classroom. When asked about integrating IK into science teaching and learning, school principals, department heads, and supervisors emphasized that IK enriches students' understanding of science due to its evidence-based and practical nature. Furthermore, during interviews all respondents acknowledged on the significance of integrating IK concepts in teaching.

Therefore, the findings about teachers' conception on incorporating Indigenous Knowledge (IK) into general science education through interview were evaluated to complement the findings from questionnaire responses. School principals, supervisors, and department head teachers acknowledged the significance of integrating indigenous knowledge in teaching science. Interview participants highlighted the potential of IK to enhance scientific understanding of the natural world and emphasized its value in science curriculum development. Specifically, a department head teacher expressed this idea during the interview as:

“Indigenous Knowledge (IK) serves as the initial framework for learners, encompassing knowledge acquired from their cultural heritage and family. It forms the bedrock upon which natural sciences education can be built. Consequently, as educators, integrating scientific concepts with indigenous knowledge becomes crucial in shaping students' learning experiences and enhancing their grasp of subject matter.”

When examining the respondents' conception on integrating Indigenous Knowledge (IK), they exhibited a positive outlook compared to the results obtained from teacher questionnaires.

However, the other head of department of General science reflected her perception on the integration of IK elements in her subject matter as follows:

The new General science textbook did not include different indigenous values. Except for a few lessons that can be used as examples, there is little integration of societal knowledge and values in the textbooks. Almost every lesson is Western-focused and reflects the idea of Western ideology. It is not at a level where learners can have a thorough understanding of how their IK is connected with other knowledge systems. Hence, I believe, the textbook incorporates small scale IK components.

According to her, the new General Science textbook lacks inclusion of diverse indigenous values. While a few lessons serve as examples, overall, there is minimal integration of societal knowledge and values. Most of the content remains Western-focused, reflecting Western ideology. Unfortunately, the textbook falls short in enabling learners to fully grasp the connections between their IK and other knowledge systems. In summary, the textbook only incorporates a limited amount of IK. Therefore, the curriculum by itself lacks inclusion even though teachers have positive perception to integrate IK in teaching. The same subject teacher and department had from other primary School in the woreda in the same case narrated that:

“There are a few attempts to integrate a few IK elements in activities, exercise questions, project works, and lessons. These integrations are not in a way that learners could grasp the IK elements of their own from the contents, activities, and pictures represented in the textbook. Nonetheless, there are attempts to make a few pictures showing the traditional separation of mixtures, decantation (coffee after it is boiled), and farmers isolating harvests from the byproducts”.

Three cluster supervisors’ conception also the same as that of summarized view point of the head of the department and the school principals. Therefore, this shows that in teachers’ perception General Science textbook makes some efforts to incorporate Indigenous Knowledge (IK) elements into activities, exercise questions, project work, and lessons.

However, these integrations do not effectively enable learners to independently grasp the IK elements from the textbook’s content, activities, and illustrations. Despite this limitation, there are a few visual representations, such as pictures depicting traditional separation of mixtures, decantation.

Interview informants emphasized the relevance of IK in science education, citing various examples rooted in indigenous knowledge. They recognized that IK plays a crucial role in teaching sciences by providing insights into the cultural origins of scientific knowledge, so as the text should focus in inclusion of the IK.

On the other hand, teachers acknowledge that scientific knowledge is not culturally neutral; rather, it is influenced by historical and cultural factors. Therefore, understanding the cultural underpinnings of scientific knowledge contributes to a more holistic view of science and its societal significance, as discussed during interviews.

It is clear that the department head teacher's response underscores the critical nature of starting with what learners already know, which can encompass knowledge acquired from their parents or cultural background. This highlights the importance of acknowledging the cultural context within which scientific knowledge is acquired. Furthermore, the significance of recognizing the cultural context of scientific knowledge was also emphasized.

In generally, head teachers' supervisors and school administrators generally viewed indigenous knowledge positively during interviews. However, research findings highlight a significant gap between perception and practical implementation. Integrating indigenous knowledge (IK) into teaching and learning processes remains limited and constrained. Interestingly, during these interviews, participants emphasized the resemblance between indigenous knowledge and traditional practices, such as initiation ceremonies. The following was taken from interview with department had:

“Indigenous knowledge resembles traditional practices, such as initiation ceremonies where information is transmitted,” stated a principal in (April 2024).

However, this view confines indigenous knowledge to the context of initiation rites, which signify the transition from childhood to adulthood. In reality, indigenous knowledge encompasses a lifelong journey that commences at birth and extends until death. Initiation ceremonies constitute only a small fraction of the broader concept of indigenous knowledge.

According to a cluster supervisor in (April 2024),

“Indigenous knowledge is traditional views.” However, this definition confines indigenous knowledge to the concept of “tradition,” which implies an inherited or customary pattern of thought, action, or behavior. Traditions represent only a fraction of the broader tapestry of indigenous knowledge.

Respondents' overall understanding of indigenous knowledge can be summarized as follows: tradition, oral transmission across generations, knowledge derived from sustained local experiences, ancestral wisdom, and cultural insights.

While these terms capture certain aspects of indigenous knowledge, they also present challenges when used in local contexts. For example, terms like “local,” “traditional,” “ancestral,” and “orally passed on”

often mirror a Western viewpoint, linking indigenous knowledge to notions of primitiveness, static nature, inferiority, wildness, and the natural world.

Acknowledging the intricate and multifaceted nature of indigenous knowledge is crucial for cultivating a more comprehensive understanding and deeper appreciation of their significance.

Western perspectives often view indigenous practices as irrational, mythical, unscientific, and superstitious, often dismissing their potential contributions to development. While respondents emphasized the preservation of indigenous knowledge as a national heritage, the recognition of it as a national resource was lacking. Odora Hoppers, (2002) defines indigenous knowledge as a fusion of knowledge systems that span technology, social dynamics, economics, philosophy, education, legal frameworks, and governance.

Many respondents tended to perceive indigenous knowledge as static, rooted in the past. For instance, one submission stated in Breidlid (2013): Indigenous knowledge (IK) is a form of knowledge passed down from one generation to the next. So, it was expressed that IK remains static and it is primarily transmitted orally. Therefore, elders would gather in the Kinzanza (Traditional shelter) to share their experiences with the younger generation.

As submission from present study from cluster supervisor in April 2024, Indigenous knowledge is the collective knowledge, practices, and beliefs of indigenous or local communities that have been developed over generations through experiences, observations, and interactions with the environment. This was also aligned with the other study by Breidlid, as his study revealed that Indigenous knowledge is the knowledge, wisdom, practices, skills, and beliefs of indigenous peoples that are developed over generations and handed down through oral traditions and Indigenous knowledge is dynamic and enable people to coexist harmoniously with their environment, as highlighted by Breidlid (2013).

In addition to interviews and questionnaires, the researcher observed teachers during actual classroom lessons. The observation data revealed that teachers made efforts to contextualize lessons and enhance student understanding by incorporating Indigenous Knowledge (IK) examples. Overall, teachers demonstrated a moderately positive perception of integrating IK.

Table 4: Teachers' Conception Level about Integrating IK

Items	N	Mean	Std. Deviation
Indigenous Knowledge is dynamic knowledge that people in a given community have developed over time	38	3.00	1.040
Indigenous Knowledge is the same as traditional knowledge.	38	2.79	.811
Indigenous Knowledge is a large body of knowledge and skills that has been developed outside formal educational system.	38	2.97	1.026
Local languages are part of Indigenous Knowledge.	38	2.76	1.101
Indigenous Knowledge is an important part of the livelihood of people in poor countries only.	38	1.76	.971
Indigenous Knowledge is an important part of the livelihood of people in rich countries only	38	1.84	1.053
Indigenous Knowledge is culture- specific	38	2.61	1.104
Indigenous Knowledge is a critical part of culture	38	2.71	1.037
Indigenous Knowledge is knowledge that is not documented	38	2.34	1.258
Indigenous Knowledge is adapted to a specific group of people	38	2.58	1.177
Each ethnic group has got its own Indigenous Knowledge which is different from other ethnic groups.	38	2.53	1.156
Indigenous Knowledge is the basis of decision-making in societal issues such as agriculture, education and health	38	3.03	.972
Indigenous Knowledge is obtained through the scientific method.	38	2.45	1.083
Western science and Indigenous Knowledge are one and the same thing.	38	2.08	1.075
Indigenous Knowledge is documented knowledge.	38	2.32	1.254
Average	38	2.52	1.1

Table 4 displayed the teachers' conception levels regarding indigenous knowledge. To assess their understanding, various statements related to indigenous knowledge were considered. The subsequent discussion probes into the findings for each of these questions.

Question one asked participant to assess their conception level whether indigenous knowledge is dynamic a body of knowledge that people within a specific community develop over time.

In response, teachers indicated that indigenous knowledge indeed changes within communities, adapting to changing circumstances and experiences.

The average mean score for this level understanding was ($M=3.00$), with a standard deviation of ($SD=1.040$). This implies that teachers have moderate level of understanding about the concepts of IK. Another aspect discussed in the table pertained to evaluating teachers' comprehension of whether indigenous knowledge aligns with traditional knowledge. On average, teachers perceive indigenous knowledge as somewhat connected to traditional knowledge, although there is variation in their responses. This is reflected in the mean understanding level of ($M=2.79$), with a standard deviation of ($SD=0.811$). This implies that teachers have moderately aware about the integration of IK.

