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INFUSION OF INDIGENOUS KNOWLEDGE INTO ORDINARY LEVEL CHEMISTRY LEARNING AT TAKURA SECONDARY SCHOOL

BY

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DECLARATION

I Linda Tasara hereby declare that, except for references to other people's work which have been duly acknowledged, this dissertation is a result of my study and has neither in part nor in whole been presented in the education programme.

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(student)

This research work was undertaken under the supervision of Dr. P. Chikuvadze

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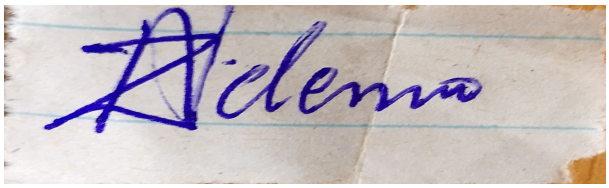
Signed: 

DEDICATION

This research is dedicated to my son Elson who has always motivated me all the way and encouraged me even when I felt like giving up. I also dedicate this research to my mother who gave me unwavering support and stood in for me when I was away doing my research.

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Firstly, and above the rest, I would like to thank the almighty God who is in heaven for taking me through every step of my research. There were times I had to travel and his journey mercies kept me alive.

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ABSTRACT

Indigenous knowledge is an important part of any community but over centuries it has not been given much attention in the formal Zimbabwe education curriculum as a whole. This study sought to gain insight of the infusion of indigenous knowledge into ordinary level chemistry learning at Takura Secondary School. The researcher took the qualitative way for data generation, analysis, and discussion. The researcher used class observation and interviews as data generating tools. In this study the sample group consisted of four ordinary level chemistry teachers and thirty ordinary level chemistry learners. The data generated was analysed thematically. The findings revealed that ordinary level chemistry teachers were aware of what is indigenous knowledge and infusing indigenous knowledge into Ordinary Level Chemistry gives learners the privilege of learning using local resources. The findings also revealed that there was need to decolonise the Ordinary Level Chemistry curriculum in order to successfully infuse indigenous knowledge into Ordinary Level Chemistry learning. From the findings it can be concluded that the participants had a positive view towards the infusion of IK into Ordinary Level Chemistry teaching and learning. It was recommended that the school should create an environment that enhances learners interaction with their environment during their teaching and learning.

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CHAPTER ONE

PROBLEM AND ITS CONTEXT

1.1 Introduction

This chapter unfolds the Chapter 1 of this dissertation serves as the introduction to the research study. It provides an overview of the background, research problem, objectives, research questions, significance, and scope of the study.

1.2 Background to the Study

According to Govender and Mutendera (2020), the value of Indigenous Knowledge (IK) has been acknowledged more recently in a number of domains, including education. Mandikonza (2019) posits that the integration of indigenous knowledge into education can augment the efficacy, inclusivity, and pertinence of the pedagogical and learning procedures. IK increasingly playing a major role in promoting essential to the growth of both individuals and societies (Zidny et al., 2020). Mukwambo (2017), offer a review that justifies a more thorough consideration of the ways in which science education might incorporate the perspectives, characteristics, and customs of IK.

The demand for scientific literacy for all, has changed the orientation towards the teaching and learning of chemistry in such a way so as to benefit every individual student. The focus according to Hofstein and Eilks (2013) is no longer the preparation of few students for their career in science only but also on the acknowledgement that, every citizen needs a basic understanding of chemistry in decision making about daily choices and to contribute to societal debates to promote national development. This evolvement in the purpose of chemistry education has necessitated the research into and development of teaching strategies to meet this goal of learning chemistry which is considered as the central science due to its relevance in all other sciences and subjects. Kotz et al (2014) maintained that a basic knowledge in chemistry is essential for students of all other disciplines.

Although Chemistry is relevant in all disciplines, it is perceived to include numerous abstract concepts, hence creating a general opinion among learners that chemistry is complicated (Sarabi & Gafoo, 2018). Ujezi et al (2017) postulate that these abstract concepts, if not properly taught, interfere with students' understanding by making them unable to understand and relate principles in Chemistry to real life situations and aids in the development of negative attitudes towards the subject. Students in bid to pass their Chemistry examinations and progress to a higher educational level resort to rote learning (Anamuah-Mensah, 2004; Foster et al., 2021). According to Achare (2021), there was a need on the impact of incorporating indigenous knowledge into Chemistry learning.

1.2 Statement of the Problem

Chemistry education often predominantly relies on Western scientific knowledge and pedagogical approaches (Bernadi & Pazinato 2022). This overlooks the valuable contributions of IK in teaching and learning activities in different fields of education (i.e., Chemistry) (Mudau & Tawanda, 2022). However, concerns have been raised around the limited infusion of IK into Chemistry teaching and learning (Oluboyo, 2021). It is in this context that this study sought to contribute towards the closure of this gap guided by the following main research question: What are the teachers views towards the infusion of IK into Ordinary Level Chemistry teaching and learning?