The third question addressed in the table pertained to whether indigenous knowledge constitutes a substantial reservoir of knowledge and skills that has evolved outside formal educational systems. Teachers were asked to express their awareness on this matter. The findings indicated that, on average, teachers were well aware that indigenous knowledge encompasses a diverse array of skills and wisdom developed independently of formal education. The mean score was ($M=2.97$), with a standard deviation of ($SD=1.026$). From this we can understand that teachers have moderate level of understanding about the integration of IK.

Another aspect discussed in the table aimed to assess teachers' understanding of whether local languages are integral to indigenous knowledge. After considering the question, respondents indicated that, on average, they were aware that local languages play a role in transmitting indigenous knowledge. These languages serve as carriers of cultural wisdom and practical insights. The mean score for this awareness was ($M=2.76$), with a standard deviation of ($SD=1.101$). This shows teacher's level of understanding about Integration of IK is moderate.

In the provided table, educators' conception levels were assessed concerning whether indigenous knowledge plays a significant role in the livelihoods of individuals in economically disadvantaged countries exclusively. The evaluation revealed that respondents below the average disagreed with the idea that indigenous knowledge is not solely crucial for the well-being of people in impoverished nations. The mean score for this understanding was ($M=1.76$), accompanied by a standard deviation of ($SD=0.971$). These findings highlighted that there was an awareness gap among teachers.

Conversely, researchers focused on assessing teachers' comprehension regarding whether indigenous knowledge plays a significant role solely in the livelihood of people from wealthy nations.

The findings suggest that their awareness is somewhat limited. The average mean score was ($M=1.84$), with a standard deviation of ($SD=1.053$). Consequently, it can be inferred that below average number of respondent teachers recognize that indigenous knowledge is not exclusively vital for the well-being of people in wealthy countries.

Another notable aspect examined in this study pertained to whether indigenous knowledge is culture-specific. The data revealed that teachers possess a moderate awareness that indigenous knowledge is indeed culture-specific, as indicated by a mean score of ($M=2.6$) with a standard deviation of ($SD=1.104$).

Additional aspect investigated in this study was the significance of indigenous knowledge within culture. The results indicated that, on average, teachers recognize that indigenous knowledge plays a critical role in shaping culture. This conclusion is supported by an average mean score of ($M=2.71$), with a standard deviation of ($SD=1.037$). From this we can conclude that teachers have moderate level of understanding about integration of IK.

As part of an assessment, questions were posed to test teachers' understanding of whether indigenous knowledge is synonymous with undocumented knowledge. The study findings indicate that teachers possess a moderate level of awareness that indigenous knowledge indeed falls into the category of undocumented knowledge. The average score was ($M=2.3$), with a standard deviation of ($SD=1.258$).

As in the table mentioned earlier, another aspect discussed was the adaptation of indigenous knowledge to particular groups. Regarding this matter, teachers demonstrated moderate awareness that indigenous knowledge is tailored to specific communities. This conclusion was substantiated by an average score of ($M=2.58$), accompanied by a standard deviation of ($SD=1.177$).

The subsequent investigation centered on assessing teachers' comprehension regarding whether each ethnic group possesses distinct indigenous knowledge that differs from other ethnic groups. After posing this question, the teachers' awareness level was evaluated, revealing that they exhibit moderate awareness of this issue. This conclusion is based on an average score of ($M=2.35$), accompanied by a standard deviation of ($SD= 1.156$).

In this study, the researcher explored whether indigenous knowledge forms the foundation for decision-making in societal matters such as agriculture, education, and health. To assess teachers' understanding, the researcher evaluated their awareness level and the result revealed that they were well-informed about indigenous knowledge being integral to decision-making in societal contexts.

The average score of ($M=3.03$), with a standard deviation of ($SD=0.97$), supports this conclusion. Essentially, indigenous knowledge acts as a bridge connecting ancient wisdom to contemporary challenges. By acknowledging and valuing this knowledge, societies can make informed choices that honor cultural heritage, promote sustainability, and enhance overall well-being.

In this study, researcher investigated whether indigenous knowledge is acquired through the scientific method. The results indicated that teachers demonstrate a moderate level of awareness regarding this matter. Specifically, the mean score was ($M=2.45$), with a standard deviation of ($SD=1.083$).

In the following part teachers result obtained from questionnaire were supported with interview result and classroom observation. The interview result with school principals, department head teachers and cluster supervisor also revealed positive level of understanding about the concepts of indigenous knowledge integration. Therefore, the following information summarizes qualitative information obtained.

As interview participants, IK is dynamic by its nature people develop it over time. Learning occurs most effectively within social-cultures because it includes interactions between people who informally connect their prior experience (Fuller et al., 2005). The following is the voices recorded of department head teacher transcribed:

“As far as my understanding IK is dynamic knowledge that a given community have. It is original knowledge it may include traditional sayings tales legends way of living, expirations, living styles, language, values, cultures etc. So as school teacher we should considered integrating IK while teaching our students. Because, localizing or contextualizing lesson make our learner easily to understand the content we teach them”.

From this we can understand that teacher’s level of understand about the integration of IK is positive. The finding with interview is aligned with results of questionnaire too.

Principals and cluster supervisors have also described IK knowledge that has developed in a specific context over time and is gained from the experience of members that belong to certain cultural groups. This is similar study by Abah et al. (2015) that IK as knowledge gained through experiences and is limited to a specific community of people. Furthermore, Snively (2018), added that because of some communities’ deep-rooted occupation, which has existed for thousands of years, indigenous people have profound attachments and identify with their ancestral land.

They are connected by complex, socially formed webs of beliefs and values within their communities. These principles and values are important because they underpin indigenous peoples’ social activities which shape worldviews (Brown et al., 2019). Because of this, one of the interview cluster supervisors stated in his definition that IK can be used in the modern-day to understand how, during the early days, ancestors carried out some of their social activities.

Contrary to expectations, classroom observations reveal that teachers possess only a limited awareness of integrating Indigenous Knowledge (IK). Despite the clear impact of teachers' understanding and incorporation of indigenous knowledge on their teaching methods, there remains an urgent need for heightened awareness and training to effectively integrate IKS into education.

The observation data emphasize the significance of capacity building and enhancement to increase teachers' awareness of the Indigenous Knowledge (IK) integration process. The data suggest that, although teachers may be able to define what IK is and possess a moderate level of understanding; their actual implementation appears to be limited. As it was discussed on questionnaire data in former section teachers have moderate level of awareness's that they define IK and have understanding on integration of it in teaching.

According to Taylor and Cameron (2016), IK continues to be utilized by communities due to its transmission across generations over decades. Taylor and the study participants define IK as context-specific, influenced by geographic and social factors surrounding communities. However, teachers' actual classroom implementation is much limited. This finding is in line with the finding of the present study, because observation data shows this reality.

In the same manner, the study by Abah et al. (2015) IK is adapted to the local environment, resources, and cultural practices of indigenous communities. It encompasses skills, beliefs, and customs that are considered valuable and relevant to the community's way of life. Therefore, Indigenous knowledge is a subset of traditional knowledge that is unique to indigenous communities while traditional knowledge is a more general term for knowledge and practices that have been passed down through generations in any given culture or community. As study by Abah et al. (2015) teachers provided their insight on the concepts of IK and integration process. The study results revealed teacher's practical implementation lesson by integration of IK is very restricted. So, the present study result from classroom observation supported this finding.

According to Bishaw and Wubshet's research (2020), Indigenous Knowledge (IK), which holds immense importance in the daily lives of local communities but the attention given by curriculum developers and other stake holders in helping to build the capacity of teachers in the implementation process needed to be improved, efforts are needed to document and disseminate recognition of these knowledge systems. Despite serving as the foundation for societal knowledge, inadequate institutional support puts IK at risk of extinction (Tigist et al., 2018) this also needs attention.

Furthermore, the study findings reveal insufficient attention given to incorporating local knowledge systems into the new curriculum and teachers training. Thus, improvements are necessary to effectively involve IK in the educational framework. As a result of this problem teacher's practical classroom implementation of integrating IK is restricted (Tigist et al., 2018). Therefore, this finding is in line with current study.

Table 5: Teachers Practical Integration of IK

Items	N	Mini mu m	Maximu m	Mean	Std. Deviation
I have experiences to teach my students by using local examples	38	1	4	3.29	.835
I prepare activities by adopting the materials to local context and local language.	38	1	4	2.92	.784
I plan having much time to teach my students new topics with integration of IK	38	1	4	2.89	.727
I try to make my lesson very interesting by incorporating IK	38	1	4	2.74	.950
When I am not sure how to integrate IK in my lesson for new concepts, I have experiences of consulting me collogues	38	1	4	2.32	.933
I have experiences of reading different history books, oral tales and traditions in local language of the community to integrate my lesson with IK	38	1	4	3.11	.894
I have discussion time with my collogues on how to teach my students new concepts with integration of IK	38	1	4	3.13	.963
Average	38	1	4	2.92	.87

Table 5 provides insights into teachers' practical encounters with integrating Indigenous knowledge into General science teaching. As showed in the table, teachers frequently engage with Indigenous knowledge, resulting in an overall mean score of (M=2.92). This implies that teacher's practical implementation of integration of IK above average.

In the context of integrating Indigenous Knowledge (IK) into their teaching, teachers often allocate sufficient time to introduce new topics. This practice received a mean score of (M=2.89) with a standard deviation of (SD=0.727).

Additionally, teachers actively incorporate IK to make their lessons engaging and interesting, as reflected by a mean score of (M=2.74) with the (SD= 0.950). When uncertain about integrating IK, teachers consult their colleagues for guidance, with a positive view of this practice (mean score: 2.32, standard deviation: 0.933).