1.3 Research Questions

From the above main research question the following sub-questions were derived to guide the study:

1. What are the teachers understanding of Indigenous Knowledge?
2. What is the relevance of infusing Indigenous Knowledge into Ordinary Level Chemistry learning?
3. What approaches are used to infuse Indigenous Knowledge into Ordinary Level Chemistry learning?
4. How are these approaches infused into Ordinary Level Chemistry learning?

1.5 Significance of the Study

The findings of this study are expected to benefit the following:

1.5.1 Curriculum developers

The findings of this study are expected to benefit curriculum developers by providing them with insights into the integration of indigenous knowledge into teaching chemistry. The study will identify the challenges, opportunities, and strategies for effectively incorporating indigenous knowledge into chemistry education. This information can inform the development of culturally responsive and inclusive curriculum materials that align with the needs and contexts of learners in Zimbabwe. By integrating indigenous knowledge, curriculum developers can enhance the relevance and authenticity of chemistry education, ensuring that it reflects the diverse cultural perspectives and experiences of learners.

1.5.2 Chemistry teachers

Chemistry teachers will benefit from the findings of this study as it will provide them with a deeper understanding of the integration of indigenous knowledge into their teaching practices. The study will explore the perceptions and experiences of chemistry teachers regarding the integration of indigenous knowledge, highlighting effective strategies and approaches that they can adopt. This knowledge will enable teachers to create more engaging and culturally relevant learning experiences for their learners. It will empower teachers to incorporate indigenous knowledge into their lessons, fostering a more inclusive and meaningful chemistry education for all learners.

1.5.3 Parents/guardians

The findings of this study will benefit parents/guardians by promoting their understanding of the importance and value of indigenous knowledge in chemistry education. Parents/guardians will gain insights into how indigenous knowledge can enhance their children's learning experiences and academic achievements. This awareness will enable parents/guardians to support and advocate for the integration of indigenous knowledge in chemistry education, fostering a more culturally responsive and inclusive learning environment for their children.

1.5.4 Learners

The primary beneficiaries of this study are the learners themselves. The findings will contribute to a more inclusive and culturally relevant chemistry education system in Zimbabwe. By integrating indigenous knowledge into teaching chemistry, learners will have the opportunity to connect their learning experiences with their cultural heritage and traditional knowledge systems. This integration will enhance learner engagement, motivation, and understanding, ultimately improving their academic performance and overall educational experience.

1.5.5 Bindura University of Science Education

As the study is being conducted at Bindura University of Science Education, the findings will benefit the university by enhancing its reputation as a center for research and innovation in science education. The research outcomes can be used to inform curriculum development at the university, aligning it with current educational trends and promoting a more inclusive approach to teaching chemistry. The findings can also contribute to the university's research portfolio and support its commitment to producing research that addresses real-world challenges in education.

1.5.6 Researcher

The researcher will benefit from this study by gaining valuable insights into the integration of indigenous knowledge into teaching chemistry. The findings will contribute to my personal development as a researcher and expand my knowledge and expertise in the field of science education. It will also provide opportunities for disseminating the research findings through publications and presentations, contributing to the academic community and potentially opening doors for further research collaborations and opportunities.

1.6 Delimitations of the Study

Ministry of Primary and Secondary Education, Mashonaland East Province is comprised of the following districts: Seke, Goromonzi, Mutoko, Uzumba-Maramba-Pfungwe, Murehwa Mudzi, Chikomba, Marondera and Hwedza. This study was conducted at Takura Secondary School, under the Goromonzi District. The selected secondary school has a staff compliment of twelve teachers and an enrolment of two hundred and fifty learners. It offers basic education guided by

the curriculum framework (2024 - 2030) from Form 1 - 4. At this school the study was centered on gaining insights into the infusion of IK into Ordinary Level Chemistry learning activities.

1.7 Limitations of the Study

The major limitation of the study was the acquisition of the permission to carry out the study from the responsible ministry. The researcher was not able to get the permission on three different occasions. This became strenuous and monotonous for the researcher but at the end she managed to get the permission. The researcher had to keep checking with the participants if they had any free time for the interviews and some of them suggested odd hours which forced the researcher to find third parties who would stand at a distance as the interview was conducted.

1.8 Definition of terms

In this section the following key terms are defined contextually:

1.8.1 Indigenous Knowledge:

Makondo and Thomas (2018) refers Indigenous Knowledge as the unique knowledge, practices, and understandings developed by indigenous communities over generations. It encompasses the wisdom, skills, and cultural expressions that are rooted in the traditions, values, and experiences of a specific indigenous group. According to Mpofu (2016), IK is often context-specific and interwoven with the natural environment, spirituality, and social structures of the community.

1.8.2 Infusion

In the context of education, infusion refers to the process of integrating or embedding a particular concept, approach, or perspective into an existing curriculum or educational framework (Murwira, 2020). Hogmo (2015) posits that it involves incorporating the desired content or ideas seamlessly throughout the curriculum, rather than treating them as separate or isolated elements.

1.8.3 Ordinary Level Chemistry

Is the study of the fundamental Chemistry principles and concepts at secondary school level (Mahroof et al., 2020). Ordinary level chemistry is a science subject typically taught at

secondary school level. It covers fundamental principles related to chemistry (Magwanya et al, 2016)

1.9 Chapters layout

This dissertation is organized into five chapters. Chapter 1 provides an introduction to the study, including the background to the study, problem statement, research questions, significance, and limitations. Chapter 2 presents a review of the relevant literature on indigenous knowledge, chemistry education, and their intersection. Chapter 3 outlines the methodology employed in the study, including the research paradigm, research approach, data collection procedures, and data analysis techniques. Chapter 4 presents the findings of the study and discusses them in relation to the research questions. Finally, Chapter 5 provides a summary of the study, conclusions drawn from the findings, and recommendations for future research.

1.10 Chapter Summary

Chapter 1 serves as an essential introduction, providing the necessary context, rationale, and objectives for the study. The chapter's follow-up elements, which cover the study's background, problem description, objectives, and significance, lay the groundwork for the next chapters' in-depth examination of the use of indigenous knowledge in the teaching of chemistry at Takura Secondary School.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter aims to provide a comprehensive review of the existing literature related to the infusion of indigenous knowledge into learning activities. The chapter aims to provide a comprehensive understanding of the current state of knowledge regarding the infusion of indigenous knowledge in Chemistry teaching. It helps to identify gaps, trends, and areas for further research, ultimately contributing to the advancement of knowledge and informing the research design and methodology of the study.

2.2 Theoretical framework

This framework is made up of the following theories:

2.2.1 Culturally Responsive Pedagogy

Howard (2021), explains that culturally responsive pedagogy recognizes and values the cultural backgrounds, experiences, and perspectives of learners. Paris (2012) acknowledges that learners' cultural identities and knowledge systems influence their learning processes and outcomes. Culturally responsive pedagogy has a direct relationship to the study and the need to create an inclusive and culturally relevant educational experience (Sleeter, 2011). According to Majoko (2018), with the infusion of indigenous knowledge into learning activities, educators can foster a sense of cultural identity, relevance, and empowerment among learners. Furthermore Gay (2000) asserts that Culturally Responsive Pedagogy aims to address educational inequities and promote the success of all students, including those from marginalized or underrepresented communities. According to Mubangizi (2015), by using culturally responsive pedagogy, the study can contribute to the development of inclusive and equitable educational practices that value and integrate diverse cultural views in Chemistry teaching and learning.

This theory provides a theoretical framework and practical strategies for integrating indigenous knowledge into chemistry education (Mukwambo, 2017). By adopting this framework Barak (2017) indicates that teachers facilitate active engagement and knowledge construction, enabling learners to connect Chemistry concepts with their cultural contexts. Simultaneously, employing culturally responsive pedagogy ensures that the learning experiences are culturally relevant and respectful of indigenous knowledge and perspectives (Brown, 2017).

2.3 Indigenous Knowledge as a concept

According to Cambel (2015), IK includes the expressions, practices, beliefs, understandings, insights, and experiences of Indigenous groups generated over centuries of profound interaction with a particular territory. Its iterations and mechanisms are unique to each community, even where it shares certain features across groups by virtue of being embedded in a wider, common culture. Atis (2020) posits that, in all locations IK is the foundation of Indigenous governance, ecological stewardship, social, ethical, linguistic, spiritual, medical, food, and economic systems. So that the continual production and reproduction of local, land-based knowledge is the basis of indigenous identity and sense of place in the world, as well as of indigenous groups survival as distinct people (Ossai, 2010). Berckes (2012 postulates that indigenous knowledge refers to the understanding, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. According to Houd (2007) indigenous knowledge system often differ from western scientific knowledge in several ways. Western science typically focuses on reductionist, objective, and quantifiable observations while indigenous knowledge is often more qualitative and context -specific and based on direct experience and close observation (Zegeye & Vambe, 2006)

2.4 Relevance of infusing Indigenous Knowledge into learning activities

The infusion of IK into learning activities holds significant relevance for a range of reasons.

2.4.1 Cultural diversity and inclusivity in education

By incorporating IK, students from diverse cultural backgrounds can see their own experiences and traditions reflected in the curriculum, enhancing their sense of identity and belonging. Isaac (2023) concentrated on how indigenous knowledge might help learners grasp the significance of

promoting sustainability and provide them with proper frameworks in which to explore scientific principles. The results showed that putting science instruction in the context of indigenous knowledge is a workable strategy for raising learners' opinions on the importance of science education.