Furthermore, teachers frequently draw from various sources, including history books, oral tales, and local traditions in the community, to seamlessly integrate IK into their lessons. This approach received a mean score of 3.11 (standard deviation: 0.894).

So as in the current study, researchers investigated how teachers incorporating Indigenous Knowledge (IK) into their general science classroom practices. The integration of IK into science learning is a transformative approach that honors cultural diversity, fosters environmental consciousness, and cultivates a holistic understanding of science. By leveraging IK, educators can provide students with a well-rounded education that equips them to tackle intricate challenges with empathy, ethical awareness, and a profound connection to the natural world (Krishna Maya, 2023).

The practical classroom implementation of the incorporation of Indigenous Knowledge (IK) practices underscores the significance of diverse ways of knowing and learning, especially in our increasingly interconnected global society. Within the context of science education, IK practices offer valuable insights (Krishna Maya, 2023).

The following excerpt is from an interview with a school department head teacher,

“In my science lessons, I incorporate everyday kitchen materials to teach about acids, bases, and salts. For instance, I use tea, turmeric, and red cabbage juice as indicators. Lemon, tomato, and vinegar serve as examples of acids, while ash, soap, and shampoo represent bases. Rock salt and common salt are used to demonstrate salt properties. Additionally, I create carbon dioxide gas by combining egg cells and lemon juice, illustrating a chemical reaction. To explain mixtures, solutions, and colloids, I show real-life examples like tea, lemonade, and milk, connecting these concepts to students’ daily experiences”. (Interview Recorded, March 2024).

The information above highlights how teachers incorporate Indigenous Knowledge (IK) into their classroom practices by utilizing local examples. These examples serve to enhance students’ understanding of the lesson. The teacher’s approach is grounded in students’ daily experiences, and during classroom discussions, the focus is on sustainable culinary practices related to IK.

The researcher also observed classroom lessons to gather information about teachers’ current instructional practices and the incorporation of Indigenous Knowledge (IK). However, the actual

classroom presentations and examples of IK, indigenous teaching-learning methods, and teaching aids observed during lessons did not align closely with the data obtained from interviews and questionnaires. Teachers occasionally integrated IK, but there is room for improvement in this approach.

The quantitative findings for this aspect revealed moderate contextualization within lessons. However, these results were at odds with observations made by the researcher. Specifically, the practical implementation of Indigenous Knowledge (IK) elements by teachers was infrequently evident in certain lesson content as observed.

Conversely, interview findings highlighted successful integration of lessons with IK, enabling children to comprehend the material more easily through local examples and materials during classroom instruction. Despite some efforts, the incorporation of indigenous values remains less prominent in new textbooks, exercises, visual aids, and teaching methods. This discrepancy persists due to the curriculum's strong alignment with Western educational norms. Addressing this issue is crucial to enhance the teaching and learning process for primary school children.

Educators ought to be conscious of the distinctions and commonalities across diverse cultural viewpoints when integrating Indigenous Knowledge (IK) into teaching materials. Teachers have to comprehend their responsibilities, engage in ongoing self-reflection, and develop strategies for incorporating the rich cultural influences that have shaped their development. Their pivotal role lies in refreshing learning across all schools by effectively integrating IK into teaching practices.

This finding is somewhat similar with the study conducted by (Hunter 2015). His study revealed that even though teachers have moderate level of understanding about the importance and concepts of IK, practical implementation of integrating IK in teaching is inadequate.

Teachers sometimes focus on the integration of IK in teaching. According to Hunter (2015), the bedrock of indigenous knowledge rests with teachers who honor cultural identity, foster conducive learning environments, and choose appropriate pedagogical approaches for the classroom. Consequently, educators should undergo training that imparts a relevant conceptual grasp of indigenous knowledge within their specific educational context (Chepchirchir, 2017).

The other study by Thaman (2013) found that practical implementation of IK in teaching of sciences was not effective. It was observed that the impact of globalization discouraged Pacific teachers and students from recognizing, appreciating, and studying their own indigenous knowledge systems, fearing stigmatization as outdated, overly sentimental, or even racist.

Numerous researchers have explored the factors influencing successful curriculum integration. Jackson et al. (2016) observed that some teachers undervalue transmitting indigenous knowledge systems due to their intrinsic value systems, particularly in the affective domain.

Some educators view indigenous knowledge as pseudoscience, as highlighted in Mothwa's study (2011). Jackson et al. (2016) suggest that teachers may lack cultural sensitivity beyond their ingrained mental models even if they have understanding about concepts of IK and to integrate it teaching process.

To promote cultural sustainability and establish a positive link between classroom learning and students' lives outside school, teachers should engage in training and professional development that fosters attitude, knowledge, and skill transformation. Jackson et al. (2016) observed a general shift toward a more nuanced understanding of indigenous knowledge among teachers after participating in specialized training. Many teachers progressed from being uninformed about indigenous knowledge to developing partially informed and fully informed perspectives.

Attitudes and perceptions can be reshaped through workshops and training provided by higher education institutions, enabling teachers to gain a comprehensive grasp of indigenous knowledge.

Table 6: Challenges Teachers are Facing During Integrating IK

Items	N	Mean	Std. Deviation
The lack of supplementary materials (books, teachers guide and etc....) usually can be the major obstacles of integrating the indigenous knowledge in the classroom.	38	1.79	.413
The perception of the learner is the major obstacles of integrating the indigenous knowledge	38	1.79	.413
The perception of the teachers is the major obstacles of integrating the indigenous knowledge	38	1.79	.413
The perception of the school community is the major obstacles of integrating the indigenous knowledge	38	1.84	.370
The complex nature of indigenous knowledge and practices makes it impossible for integration process	38	1.82	.393
The attention given on the curriculum were demotivating the Integration of IKS	38	1.45	.504
The influences of western culture on the integration process of IKS is challenging factor	38	1.79	.413
Lack of documented resources to facilitate teaching and learning of IK	38	1.68	.471
Lack of training by teachers in indigenous knowledge	38	1.79	.413
Shortage of indigenous experts in the area	38	1.76	.431
Teachers' prior experiences and background knowledge on indigenous practices	38	1.63	.489
Religious beliefs also have negative influence to integrate IK	38	1.71	.460
The advancement of Urbanization and its effect	38	1.71	.460
Cultural and Linguistic Barriers have negative influences on the integration of IK	38	1.76	.431
Lack of support from educational institutions can hinder the integration of Indigenous knowledge	38	1.95	.226
Average	38	1.75	.42

The overall average, score across all challenges in the table above is ($M=1.75$) with the standard deviation of ($SD=0.420$). This can be concluded that teachers encounter multifaceted challenges when integrating indigenous knowledge. These challenges span learner and teacher perceptions, resource availability, cultural factors, and institutional support. Addressing these obstacles is crucial for effective IK integration in educational settings.

The challenge highlighted in the table relates to the insufficient availability of supplementary materials required for effectively integrating indigenous knowledge (IK) in the classroom. These supplementary resources include books, teacher guides, and other relevant materials. The mean score for this challenge is ($M=1.79$), indicating that it is indeed a significant obstacle. Teachers are grappling with the task of locating relevant materials to enhance their teaching of indigenous knowledge.

The second aspect highlighted in the table related to learner perception regarding the integration of indigenous knowledge (IK). Learners' perceptions play a critical role in the successful integration of IK. When learners perceive it negatively, it becomes a significant obstacle. The study results indicate that students' perception of IK integration is truly negative, and this perception affects teachers' ability to integrate IK. The mean score for this challenge is ($M=1.79$).

The third point discussed in the table is about the teachers' perception regarding the integration of indigenous knowledge. The data highlights that teacher perception has a substantial impact on the integration process. Once again, the mean score for this challenge is ($M=1.79$), underscoring its significance. This implies that teacher's way of perceiving integration of IK significant challenge.

Another challenge highlighted in the table is related to the perception of the broader school community, which includes administrators, parents, and other stakeholders. This perception significantly impacts the integration of indigenous knowledge (IK). The mean score for this challenge is ($M=1.84$), with a standard deviation of ($SD=0.370$).

Another challenge explored in understanding the obstacles faced by teachers during the integration of Indigenous Knowledge (IK) is related to the complexity of indigenous knowledge and practices. The study findings revealed that the intricate nature of indigenous knowledge and practices can definitely create difficulties during the integration process. With the mean score of ($M=1.82$).

Another issue highlighted in the table is related to curriculum challenges. The report indicates that this is a significant concern, with a mean score of ($M=1.45$). Essentially, when the curriculum fails to adequately address indigenous knowledge (IK), it can demotivate teachers to integrate IK.

The impact of Western culture on integrating Indigenous Knowledge is exposed as a challenge with the mean score (M=1.79), and standard deviation of (SD= 504). This finding implies that western culture affects the integration of IK in teaching general sciences.

Another issue related to the lack of documented resources, hindering effective teaching and learning of IK, with a mean score of (M=1.68). The other point in the table shows lack of training specifically in indigenous knowledge affects successful integration. The mean score for this challenge is (M=1.79). Additionally, the scarcity of experts in the field is also another challenge exposed with the mean score of (M=1.76). Teachers' prior experiences and background knowledge also affect IK integration. This was reported with the mean score (M=1.63).

The other point focused in the table was religious principles as hinders of IK integration having the mean score of (M=1.71). It was also indicated in the study that urbanization is a challenge in teaching integrating IK with the mean score: (M=1.71). Cultural and linguistic differences negatively impact successful IK integration mean score: (M=1.76).

Finally, educational institutions' inability to provide adequate support is the most significant obstacle, with a mean score of (M=1.95).