2.4.2 Promotes holistic and understanding of subject matter

Infusing IK also fosters a more holistic understanding of the subject matter. Indigenous Knowledge often encompasses a deep connection to the natural environment, spiritual beliefs, and community values. By incorporating these perspectives, students can gain a broader and more comprehensive understanding of the topic being studied. Brand et al (2023), conducted a case study at higher education institutions about how they are shifting their emphasis to incorporate planetary health and other environmental and social goals into research, teaching, and campus operations. The study looked at how educators, learners, and members of the indigenous community integrated indigenous viewpoints, customs, and examples into health education. The results showed that incorporating indigenous knowledge improved learners' involvement, sense of cultural identification, and conceptual understanding.

2.3.3 Promotion of respect for diverse knowledge systems

Furthermore, the infusion of IK promotes respect for different ways of knowing and challenges Eurocentric biases in education (Chimbunde & Kgari-Masondo, 2021). It encourages critical thinking, cultural appreciation, and the recognition of the value of diverse knowledge systems (Brand et al., 2023). Overall, the infusion of Indigenous Knowledge into learning activities enriches education by providing a more inclusive, holistic, and culturally relevant learning experience for students (Chabaya & Chabaya, 2023).

2.5 Approaches used to infuse Indigenous Knowledge into learning activities

Karel et al. (2021) looked at how traditional knowledge was incorporated into chemistry lessons in Zimbabwean schools. The study looked at chemistry instructors' perspectives in addition to identifying crucial strategies like including indigenous models, visiting indigenous communities on field trips, and doing experiments with locally available materials. The study emphasized how important it is to engage with local communities and involve people with indigenous knowledge

while creating curricula. This study highlights the importance of incorporating Indigenous knowledge holders and local examples into the creation of culturally appropriate teaching materials and other locally relevant chemical education initiatives.

2.5.1 Incorporating local examples

Chemistry education should incorporate local contexts and examples to emphasize the value of indigenous knowledge. This can entail illustrating chemical principles through case studies or examples involving natural resources, customary practices, or chemical processes that have cultural significance (Pedzisai, 2013). According to Mhotwa (2011), infusing IK into learning activities can have practical applications. According to Oggunniyi (2007) learn from indigenous practices and innovations in areas such as sustainable agriculture, traditional medicine, and environmental conservation.

2.5.2 Collaborating with Indigenous Knowledge holders

According to Kelogg et al (2010), engage with IK holders, such as elders or community leaders, to gain insights into traditional chemical practices and their connection to local culture. Invite community elders as guest speakers or arrange for field trips to indigenous communities to facilitate direct interactions and knowledge sharing (Mpofu, 2016). This approach focuses on connecting learning to the local environment and community and it involves incorporating IK of the land, the relationship between people and place (Karel et al., 2021). Engaging indigenous elders, knowledge keepers, and community members in the learning process is crucial for infusing Indigenous Knowledge (Majoko, 2018). Their wisdom, stories, and teachings can provide valuable insights and firsthand experiences.

2.5.3 Developing culturally relevant teaching materials

Kaya (2013) indicates that provision of educational tools that connect with learners' cultural backgrounds and integrate indigenous knowledge, such as lesson plans, textbooks, and multimedia resources. According to Kayes (2002), this may entail creating new materials or modifying current ones to represent the regional context and take into account indigenous viewpoints. This approach emphasizes the importance of recognizing and valuing students' cultural identities and experiences (Bhukuvhani, 2020). Howard (2021), indicates that it involves

incorporating Indigenous perspectives, examples, and practices into the curriculum, making connections to students' cultural backgrounds.

2.5.4 Encouraging student research and projects

Moyo and Kizito (2014) supports those encouraging learners to investigate indigenous knowledge through homework or research projects. According to Stein (2006), this can include looking at conventional chemical processes, doing experiments with conventional techniques, or learning about Chemistry-related environmental knowledge from indigenous groups. Through research and projects, students have the opportunity to engage directly with IK, engaging in dialogue and knowledge exchange with indigenous communities (Richards, 2006). This co-creation of knowledge promotes a more authentic and culturally responsive approach to learning.

2.5.5 Promoting cross-curricular connections

In a study by Das and Paital (2021) which explored the promotion of cross-disciplinary links between chemistry and other fields like biology, environmental science, or social studies that heavily draw on indigenous knowledge and the findings concluded that it is essential in retaining lessons learnt. The findings showed that it made it easier to comprehend indigenous knowledge systems and how chemistry interacts with them on a larger scale (Karel et al., 2021). Providing opportunities for students to actively engage with indigenous communities, participate in cultural activities, and learn from Indigenous practitioners fosters its deeper understanding (Govender, 2020). This approach encourages hands-on experiences and dialogue between students and community members (Achare, 2021). Ezeanya-Esiobu (2019) states that infusing IK across various subject areas, not just limited to social studies or history, helps create a more comprehensive and integrated approach to education. Thereby assist in finding connections between IK and other disciplines, such as Science, Mathematics, and literature (Govenda, 2020).

2.5.6 Professional development and training for teachers

According to Evelyn and Matamba (2020), giving teachers chances for professional development that integrate IK through workshops, seminars, and conferences. These platforms give teachers an opportunity to discuss the difficulties and ideal methods for integrating IK into Chemistry education and go further in improving the quality of teaching (Zidney, 2021).

2.5.7 Involving indigenous communities in curriculum development

Cooperation with native groups to guarantee that the chemistry curriculum takes into account their viewpoints and expertise (Dzvimbo et al., 2022). When creating curriculum frameworks, choosing learning objectives, and creating assessment strategies that complement IK systems, get their advice and counsel (Li & Shein, 2023). Another case study on the trial of incorporating IK into the new primary and middle school textbooks (Yeseraw et al., 2023). This is possible through involving indigenous elders in the writing of the textbooks or sourcing information about IK from them.

2.8 Chapter summary

Chapter two outlined the theoretical base on which the study took reference. This chapter examined various scholarly articles, books, reports, and other relevant sources to gain a comprehensive understanding of the current state of knowledge in this area. The chapter explored different definitions and conceptual frameworks related to IK. The literature review examined the role of indigenous knowledge in education and its potential benefits for students.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

Having gone through the review of related literature, this current chapter will focus on the research methodology used to conduct this study. The issues to be discussed in this chapter are research design, research approach, research methods, sample and sampling procedure, data generation procedures, data presentation and data analysis procedures, research integrity, and chapter summary.

3.2 Research Paradigm

Bryman (2016) defines a research paradigm as the framework and perspective that guides the entire research process, including the formulation of research questions, the selection of research methods, the interpretation of data and the dissemination of findings. Davis and Fisher (2018) suggest that, it encompasses the underlying assumptions, beliefs and principles that shape a researcher s approach to investigating a specific phenomenon or problem. Kaushik and Walsh (2019) further explain that a research paradigm provides a philosophical guide to the interrogation of the issue under investigation. It is against this background that the researcher chose the interpretivist paradigm in interrogating the issue of IK and Chemistry learning. The researcher chose this paradigm because it is contextual and holistic and recognizes that individuals and groups are not isolated entities but are influenced by their social, cultural, and historical context (Kivhunja & Kuyini, 2017). Khatri (2020) posits that interpretivist paradigm also values the perspectives and voices of the participants under study which is the backbone of the study in question.

3.3. Research Approach

For every researcher to have direction on how he or she is going to collect data, it is of great importance that the researcher has a research design (Creswell, 2018). According to Spector (2005) a research design is a plan or strategy that outlines how a study will be conducted and serves as a blueprint for researchers in guiding them in collecting and analyzing data to answer research questions or test hypotheses. This can be supported by Polit et al (2016) who also

defines a research design as the plan or framework used to conduct a research study and it involves outlining the overall approach and methods that are used to collect and analyse data in order to answer questions or test hypothesis. Flick (2014) highlighted that qualitative approach is interested in analysing subjective meaning or the social production of issues, events, or practices by collecting non-standardised data and analysing texts and images rather than number and statistics.

Patern (2016) explained that this approach is all about persons lives, lived experiences, behaviours, emotions, and feelings as well as about organisational functioning, social movements, cultural phenomena, and interactions between nations. This means that qualitative research is not statistical and it incorporates multiple realities (Teherani et al., 2018). In this study the qualitative research method was used in order to get the most accurate results possible. According to Denzin, (2019), qualitative research approach produces the thick, detailed description of participants feelings, opinions, and experiences; and interprets the meanings of their actions. Hankin et al (2020) posits that qualitative research approach holistically understands the human experience in specific settings.

3.4 Methods

Research methods are the tools that the researcher uses in data generation (Karemba, 2014). For this particular study the researcher was the chief data generating tool aided by the following:

3.4.1 Lesson observation

According to Bernard (2017) observation refers to the systematic gathering and recording of data by directly observing phenomena or events as they occur in their natural settings. It involves carefully watching and noting behaviors, characteristics, or occurrences. Nkunda (2015) posits that observation allows the researcher to gauge real actions rather than when people give information on their own. In this study, the researcher used the participant observation method. In this method according to Merriam (2009) the researcher actively engages in the setting or group being observed.

3.4.2 Interview

According to Henrik (2019), an interview is a structured conversation where one participant asks questions, and the other provides answers. Loisa (2018) posits that interviews are most effective for qualitative research. They help one explain, better understand, and explore participants opinions, behavior, experiences, and phenomenon. Interview questions are usually open-ended questions so that in-depth information will be collected. In this study interviews were carried out in order to find out the depth at which IK is understood by the participants. The participants were asked same questions but the interviews were done separately and privacy was maintained. The focus of the interview was exploring personal experiences of the teacher; according to Trainor (2013) this theme focuses on understanding the participant s personal experiences, perspectives and interpretation of an event or something. The interview sought to elicit recommendations and suggestions. According to Adhabhi and Anozi (2017), this theme invites the participants to provide recommendations, suggestions, or insights that could inform future actions, policies or interventions,

3.5 sample and sampling procedure

According to Mark (2018), a sample is a smaller group of members of a population selected to represent the population. Thus, the researcher deliberately selects a small number of participants who will be used in data generation (Kothari, 2014). According to Kamuren et al (2017), sampling is defined as seeking information about a population to explore the findings of the entire population. In this study, the sample comprised four teachers and thirty learners who were purposively sampled to be the source of data needed to provide answers to the research questions. According to Lewis and Thornhill (2017), purposive sampling is a technique in which the sample subject is chosen on the bases of the individual s ability to provide the type of special information needed by the researcher.