In order to triangulate study finding with other source of information the researcher conducted interview and classroom observation. As a result, the selected teachers, principals and supervisors interview result were discussed here under. According to the interview with teachers', supervisors and principals there were numerous challenges in integrating IK into the teaching of general science in primary school. These challenges are discussed below that are aligned with the finding from questionnaire by sampled teachers.

As the interview data revealed that teacher lack of Indigenous Knowledge. The general findings tell that teachers are either reluctant or lack the necessary knowledge to implement indigenous science. This is evident by the views expressed interview with department head teachers, supervisors and school principals. According to them teachers were not well equipped and therefore, had no capacity to go and implement inclusion of alternative knowledge in science. In addition to this there is lack of supplementary materials such as book teachers guide etc. to integrate IK.

For example, one of the department head teachers had this to say:

“For teachers to be ready, first the curriculum at the general science has to be changed. Let the teachers include indigenous knowledge. If indigenous knowledge will not be taught here, I doubt if there will be a teacher that will go and change things out there. Because even the teaching materials, do not have any of those knowledge”. (Recorded April. 2024).

Another cluster supervisor questioned:

“Since, teachers were not equipped in indigenous knowledge, how can they integrate IK? So first of all, it is very important to equip teachers with necessary skills and knowledge, providing educational resources, The concerned stakeholders have to train teachers on the integration of IK” (Recorded April. 2024).

This view was also expressed by Baynes, (2010) that the education authority both (policy and curriculum) requires teachers to embed indigenous perspectives; however, many teachers express concern that they lack the necessary knowledge and skill to implement this. Teachers are also reportedly hesitant about incorporating indigenous content when they feel that they do not have the expertise to do this in an authentic way.

As a lined with questioner data report lack of documented resources was one of the challenges which teachers have been facing in their way to integrate IK in teaching General sciences.

As one of the sampled primary school principals explained how the lack of documented resources is a challenge to IK integration in the following way:

“Most of the information we have is oral. There are not many efficient sources on indigenous knowledge systems in well documented way to integrate it in teaching. That will be a challenge because when you are to integrate, you must be fully knowledgeable about what you want to teach”.

Therefore, it was evident from the principal view that undocumented sources of information hinder the integration of IK in the teaching of in class this implies that teachers are not fully knowledgeable of the IK content to be taught due to a lack of documented sources to which they can refer. The teacher also believed that they needed documented sources to refer to during scheming, planning and preparation of teaching.

The other teacher interviewee expressed how information can be altered when passed from one person to the other orally:

“The problem with integrating IK is that there is no documentation that we have, the problem is unrecorded information. It lacks consistency, people die with some knowledge before it is passed to the next generation and people not willing to record, as such it lacks coherence of some sort. If my grandmother told my father something before, she dies, the same knowledge impacted by my father to my child she can't say it 100 per cent the way it was told by my grandmother”.

It was also evident from this explanation that the challenge of integrating IK in the teaching was unrecorded information on IK which lacks consistency and coherence. Furthermore, the teacher observed that as a result of the oral nature of IK, information is altered during transmission from one generation to the other. As the finding revealed teachers are not knowledgeable as to what to teach in IK due to a lack of documented sources reference materials.

It was exposed that the shortage of learning materials was found as an impediment to the full implementation of indigenous technology and culture in South Africa (Vandeleur, 2010).

Teachers require well-documented sources to guide their schemes of work, lesson planning, and teaching note preparation. Another study in the same area revealed that the textbooks currently used in Zimbabwean schools are predominantly imported from Britain and reflect British culture. Shizha (2006) and Mavhunga (2006) highlighted this cultural bias. Additionally, Indigenous Knowledge (IK) is primarily transmitted orally, which can lead to the loss of valuable information during transmission. This scarcity of resources for integrating IK was also observed in research conducted at North-West University in South Africa (Mmola, 2010).

In the study it was presented that community and parent's perception is as challenge that affects the integration of the IK as the finding in the table above exposed. This was supported by study conducted by Seehawer (2018), according to the study learners should receive take-home assignments to explore Indigenous Knowledge (IK) practices within their families as part of an IK integration strategy.

However, the study revealed that parents and the broader community were hesitant to actively support students in integrating IK into their learning. Conversely, another study by De Beer and Mothwa (2013) found that learners benefit when parents are involved in their education. This researcher emphasized that parents, being community members, possess a wealth of IK. Consequently, assigning take-home projects to learners could facilitate parents in guiding them to relevant community resources. Despite this potential, parental unwillingness remains a significant challenge.

The other challenge explored in this study on the implementation of integrating IK in teaching was lack of training by teachers in indigenous knowledge areas. The study result revealed it as the other obstacle. It was evident that some teachers were not prepared to integrate IK in the teaching of primary school general science lessons because they lacked any form of training in indigenous knowledge: One of the participant department head teachers stated that:

“We have heard about indigenous knowledge, but the challenge is especially that we have not been trained. Teachers need to be trained. Especially I myself I am not professionally trained how to incorporate IK in teaching. As a result, I am not focusing the integration of IK in my teaching. There are many studies in the teaching methodology how to integrate lesson with IK. So, shall teachers expected to research the way to integrate it or prepare our lesson? This is big question needed to be answered”.

This teacher viewed the lack of training by teachers in IK as major challenge in integrating IK in the General science lessons. In addition, the teacher felt that it is a burden to investigate IK in preparation for the lessons. As the finding shows it is difficult for the teachers to change from the usual classroom teaching practices to that which involved integrating IK in teaching. As a result, it is important to train teachers on the methodological aspects especially the way to integrate IK in teaching learning process.

The other school supervisor from another cluster proclaimed that:

“Teachers are trained during a certain era and they don’t expire with the expiring of a syllabus. They should be able to read and understand these things (referring to IK) and teach them”.

The above cluster supervisor argument exposes that teachers should be able to adapt to changing learning environments. He argued that teachers were not trained for a specific syllabus or content of which they should be able to adapt to the new General sciences curriculum.

This cluster supervisor seems to suggest that teachers are supposed to engage in ongoing development of themselves as teachers to meet changing demands in the education sector. As this cluster supervisor view, lack of training by teachers cannot be as a hindrance to integrating IK in the teaching.

In the study area, General Science teachers expressed reluctance to incorporate Indigenous Knowledge (IK) into their teaching practices due to their perceived lack of training in this domain. This finding aligns with research conducted by Vandeleur (2010) in South Africa, where a deficiency in qualifications related to indigenous knowledge hindered the effective teaching of indigenous technology and culture.

The teachers’ confidence in delivering subject matter was adversely affected. Similarly, Mmola (2010), in a study at North-West University, highlighted that the scarcity of teaching staff trained in IK posed challenges to the successful integration of IK within classrooms.

Based on the research finding (Dennis, 2010) it was believed that older community members have the potential to close the above gap in qualification. Because research carried out in Canadian schools

revealed that teachers invited community elders to deliver lessons on local traditions (Dennis, 2010). Other ways, without updating teacher with professional training on the IK it is difficult to expect well integrated lesson with IK practices from teacher.

In line with results from quantitative data from teachers interview with teachers and supervisors revealed that shortage of indigenous experts was the other hindering factor for teachers' integration of IK in the present study.

The following idea was obtained from one of the interviewed department head teachers how a shortage of indigenous experts could hamper IK integration in primary school teaching of General sciences.

“I think one of the challenges of integrating IK may be in urban set-up, it may be so challenging to get someone, an elderly person who can actually come to help in delivering such a lesson”.

As we see the finding from the teacher revealed that the scarcities of indigenous experts who are knowledgeable in IK become a challenge to IK integration in the teaching. As the above teacher's opinion the urban areas, a shortage of indigenous experts could hinder the teaching of the topic with integration of IK.

So, from this one can understand that the scarcity of indigenous experts within the community is a challenge for particularly teachers who lack a readily available resource base to support them when they feel inadequately prepared.

The other challenge identified by interview was about teachers' prior experiences and background on indigenous practices. One of the school principals narrated how prior experiences can hinder the integration process of IK in classroom instructional process here below.

“In my opinion background knowledge with in teacher has positive impact in the integration process of IK in teaching. Teachers with good prior experiences can integrate IK effectively as compared with teachers lack background knowledge”.

From this we can understand that teachers' lack prior experiences of indigenous knowledge were a challenge for the integration and teaching for teachers.

The teachers' backgrounds can either facilitate or impede the incorporation of Indigenous Knowledge (IK), as highlighted by Vandeleur's research on the South African indigenous technology and culture curriculum in 2010.

In the present study, teachers without an indigenous background encountered difficulties when incorporating general sciences into their teaching. This finding aligns with research conducted in South

Africa by Vandeleur (2010), who observed that teachers exposed to indigenous technology and culture were better equipped to implement the new curriculum related to culture and technology.

Conversely, teachers with a westernized background faced challenges in implementing the curriculum focused on indigenous technology and culture.

Similarly, in their research on the Aborigines in Australia, Mclaughlin and Whatman, (2015) observed that urban teachers lacking connections with Aborigines faced challenges when incorporating indigenous knowledge into their teaching. The researchers emphasized the critical importance of prior experiences in this context.

The other challenge observed in this study was concerning religious beliefs and its effect on the integration of IK in teaching. So, the findings from the teachers established that religious belief was another challenge to the integration of IK in the teaching. This was indicated by one of the interview participants below.

“In my view religious belief has some negative impact on the integration of IK while teaching. Because, when I use some local examples to illustrate points in my lesson some of my learners were directly relate it with their religion and blaming back me with their parents”.

The research revealed that religious factors can influence the integration of Indigenous Knowledge (IK) into classroom instructional process. This finding aligns with Shizha’s observations in 2006.

Colonial education in Zimbabwe historically viewed indigenous knowledge as primitive and unrelated to economic interests. Consequently, schools that perceive indigenous education as inferior may resist including IK in their teaching practices.

Generally, it can be concluded that religious belief is also the other challenge on the integration process of indigenous knowledge in teaching.

The other issue focused in this study was urbanization as challenge in integration of IK in teaching process. The study established from the interview with school principal and department head teacher showed that urbanization is perceived as a challenge to the integration and teaching of IK in the classroom. The following is the interview result directly taken form interviewed supervisor.

“Urbanization is a challenge especially for people in urban areas here who are no longer experiences local examples from rural areas of our nations. As far as I know students from rural areas have more awareness of different concepts related with indigenous items objects our people uses”.

This implies that urbanization was also the other challenge teachers have been facing to implement the integration of IK while teaching their students.

In generally the challenges in Integrating Indigenous Knowledge (IK) in research area on general science education within classrooms context were discussed and the educators grapple with the task of seamlessly incorporating Indigenous Knowledge (IK) into science instruction.

While the curriculum advocates for the inclusion of IK, specific guidelines on harmonizing these two worldviews IK and Westernized science remain intangible. Teachers perceive IK and westernized science as complementary modes of understanding, sharing a common scientific foundation. They acknowledge the potential for integrating IK into General Science's classes, emphasizing the importance of cultural context.

CHAPTER FIVE

5 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

The study addressed four main areas: teachers' conception of integrating indigenous knowledge (IK) into the General Science, their conception level of IK and the challenges faced in its implementation as well as practical implementation of the integration of IK in teaching. The finding indicated a generally positive conception among teachers, supported by quantitative data (mean score of **3.56**, standard deviation of **0.72**) and qualitative interviews. Teachers also showed a moderate level of understanding of IK's importance in teaching General Science, with an average score of **2.52** and a standard deviation of **1.1**.

It was also exposed that teachers frequently applying the integration of IK in teaching their students. This was indicated with the (mean score of **2.92**, standard deviation of **0.87**). However, the class room observation data was contradicted with the former finding by questionnaire with teachers. Because the researcher unable to observe this quality of integration of IK. In addition, the study identified several barriers to integrating IK, such as a lack of resources, inadequate training, and challenges in developing teaching materials that incorporate IK. Moreover, the mindset and beliefs of students and the community, influenced by religion and past experiences, present further obstacles.

The research underscores the need for better resources, training, and support to overcome these challenges and effectively integrate IK into the education system, recognizing its value for cultural and scientific enrichment.

5.2. CONCLUSION

The study was focused and guided on the following four basic issues. That are the conceptions of general sciences teachers regarding the integration of indigenous knowledge into the General science, the level of conceptions of teachers on the integration of Indigenous knowledge, the teacher's practical integration of indigenous IK and the major challenges teachers are facing during integrating the indigenous knowledge in teaching General science. Concerning teacher perception towards the integration of IK there were collectively positive understanding reflected. This was exposed by the sum mean score ($M=3.56$) with standard deviation ($SD=0.72$). This cumulative result was also supported by interview result with cluster supervisors, school principals and department head teachers.

Regarding the conception of teachers on the integration of Indigenous knowledge, the data revealed that teachers have positive understanding about the integration of IK in teaching of general science. The average score for this was ($M=2.52$) with the standard deviation ($SD=1.1$). The finding was also exposed by interview data and classroom lesson observation.

The other issue addressed in the present study was teachers' practical implementation of integrating IK while teaching General sciences. As the data described teachers regularly engage with Indigenous knowledge, resulting in an overall mean score of ($M=2.92$) with standard deviation of ($SD=.87$). Even though, less practical implementation was observed while conducting class room observation.

Other perspectives presented in this research report highlight several expected obstacles when incorporating Indigenous Knowledge (IK) into the teaching of General Science. According to teachers' viewpoints, the lack of well-documented resources and insufficient training in IK pose challenges when integrating it into the General Science curriculum.

Limited availability of relevant national and local resources, including textbooks specifically focused on Indigenous Knowledge (IK) for use in teachers' guides, created challenges. Consequently, teachers find it challenging to design schemes, create lesson plans, and prepare teaching materials that effectively integrate IK into their instruction.

The mindset and belief systems of both students and the broader community were also exposed as challenges to the integration of Indigenous Knowledge (IK). Certain students and parents, influenced by their religious convictions and past encounters, remain doubtful about indigenous traditions.

However, there is also interest and a sense of duty among some to learn about IK within educational institutions. Additionally, some of the interviewed department head teachers perceived that modernization and religious beliefs were replaced IK. Because of this teachers were facing difficulties to integrate IK.

Generally, in the context of integrating indigenous knowledge (IK), several challenges have been identified. These include the absence of supplementary materials such as teacher guides, learner perceptions, community perspectives, the intricate nature of indigenous knowledge itself, limited attention from curriculum developers, the impact of Western culture, insufficient documented resources, inadequate teacher training, shortages of indigenous experts, teachers' prior experiences and religious beliefs, urbanization, cultural and linguistic barriers, and insufficient support from educational institutions.

5.3. Recommendation

Successful integration of IK requires a holistic approach involving collaboration, resource development, training, and ongoing support. By implementing the following recommendations, it is possible to create a more inclusive and culturally enriched General Science curriculum in primary school. Consequently, based on the conclusions drawn from the study on “Teachers’ conception in Integrating Indigenous Knowledge in Teaching General Science,” the researcher recommends the following actions to the concerned body:

- ❖ Ministry of Education (MoE) to acknowledge the value of Indigenous Knowledge (IK) and to raise awareness among those who develop curricula. Curriculum developers need to understand the importance of IK and work towards its inclusion. This involves collaborating with indigenous communities, thoughtfully crafting curriculum materials, investing in the professional growth of teachers, producing pertinent educational materials, and conducting assessments to gauge the effectiveness of these efforts, all while encouraging community participation.
- ❖ The Woreda education office and schools had better collaborate to provide resources, with a particular emphasis on well-documented materials related to Indigenous Knowledge (IK). These resources should be tailored for inclusion in the General Science curriculum and easily accessible to teachers while aligning with the syllabus.
- ❖ Regional education bureau, Zonal education department and woreda education office had better to work collaboratively organizing training for teachers to enhance their understanding of IK and its integration into teaching. This training should address both theoretical knowledge and practical implementation.
- ❖ Education universities and colleges should actively enhance teacher awareness by persistently promoting the significance and advantages of incorporating Indigenous Knowledge (IK) into their teaching practices. Conducting workshops, seminars, and providing ongoing professional development opportunities can significantly contribute to fostering this awareness among educators.
- ❖ It is important if there is collaboration in order to foster positive interaction with teachers, cluster supervisors, school principals, and department head teachers. Encouraging discussions and knowledge-sharing related to IK integration.
- ❖ To ensure the practical integration of Indigenous Knowledge (IK), schools should actively assist teachers in creating lesson plans that incorporate IK. Additionally, providing clear guidelines and illustrative examples can demonstrate how IK can be effectively woven into General Science teaching.

- ❖ Schools should conduct regular classroom observations to evaluate the practical integration of Indigenous Knowledge (IK). Providing constructive feedback to teachers based on these observations is essential.
- ❖ The Zonal education department and schools should proactively tackle the scarcity of well-documented resources by actively collecting and sharing pertinent materials. Collaborating with educational institutions, research centers, and indigenous communities is crucial for compiling comprehensive resources.
- ❖ The zonal education department, Woreda education office and schools should collaborate with pertinent national and local organizations, such as educational authorities, curriculum developers, and community representatives. Actively ask their input and encourage their participation in advancing the integration of Indigenous Knowledge (IK).

References

- Abah, J., Mashebe, P., & Denuga, D. (2015). Prospect of integrating African indigenous knowledge systems into the teaching of sciences in Africa. *American Journal of Educational Research*, 3(6), 668-673.
- Abdisa Olkeba Jima (2022) Significance and restraint of indigenous knowledge inclusion in Ethiopian higher education curriculum: In focus Gadaa system, *Cogent Education*, 9:1, 2046241, DOI: 10.1080/2331186X.2022.2046241.
- Abera, T. (2020). Integrating Ethiopian indigenous knowledge and international knowledge: Special emphasis on STEM education. *International Journal of Multidisciplinary Research and Development*, 6(12), 204–208. <https://www.researchgate.net/publication/338897110>.
- Abha, P Mashebe, and Denuga (2015), *Prospect of Integrating of African Indigenous*
- Adeyemi, M., & Adeyinka, A. (2003). The Principles and Contents of African Traditional Knowledge. *Educational Philosophy and Theory*, 35(4). <https://doi.org/10.11/1469-5812.00039>
- Adimasu, A. (2014), *The Origin, Significance and Physical Condition of the Great Medieval Defensive Dry Stone Walls of Dawuro/Kati Halala Keela, Southwest Ethiopia*, Madawalabu University.
- Ahenakew, C. R. (2017). Mapping and complicating conversations about indigenous education. *Diaspora, Indigenous, and Minority Education*, 11(2), 80–91. <https://doi.org/10.1080/15595692.2017.127869>.
- Alemayehu, H., Solaiappan, A., Chebude, Y., & Eguale, T. (2018). Fabrication of tunable anatase/rutile heterojunction N/TiO₂ nano photo catalyst for enhanced visible light degradation activity.
- Anderson, J. R. (1990). *Cognitive psychology and its implications* (3rd ed.). W H Freeman/Times Books/ Henry Holt & Co.
- Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education*, 94(6), 1008–1026.
- Banks, J. A (1989). *Multicultural education: Issues and perspectives*. Allyn and Bacon