3.6 Data generating procedure

The researcher was given an introductory letter at Bindura university faculty of science education which she used to seek permission to carry out the study at Takura secondary school. The introductory letter was also used to seek permission from the ministry to carry out the research at the selected school. The researcher was given approval by the Ministry of Primary

and Secondary Education. The participants were selected purposively and the researcher personally conducted the interviews during their spare time. The researcher made sure that the participants were well informed about the ethical considerations were also put into place during the data generation process. The researcher explained the purpose of the study to the participants and their role in it. Ethical issues were taken care of during the data generation procedure.

3.7. Data analysis

According to Creswell (2014) data analysis is a comprehensive method of inspecting, cleansing, transforming, and modeling data to discover useful information, draw conclusions, and support decision-making. It is a multifaceted process involving various techniques and methodologies to interpret data from various sources in different formats, both structured and unstructured. The data that was obtained from the study was analysed qualitatively. Creswell (2012) identifies four essential steps for this phase that is preparation of data, analyzing data, report results and discuss the findings. According to Bailey (2008), during the preparation of data, researchers transfer qualitative data into a form conducive for analysis, in this case that is data collected through interviews and observations. In this study thematic analysis was used to analyse data from the interviews conducted and the observations made. According to Steven (2021) thematic analysis means coding data into themes based on responses given by participants.

3.8. Integrity of the study

This section will focus on the following issues

3.8.1 Trustworthy of the study

Trustworthy of a study refers to the degree of confidence in data, interpretation, and methods used to ensure the quality of the study (Pilot & Beck, 2014). When it comes to qualitative research, one can achieve trustworthiness by demonstrating that their findings are credible, dependable, confirmable and transferable (Gunawan, 2015). According to Conelli (2016) there are several key factors that contribute to the trustworthiness of are study such as, methodological rigor, transparency and reporting, peer review, replicability and consistence, conflicts of interest and funding, and ethical considerations.

3.8.2 Ethical issues

Ethical issues in research refer to the moral principles and guidelines that should be followed to ensure the protection of participants rights, wellbeing, and privacy throughout the research process (Beauchamp & Childress, 2019).

3.8.2.1 Informed consent

Informed consent is a process of communication between a researcher and a potential participant in which the researcher provides adequate information about the study, its risks and benefits, and the participant voluntarily agrees to participate (Neff, 2008). The researcher explained to the participants the procedure of the study and they all agreed to be part of it.

3.8.2.2 Anonymity

According to Wiles et al (2008), anonymity is the state of being anonymous or having an unknown identity for various different reasons. Vainio (2013) posits that when carrying out a study anonymity of the participants is one research ethic that cannot be overlooked. The researcher did not use actually names for the participants to promote anonymity and this helps protect participants from any form of victimization (Wiles et al., 2008).

3.8.2.3 Confidentiality

The researcher tried by all means to protect the confidentiality of the participants from other people in the study and the general public (Jamrozik & Selgelid, 2020). Participants were assured that the information they provided will be treated with strict confidence and can be used for academic purposes only and their identities were protected.

3.8.2.4 Privacy

The participants were given the right to decide when, where, to whom, and to what extent their beliefs and behavior were to be used (Head, 2020). The participant's right to privacy was not violated by the unauthorized use of one-way mirrors, microphones, and cameras, or any other method that may interfere with privacy. Any form of identification of the participants was not regarded in the research (Krishna, 2020). As a result, participants were assured of privacy and confidentiality

3.9 Chapter summary

The chapter focused on the methodology of the study and included research paradigm, approach, sample and sampling procedures, data generation and data analysis, research integrity and chapter summary. The next chapter will focus on data analysis and discussion.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

In this chapter, the researcher presents the key findings that came out from the qualitative data collected for this study. The data was gathered through in-depth interviews with chemistry learners and teachers each lasting a minimum of thirty minutes. The interviews were analysed using thematic analysis to identify the core themes and patterns in the participants experiences and perspectives.