- Barnhardt, R., & Kawagley, A. (2005). Indigenous Knowledge Systems and Alaska Native Ways of Knowing. *Anthropology & Education Quarterly*, 36(1), 8-23. Retrieved from <http://www.jstor.org/stable/3651306>.
- Barnhardt, R., & Kawagley, A. O. (2005). Indigenous Knowledge Systems and Alaska Native Ways of Knowing. *Anthropology and Education*, 36, 18 - 23.
- Batibo, H. M. (n. d.). Indigenous Knowledge and the School Curriculum: A Case study from Botswana. Retrieved from <http://portal.unesco.org/science/en/files/4711/1122901464>. Teaching and learning science. London: Continuum.
- Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit*. Purich Publishing.
- Baynes, R. (2016). Teachers' Attitudes to Including Indigenous Knowledges in the Australian Science Curriculum. *The Australian Journal of Indigenous Education*, 45(01), 80-90.
- Bishaw, B., & Wubshet, T. (2020). The role indigenous knowledge in agricultural farming practices: The Case of Gondar and Gojjam area, Amhara Regional state, Ethiopia. *International Journal of Advanced Research in Biological Sciences*, 7(12), 106–112
- Brayboy, B., & Castagno, A. E. (2008). How might native science inform 'informal science learning'? *Cultural Studies of Science Education*, 3, 731–750.
- Breidlid, A. (2009). Culture, indigenous knowledge systems and sustainable development: A critical view of education in an African context. *International Journal of Educational Development*, 29(140–148).
- Breidlid, A. (2013). *Education, Indigenous Knowledges, and Development in the Global South. Contesting Knowledges for a Sustainable Future*. New York: Routledge.
- Brown, B. A., Boda, P., Lemmi, C., & Monroe, X. (2019). Moving culturally relevant pedagogy from theory to practice: Exploring teachers' application of culturally relevant education in science and mathematics. *Urban Education*, 54(6), 775-803.
- Burns, R.B. (2000). *Introduction to Research Methods*. (4th Ed.). Sage Publications: London.
- Canevez, R., Maitland, C., Shaw, J., Ettayebi, S., & Everson, C. (2022). STEM educational outreach and indigenous culture: (Re)centering for design scholarship. *International Journal of Human-Computer Interaction*, 38(17), 1718–1734.

- Chartrand, R. (2012). Redefining education through Anishinaabe pedagogy: A journey to clarify how Aboriginal education brought me to Anishinaabe pedagogy [Master's thesis, University of Manitoba]. MSpace. <https://mspace.lib.umanitoba.ca/xmlui/handle/1993/31755>.
- Chepchirchir, J. (2017). Indigenous knowledge in the school curriculum: teacher educator perceptions of place and position. Nelson Mandela University. Port Elizabeth South Africa.
- Chiromo, A. S. (2004). Effects of Socio-cultural Beliefs on Science Education in Zimbabwe: Implications for Science Teaching. Indilinga; African Journal of Indigenous Knowledge systems. Vol. 3 No.
- Choi, B.C.K. & Pak, A.W.P. (2006), "Multidisciplinary, Interdisciplinarity and Trans disciplinarity in Health Research, Services, Education, and Policy: Definitions, Objectives, and Evidence of Effectiveness", *Clinical and Investigative Medicine*, 29(6), 351-364.
- Creswell, J. W. & Plano Clark, V. L. (2007). *Designing and Conducting Mixed Methods Research*. Sage Publications Inc: California.
- Creswell, J. W. (2013). *Qualitative Inquiry & Research Design: Choosing among Five Approaches* (3rd ed.). Thousand Oaks, CA: SAGE.
- Damtew, T., & Heinz, G. (2010). Higher education and globalization: Challenges, threats an opportunity for Africa. Center for International Higher Education (CIHE), Boston, USA
- De Beer, J. & Mothwa, M., 2013, 'Indigenous knowledge in the science classroom: Science, pseudo-science, or a missing link?' paper presented at the ISTE International Conference on Mathematics, Science and Technology Education, Kruger National Park, 21–24 October.
- De Beer, J., & Whitlock, E. (2009). Indigenous knowledge in the Life Sciences classroom: put on your De Bono hats! *The American Biology Teacher*, 71(4), 209-216.
- Deer, F. (2013). Integrating aboriginal perspectives in education: Perceptions of pre-service teachers. *Canadian Journal of Education / Revue Canadienne de education*, 36(2), 175– 21.
- Delta School District. (2011). Aboriginal Education Enhancement Agreement. https://www.deltasd.bc.ca/board/student-achievement-data/1812__aeea_fina.
- Demeke, Y. (2011). *Ethiopian Education Policy Analysis: Using Foucault's Genealogy*.
- Dennis, V.S.T. (2010). *A Study of Aboriginal Teachers' Professional Knowledge and Experience in Canadian Schools*, University of Saskatchewan.

- Diwu, C. T., & Ogunniyi, M. B. (2012). Dialogical argumentation instruction as a catalytic agent for integration of school science with indigenous knowledge systems. *African Journal of Research in Mathematics, Science and Technology Education*, 16(3), 333–347.
- Ezeanya-Esiobu, C. (2019). Indigenous Knowledge and Curriculum in Africa. In C. Ezeanya-Esiobu (Eds.), *Indigenous Knowledge and Education in Africa* (pp. 1–10). Springer. https://doi.org/10.1007/978-981-13-6635-2_1
- Fakoyede, S. J., & Otulaja, F. S. (2019). Beads and beadwork as cultural artifacts used in mediating learners' agentic constructs in science classrooms: a case for place-based learning. *Cultural Studies of Science Education*, 1-18.
- Fuller, A., Hodkinson, H., Hodkinson, P., & Unwin, L. (2005). Learning as peripheral participation in communities of practice: A reassessment of key concepts in workplace learning. *British Educational Research Journal*, 31(1), 49–68.
- Garcia-Olp, M., Nelson, C., Hinzo, A., & Young, D. A. (2020). Indigenous epistemologies: Implementing indigenous practices and perceptions to the area of STEM. *Curriculum and Teaching Dialogue*, 22(2), 197–215.
- Grange, L. L. (2007). Integrating western and indigenous knowledge systems: the basis for effective science education in South Africa. *International Review of Education*, 53(2), 197–215.
- Gutierrez, K.D., & Rogoff, B (2003) Cultural Ways of Learning: Individual Traits or Repertoires of Practice. *Educational Researcher* 32(5):19-25.
- Hunter, T. C. (2015). *Practicing Culturally Relevant Pedagogy: A Literature Review of Classroom Implementation*. BU Journal of Graduate Studies in Education.
- Jackson, C., De Beer, J., & White, L. (2016). Teachers' affective development during an indigenous knowledge professional teacher intervention. *Journal of Curriculum Studies*, 48(4), 494–504.
- Jones, P. W. (2007). Education and world order. *Comparative Education*, 43(3), 325-337.
- Kanu, Y. (2005). Teachers' perceptions of the integration of Aboriginal Culture Into the high school curriculum. *Alberta Journal of Educational Research*, 51(1), 50–68.
- Kanu, Y. (2011). *Integrating Aboriginal perspectives into the school curriculum: Purposes, possibilities, and challenges*. University of Toronto Press.
- Khupe, C. (2014). *Indigenous knowledge and school science: Possibilities for integration* (Doctoral dissertation). University of the Witwatersrand, South Africa.

- King, L., & Sabine, S. (2004). *The Challenge of indigenous education: Practice and perspectives*. UNESCO Digital Library. <https://unesdoc.unesco.org/ark:/48223/pf0000134773>
- Kovach, M. (2021). *Indigenous methodologies: Characteristics, conversations, and contexts*. University of Toronto.
- Kugara, S.L., Kugedera, A.T.T., Sakadzo, N., Chivhenge, E., & Museva, T. (2022). The role of Indigenous Knowledge Systems (IKS) in climate change. In *Handbook of Research on Protecting and Managing Global Indigenous Knowledge Systems* (pp. 1–23). IGI Global.
- Madlela, B. (2022). The needed categories of Indigenous Knowledge Systems in Natural Science Curriculum in South Africa: Narratives from Pongola schools. *Interdisciplinary Journal of Rural and Community Studies*, 4, 23–35.
- Manaye, M., Nigussie, S., & Abiyselassie, M. (2020). Documentation of traditional knowledge associated with medicinal animals. Ethiopian Biodiversity Institute. *American Journal of Life Science*. <https://orcid.org/0000-0003-4313-8336>
- McKinley, E. (2005). Locating the global: Culture, language and science education for indigenous students. *International Journal of Science Education*, 27(2), 227–241.
- Mclaughlin, J. & Whatman, S. (2015). Embedding indigenous knowledges. An Australian Case Study of Urban and Remote Teaching Practicum. Majhanovich & R. Malet (Eds.). *Building Democracy through Education on Diversity*, 57–76, Sense Publishers.
- McNeill and Steve Chapman, 2005 *Research Methods* by Patrick third edition
- Melesse, T., & Tessema, E. (2022). Curriculum Development in Ethiopian Context vis-a-vis Patrick Slattery's Principles in the Postmodern Era. *Bahir dar Journal of Education*, Bahirdar J Educ
- Ministry of Education Strategy Center (ESC). (2018-30). *Ethiopian Education Development Roadmap*
- Ministry of Education. (1994). *Education and Training Policy. Program Action Plan*, Addis Ababa. St. George Printing Press
- Ministry of Education. (2021). *Education Sector Development Program VI. The Federal Democratic Republic of Ethiopia*.
- Mmola, S. (2010). A survey of perceptions of IKS students and IKS lecturers on the IKS Programme at North-West University (Mafikeng Campus). Unpublished manuscript, IKS Programme, North-West University, Mafikeng Campus.

- Molefe, L. & Sanders, M. (2009). The pedagogical content knowledge of Life Sciences teachers having to teach evolution for the first time. Proceedings of the Seventeenth Annual Meeting of the Southern African Association for Research in Mathematics, Science and Technology Education. 19-22 January. Rhodes University. Grahamstown, South Africa. pp 337-345.
- Mosimege, M. (2005). National priorities in indigenous knowledge systems: Implications for research and curriculum development. *Indilinga-African Journal of Indigenous Knowledge Systems*, 4(1), 31-37.
- Mothwa, M.M. (2011). Teachers' experiences of incorporating indigenous knowledge in the Life Sciences classroom. University of Johannesburg: Unpublished M. Ed thesis.
- Mpofu, V., Otulaja, F. S., & Mushayikwa, E. (2014). Towards culturally relevant classroom science: a theoretical framework focusing on traditional plant healing. *Cultural Studies of Science Education*, 9(1), 221-242.
- Munroe, E. A., Borden, L. L., Murray Orr, A., Toney, D., & Meader, J. (2013). Decolonizing Aboriginal education in the 21st century. *McGill Journal of Education*, 48(2), 317–337. <https://doi.org/10.7202/1020974ar>.
- Muza, B. 2014. South African Grade 9 teachers' and learners' knowledge about medicinal plants and their attitudes towards its integration into the science curriculum. Un published MSc dissertation. University of the Witwatersrand, Johannesburg.
- Naidoo, P 2010. Teachers' Interpretation and Implementation of the Policy on Indigenous Knowledge in the Science National Curriculum Statement. Unpublished PhD thesis, KwaZulu-Natal, Durban.
- Negash, T. (2006). Education in Ethiopia: From Crisis to the Brink of Collapse. Nordiska Africa Institute.
- Ng'asike, J. T. (2019). Indigenous knowledge practices for sustainable lifelong education in pastoralist communities of Kenya. *International review of education*, 65(1), 19–46. <https://doi.org/10.1007/s11159-019-09767-4>
- Ngulube, P (2007). Handbook of Research on Social, Cultural, and Educational Considerations of Indigenous Knowledge in Developing Countries. UNISA: Pretoria.
- Nnadozie, I. J. (2009). The integration of indigenous knowledge systems (IKS) in the teaching of conservation of biodiversity & natural resources: A critical case study of Grade 10 life sciences educators in the Pinetown district. Master's Thesis: University of KwaZulu-Natal, Durban.

- Odora-Hoppers, C. (2002). Indigenous Knowledge and the Integration of Knowledge Systems: Towards a Conceptual and Methodological Framework. In C. Odora Hoppers (Ed.), *Indigenous Knowledge and the Integration of Knowledge Systems: Towards a Philosophy of Articulation* (pp.139-143). Claremont, South Africa: New Africa Books.
- Ogunniyi, M. (2007). Teachers' stances and practical arguments regarding a science- indigenous knowledge curriculum: Part 1. *International Journal of Science Education*, 29(8), 963-986
- Ogunniyi, M. B. (2004). The challenge of preparing and equipping science teachers in higher education to integrate scientific and indigenous knowledge systems for learners. *Southern African Journal of Higher Education*, 18(3), 289 – 304.
- Owuor, J. (2007). Integrating African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development. *Journal of Contemporary Issues in Education*, 2(2), 21-37. <https://doi.org/10.20355/C5Z594>
- Park, M. (2008), "Implementing Curriculum Integration: The Experiences of Korean Elementary Teachers", *Asia-Pacific Education Review*, 8(3),308-319.
- Raselimo, M. & Mahao, M. (2015), "The Lesotho Curriculum and Assessment Policy: Opportunities and Threats", *South African Journal of Education*, 35(1), 1-12.
- Rudestam, K. E. & Newton. R. R. (2007). *Surviving Your Dissertation: A Comprehensive Guide to Content and Process*. 3rd Edition. Sage Publications: London.
- Seehawer, M. (2018). South African science teachers' strategies for integrating indigenous and Western knowledges in their classes: Practical lessons in decolonization. *Educational Research for Social Change*, 7(SPE), 91-11
- Shankar, P.R. (2014), "Challenges in Implementing an Integrated Curriculum", *Xavier University School of Medicine Journal*, 6(4), e74-e77.
- Shizha, E. (2006). Legitimizing Indigenous Knowledge in Zimbabwe: A Theoretical Analysis of Post-Colonial School Knowledge and its Colonial Legacy. *Youth and Children's Study*, Paper 2. http://works.bepress.com/e_shizha/11 retrieved 20 July 2017.
- Simpson et al. from 2023: Observed Humidity Trends in Dry Regions Contradict Climate Models
- Sisay, A. (2016). The historic move, contemporary challenges and opportunities in Ethiopian education. *International Journal of African and Asian Studies*, 2409–6938

- Smylie, J., Martin, C. M., Kaplan-Myrth, N., Steele, L., Tait, C., & Hogg, W. (2004). Knowledge translation and indigenous knowledge. *International Journal of Circumpolar Health*, 63(sup2), 139-143.
- Snively, G., & Williams, W. L. (2018). *Knowing home: Braiding Indigenous science with Western science, Book 2*. Victoria, BC, Canada: University of Victoria Press.
- Solomon, M. (2019). Trends of Educational Policy Formulation and Implementation in Ethiopia: A Historical Analysis. *International Journal of Education & Management Studies*, 9(4), 264–272
- Tankiso-Mphunyane, L.M. (2014), “Investigating the Factors that Attribute to the Teachers’ Failure to Integrate Mokhibo and Ndlamo with Business in the Three Butha-Buthe High Schools”, MEd Dissertation, National University of Lesotho.
- Tanyanyiwa, V. (2019). Indigenous knowledge systems and the teaching of climate change in Zimbabwean Secondary Schools. *SAGE Open*, 9(4), 2158244019885149.
- Taylor, D. L., & Cameron, A. (2016). Valuing IKS in successive South African physical sciences curricula. *African Journal of Research in Mathematics, Science and Technology Education*, 20(1), 35-44.
- Teshome, A. (2017). Indigenization for Restoration of Ethiopianism. *International Journal of Multidisciplinary Research and Development*, 4(10), Available. www.allsubjectjournal.com
- Thaman, H. (2013). Quality teachers for indigenous students: an imperative for the twenty-first century. In *The International Education Journal: Comparative Perspectives* (Vol. 12, Issue 1). www.iejcomparative.org.
- Thaman, K. H. (2009). “Towards Cultural Democracy in Teaching and Learning with Specific References to Pacific Island Nations (PINs)”. *International Journal for the Scholarship of Teaching and Learning*, 3(2), Article 6.
- Tigist, P., Demissie, C., Birhanu, M., & Aregalign, S. (2018). Assessment of indigenous knowledge and its relevance for livestock production: The case of North Gondar zone. *International Journal of Scientific Research and Management*, 6(4), 81–88. Tigist Petros
- United Nations. (2007). *Declaration on the Rights of Indigenous People*. University Port Elizabeth South Africa.
- Vandeleur, S. (2010). *Indigenous Technology and Culture in the technology Curriculum: Starting the Conversation, A case study*, Thesis, Doctor of Philosophy, Rhodes University.

- Vongai, M., & Elaosi, V. (2017). Indigenous knowledge and nature of science interface: Content considerations for Science, Technology, Engineering, and Mathematics Education. *International Scholarly and Scientific Research & Innovation*, 11(5), 1320–1328.
- Woldegiorgis, E. T., & Turner, I. (2023). Editorial to the special issue “Narrowing the gap beyond tokenism: Transdisciplinary search for innovative approaches in the integration of indigenous knowledge systems and epistemologies in higher education.” *Curriculum Perspectives*, 43(1), S1–S2.
- Wuhibegezer, F., Gezae, & Gezae, H. (2015). Re Africanizing the education system of Ethiopia. *African Journal of History and Culture*, 7(2), 2. [https://doi.org/ 10.5897/AJHC2014.0203](https://doi.org/10.5897/AJHC2014.0203)
- Yoseph, M., Aster, G., & Getahun, H. (2022). Indigenous sacred forests as a tool for climate change mitigation: Lessons from Gedeo Community, Southern Ethiopia. *Journal of Sustainable Forestry*, 1–28.
- Zidny, R., Sjöström, J., & Eilks, I. (2020). A multi-perspective reflection on how indigenous knowledge and related ideas can improve science education for sustainability. *Science & Education*, 29(1), 145-185.

Appendix A

**HAWASSA UNIVERSITY
COLLEGE OF EDUCATION
SCHOOL TEACHERS EDUCATION
MA IN CURRICULUM AND INSTRUCTION**

Questionnaire to be filled by school teachers

Introduction

Dear teachers, the aim of this questionnaire is to help in collecting data for the study on the title conception of teachers in integration of indigenous knowledge in general science. The questionnaire will help us to identify the teachers' conception in integration of indigenous knowledge in general science the major challenges in integration of indigenous knowledge in teaching general science, the teachers practical experience of integrating indigenous knowledge and to examine the level of awareness of teachers on the integration of indigenous knowledge. So, to achieve the goal of this study getting genuine information is vital. Hence, you are kindly requested to give genuine answer for the questions presented below. The information gathered will be used only for the purpose of the study. No part of the information will be given for third party or will be used for other purposes.

Thank you very much for your cooperation

PART ONE

Which category describes your gender? Male Female

Which category describes your Age group? 20-30 31-40 41-50 ≥50

Including the current academic year, what is your experience of working as a school teacher? please indicate it 1-10 11-20 21-----30 4. ≥30

What is the highest level of your academic qualification? Diploma Degree Masters

In which grade you are currently teaching grade 5 grade 6 grade 7 grade 8
both 5and 6 both 7 and 8

PART 1 Teachers perception of the nature and characteristics of IK

Dear, teachers please read the statements on indigenous knowledge below and indicate your perception by using the scale given in front of it.

1. (Ag): Agree 2. (SA): Strongly Agree 3. NS: Not sure
4 SD: Strongly Disagree 5. DA: Disagree

Please put (X) mark in front of the provided specific questions in the table

	Teachers' perception of the nature and characteristics of IK	AG	SA	NS	DA	SDA
1.	Indigenous Knowledge is dynamic knowledge that people in a given community have developed over time					
2.	Indigenous Knowledge is the same as traditional knowledge.					
3.	Indigenous Knowledge is a large body of knowledge and skills that has been developed outside formal educational system.					
4.	Local languages are part of Indigenous Knowledge.					
5.	Indigenous Knowledge is an important part of the livelihood of people in poor countries only.					
6.	Indigenous Knowledge is an important part of the livelihood of people in rich countries only					
7.	Indigenous Knowledge is culture- specific					
8.	Indigenous Knowledge is a critical part of culture					
9.	Indigenous Knowledge is knowledge that is not documented					
10.	Indigenous Knowledge is adapted to a specific group of people					
11.	Each ethnic group has got its own Indigenous Knowledge which is different from other ethnic groups.					
12.	Indigenous Knowledge is the basis of decision-making in societal issues such as agriculture, education and health					
13.	Indigenous Knowledge is obtained through the scientific method.					
14.	Western science and Indigenous Knowledge are one and the same thing.					
15.	Indigenous Knowledge is documented knowledge.					
16.	Indigenous Knowledge generalizations have rational and logical dimensions.					
17.	Facts within indigenous knowledge are tested.					
18.	Facts within Indigenous Knowledge are experiential					

19.	Language is important to the acquisition of Indigenous Knowledge.					
20.	All events in Indigenous Knowledge have natural causes.					
21.	Language is an important creative force in Indigenous Knowledge.					
22.	Indigenous Knowledge is a wealth of knowledge important for survival.					
23.	Knowledge explanations of Indigenous Knowledge relate to traditional beliefs and lifestyles of people.					
24.	Indigenous Knowledge is based on questioning and discovering answers					
25.	Indigenous Knowledge is passed by societies as accumulated, useful or important knowledge related to their existence					
26.	Indigenous Knowledge is passed from generation to generation by word of mouth or learned by experience.					

PART TWO

Dear teachers to determine the level of your awareness on the concepts of Indigenous Knowledge, the following Four-point Likert scales was designed: Read the statement very carefully and respond by using the cod

4= Very Much Aware 3= Moderately Aware, 2= Slightly Aware, 1= Not Aware

	Teachers' level of awareness on the concepts of Indigenous knowledge	4	3	2	1
1.	Indigenous Knowledge is dynamic knowledge that people in a given community have developed over time				
2.	Indigenous Knowledge is the same as traditional knowledge.				
3.	Indigenous Knowledge is a large body of knowledge and skills that has been developed outside formal educational system.				
4.	Local languages are part of Indigenous Knowledge.				
5.	Indigenous Knowledge is an important part of the livelihood of people in poor countries only.				
6.	Indigenous Knowledge is an important part of the livelihood of people in rich countries only				
7.	Indigenous Knowledge is culture- specific				
8.	Indigenous Knowledge is a critical part of culture				
9.	Indigenous Knowledge is knowledge that is not documented				
10.	Indigenous Knowledge is adapted to a specific group of people				
11.	Each ethnic group has got its own Indigenous Knowledge which is different from other ethnic groups.				
12.	Indigenous Knowledge is the basis of decision-making in societal issues such as agriculture, education and health				
13.	Indigenous Knowledge is obtained through the scientific method.				
14.	Western science and Indigenous Knowledge are one and the same thing.				
15.	Indigenous Knowledge is documented knowledge.				

PART THREE

Dear teachers, to in order to examine your experiences of integrating indigenous knowledge in teaching, the following four-point Likert scales was designed: Read the statement very carefully and respond by using the cod given 4= Very often 3= Often, 2= Sometimes & 1=Never

	Teachers' Practical integration of indigenous knowledge in teaching	4	3	2	1
1.	I have experiences to teach my students by using local examples				
2.	I prepare activities by adopting the materials to local context and local language.				
3.	I plan having much time to teach my students new topics with integration of IK				
4.	I try to make my lesson very interesting by incorporating IK				
5.	When I am not sur how to integrate IK in my lesson for new concepts I have experiences of consulting me collogues				
6.	I have experiences of reading different history books, oral tales and traditions in local language of the community to integrate my lesson with IK				
7.	I have discussion time with my collogues on how to teach my students new concepts with integration of IK				

PART FOUR

Major challenges teachers are facing during integrating the indigenous knowledge in teaching General science

Dear, teachers the following statements are developed to know the major challenges that you as school teachers are facing in integration of indigenous knowledge. Read it and respond by using Yes or No

N/o	Challenges teachers are facing during integrating IK	Yes	No
1.	The lack of supplementary materials (books, teachers guide and etc....) usually can be the major obstacles of integrating the indigenous knowledge in the classroom.		
2.	The perception of the learner is the major obstacles of integrating the indigenous knowledge		
3.	The perception of the teachers is the major obstacles of integrating the indigenous knowledge		
4.	The perception of the school community is the major obstacles of integrating the indigenous knowledge		
5.	The complex nature of indigenous knowledge and practices makes it impossible for integration process		
6.	The attention given on the curriculum were demotivating the Integration of IKS		
7.	The influences of western culture on the integration process of IKS is challenging factor		
8.	Lack of documented resources to facilitate teaching and learning of IK		
9.	Lack of training by teachers in indigenous knowledge		
	Shortage of indigenous experts in the area		
10.	Teachers' prior experiences and background on indigenous practices		
11.	Religious beliefs also have negative influence to integrate IK		
12.	The advancement of Urbanization and its effect		
13.	Cultural and Linguistic Barriers have negative influences on the integration of IK		
14.	Lack of support from educational institutions can hinder the integration of Indigenous knowledge		

Appendix B

Interview questions to triangulate information collected from other data gathering instrument

Dear, supervisors/ principals the objective is interview is collecting information to the study being conducting on the title teacher's perception in integration of indigenous knowledge in general science curriculum. Therefore, your genuine response is very important to achieve the objective of the study. The information gathered is used for the research purpose only.

Thank you in advance for your time

1. How do you evaluate your school teacher's perception in integrating indigenous knowledge in curriculum?
 - a. Are teachers in your school integrating indigenous knowledge in their daily teaching method by integrating the mother tongue languages of students?
 - b. Are teachers were usually preparing daily lessen plans and weekly plans through integrating the indigenous?
 - c. Do your teachers apply integration of indigenous knowledge in all subjects?
2. What do you think are the major challenges of the integrating the indigenous knowledge in curriculum and instructional process at classroom level of primary school?
 - a. The lack of supplementary materials (books, teachers guide and etc....) usually can be the major obstacles of integrating the indigenous knowledge in the classroom
 - b. Do you think the perception of the school community can be major challenge integrating the indigenous knowledge in curriculum?

Appendix C

Interview Guideline for teachers

Dear, teacher the objective of is interview is collecting information to the study being conducting on the title teacher's perception in integration of indigenous knowledge in general science curriculum. Therefore, your genuine response is very important to achieve the objective of the study. The information gathered is used for the research purpose only.

Thank you in advance for your time

1. Can you define what indigenous knowledge is for you?
2. How do you understand the integration of IK in teaching science?
3. Do you believe integrating IKS in subject you are teaching is important for students?
4. What are the major obstacles you have been facing in integration of IK in teaching?

Appendix D

Classroom observation checklist

Introduction

Recognizing teachers' perspectives on integrating Indigenous Knowledge (IK) into teaching classrooms is crucial for promoting an inclusive and culturally responsive education. When creating an observation checklist, it's essential to consider that successful IKS integration extends beyond mere factual content. It requires fostering mutual respect, understanding, and an appreciation for diverse worldviews. The resulting checklist aims to capture these nuanced aspects during classroom observations

Teacher Attitudes and Beliefs:	Remark
Teachers' attitudes toward IK integration. Are they open, curious, or hesitant?	
Lesson content How teachers incorporate Indigenous content into their lessons. Is there evidence of IKS-related topics, stories, or cultural references? Are teachers integrating IK in their lesson	
Pedagogical Practices: How teachers use IK to enhance teaching methods. Do they incorporate Indigenous perspectives into instructional strategies? Are teachers encouraging critical thinking and dialogue around IK	
Learning Resources and Materials: The availability and use of IKS-related resources (books, videos, artifacts) in the classroom Are teachers adapting existing materials to include Indigenous perspectives?	
Cultural Sensitivity and Respect: How teachers approach IK with cultural humility. Do they demonstrate respect for Indigenous cultures and traditions?	