4.2. Characteristics of participants

In this section demographic characteristics of the selected participants are tabulated in table 4.1 and 4.2

Table 4.1 Demographic characteristics of selected four teacher (n=4)

Attribute(s)		(n)	%
Sex	Females	1	25
	Males	3	75
Professional qualification(s)	Diploma in Education	1	25
	Degree in Education	2	50
	MScEd/MEd	1	25
Teaching experience (years)	Below 5	1	25
	5 – 10	2	50
	Above 10	1	25

Table 4.1 shows that three of the teachers are male and they constitute of 75% of the total number of chemistry teachers while only one of them is a female and she constitutes of only 25% of the population. Only one teacher has less than two years experience in teaching chemistry which is 25% of the chemistry teachers. Two teachers have more than

five years experience in teaching chemistry but less than ten years and they constitute of 50% of the total number of chemistry teachers. One teacher has more than ten years experience in teaching Chemistry and she constitutes of 25% of the total number of chemistry teachers. all the four teachers are qualified chemistry teachers, with the least qualified having a diploma in chemistry education and highest qualified having a master s degree.

Table 4.2 Demographic characteristics of the selected learners (n =30)

Attribute(s)		**(n)**	**%**
Sex	Females	11	37
	Males	19	63
Age Range (years)	15 - 17	28	93
	18 - 19	02	07
	Above 19	00	00
Form	3	18	60
	4	12	40

Table 4.2 shows the distribution of the selected learners who participated in the study according to sex age and level of schooling. The selected participants made a total of thirty learners comprising of both boys and girls. Boys made a total of nineteen out of thirty learners which is 63%. Most of the learners were between fifteen and seventeen years of age during the time of the study, 93% of the learners were within that age and made a total number of twenty-eight learners. Only two learners were of the age between eighteen and nineteen. And constituted of 7% of the population none of the learners were above the age of nineteen. Eighteen learners were doing chemistry in form three which is 60% of the participants and twelve in form four which is 40%.

4.3 Conceptualization on indigenous knowledge

In this section participants conceptualisation of IK as a concept was interrogated. In this context, one of the participants noted that:

Indigenous knowledge refers to the traditional knowledge, practices and beliefs of indigenous peoples. It is locally based knowledge that has been developed and passed down from generation to generation within a certain community. IK is shared orally and is not formally documented (Teacher 3)

Another participant had this to say:

Indigenous knowledge refers to the ways of knowing which are rooted in the cultural traditions of indigenous or local communities and it is adaptive and dynamic, changing over time as conditions and needs change (Learner 24)

From the above contributions it was revealed that IK is rooted in tradition and local in nature. It has no documentations since it is transmitted orally this concurs with Dei (2000) who postulates that indigenous knowledge is often orally transmitted and is dynamic and adaptive. In addition, another participant highlighted that:

IK is the way by which people in a certain community learn using local resources. The knowledge is passed from one generation to another. Usually, it sustains the way of living for the locals like providing medicines, food just to mention a few (Teacher 4)

In the same vein another participant said:

Indigenous knowledge refers to the traditional knowledge and practices of a certain community, the knowledge is passed from generation to generation. Some indigenous groups go to an extent of putting in place mechanisms to control access to their knowledge from external parties (Learner 4)

The researcher noted that all the chemistry teachers at takura secondary school demonstrated that they had some knowledge of what indigenous knowledge is even though the degree of the knowledge varied from one teacher to another. The researcher observed that from the above definitions and explanations indigenous knowledge focuses on what is helpful to the community for survival like medicines and food rather than just learning to know .it also comes from way back even before any ways of recording were put in place and is passed from generation to generation. This concurs with Cambel (2015) who says IK includes the practices, expressions, beliefs, understandings, insights and experiences of indigenous groups, generated over centuries of profound interaction with a particular territory and its iterations are unique to each

community. the participants responses also conquer with Atis (2020) who posits that, in all locations IK is the foundation of indigenous governance, ecological, ecological stewardship, social, ethical, linguistic, spiritual, medical, food and economic systems.

4.4 Relevance of infusing indigenous knowledge into Ordinary Level Chemistry

In this section the researcher focuses on analyzing and discussing on the relevance of infusing indigenous knowledge into ordinary level chemistry with the aim to address research question number two. In relation to this the first participant said:

Infusing indigenous knowledge into the teaching and learning of Chemistry at ordinary level can help deconstruct the perceived dominance of western science and appreciate the importance of indigenous knowledge systems (Teacher 3)

Another participant appreciated the infusion of indigenous knowledge into the teaching of chemistry by saying that:

IK systems are built on practical applications of chemistry related principles such as traditional medicines, natural resource management and sustainable agricultural practices. Thereby making chemistry education more grounded in real world relevance (Teacher 1)

Another participant added on by saying:

The infusion of indigenous knowledge is relevant in the teaching and learning of ordinary level chemistry because it promotes valuing diverse perspectives. If indigenous knowledge systems are validated and recognized it shows respect for cultural diversity and alternative ways of learning (teacher 4*)*

From the above quotations it can be acknowledged that the infusion of IK into Ordinary Level Chemistry can help learners have a better appreciation of their traditional way of knowing rather than think that western science is more superior This concurs with Chimbunde and Kgari-Masondo (2021) who highlighted that the infusion of indigenous knowledge promotes respect for different ways of knowing and challenges Eurocentric biases in education. In support, Brand et al (2023) highlighted that indigenous knowledge encourages critical thinking, cultural appreciation and the recognition of the value of diverse knowledge system. In the same vein, another participant reviewed that:

The infusion of IK in ordinary level chemistry is surely the way to go because indigenous knowledge emphasizes on the importance of maintaining balance and harmony with the natural environment so the infusion of IK will certainly promote environmental awareness (Teacher 2)

In addition to the idea above one of the participants said:

Infusing IK in the teaching of ordinary level chemistry is relevant in the sense that we will be learning about things that are applicable in our daily lives (Learner 5)

Furthermore, another participant said:

The infusion of indigenous knowledge is relevant in the learning of ordinary level chemistry because it provides an opportunity for us learners to learn using things that are within our cultural context and understand our culture better (Learner 12)

Another participant added by saying:

Indigenous concepts and examples in chemistry are easier to understand because we will be learning about things we can easily find and see or we have seen in real life (Learner 22)

The researcher observed that most participants highlighted that there was indeed the need to infuse IK into Ordinary Level Chemistry teaching and learning. The researcher also noted that a number of learners saw this move to infuse indigenous knowledge in the learning of chemistry as a big step in making Ordinary Level Chemistry concepts easier to understand because they will be learning about local things which they have heard of or seen. This concurs with Legrange (2007) who highlighted that infusion of IK into the learning of Chemistry teaching and learning would reduce the percentage of learners who failed sciences in Africa.

4.5 Approaches used to infuse Indigenous Knowledge into Ordinary Level Chemistry learning

In this section the researcher centers the analysis and discussion on the approaches which can be used to infuse indigenous knowledge into Ordinary Level Chemistry learning with the view of addressing research question number three in chapter one. Concerning the matter at hand one participant had this to say:

Before all the approaches are initiated, the first approach into infusing indigenous knowledge into ordinary level chemistry is decolonizing the curriculum. The curriculum must be redesigned moving away from western centric approaches in chemistry and put more effort in indigenous approaches in Chemistry, also there must be a good supply of studying materials related to that curriculum (Teacher 4)

In addition, another participant said:

Ethno chemistry is the way to go in order to infuse indigenous knowledge in ordinary level chemistry learning. This can be done by incorporating traditional knowledge and practices related to the production and use of chemicals within indigenous communities. This knowledge can be obtained through inquiry from the community elders (Teacher 2)

To add on another participant said:

Learners should be given case studies and real-world examples that show how local communities have applied chemical principles in their traditional practices such as in medicine, agriculture or even material production (Teacher 1)

The researcher observed that from the participants responses in order to infuse indigenous knowledge in the ordinary level chemistry there was need to draft a new curriculum which mostly accommodates indigenous knowledge systems with the help of the current indigenous knowledge holders. This concurs with Karel et al (2021) s study which emphasized on how important it is to engage with local communities and involve people with indigenous knowledge while creating the curricular. Kellog et al (2010) is also of the same view, they postulate that engage with IK holders such as elders or community leaders, to gain insights into traditional chemical insights and their connection to local culture. This concurs with Moyo and Kizito (2014) who support those encouraging learners to investigate indigenous knowledge through homework or research projects.

In the same view Richards (2006) goes on to say, through research projects students have the opportunity to engage directly with IK engaging in dialogue and knowledge exchange with indigenous communities. Also, there should be a shift from using western science studying materials to using indigenous knowledge rich studying resources in ordinary level chemistry learning. This concurs with Kaya (2013) who in his study suggested that the best way to infuse indigenous knowledge in chemistry learning is to provide educational tools that connects with learners' cultural backgrounds. The participant s response is also of the same idea. Kayes (2022) supports the idea by saying there is need to modify current study material or create new ones to represent regional context and take into account indigenous viewpoints. On the same issue of approaches that can be used to infuse indigenous knowledge in Ordinary Level Chemistry learning, another participant noted that:

Indigenous knowledge can be infused into ordinary level chemistry learning through integrating indigenous knowledge from other disciplines so as to provide a holistic understanding of chemistry concepts (Teacher 2)

In addition, one of the participants revealed that:

It would be easier to infuse IK into Ordinary Level Chemistry learning if school chemistry laboratories were designed in such a way that utilize locally available natural materials and resources so that learners can connect the hands-on experiences to the underlying chemical principles, giving them a deeper understanding of the subject (Learner 30)

Another participant contributed by saying:

Giving teachers a leeway to use indigenous terminology were and whenever they can would be a good approach to infuse IK into Ordinary Level Chemistry because using Western terminology can just cause unnecessary confusion to learners over simple concepts they would have understood if local terminology was used (Teacher 4)

During lesson observation the researcher observed that concepts that were explained using indigenous examples were easily grasped by learners and their participation was excellent with excitement that demonstrated a sense of belonging. This concurs with Barnhardit and Kawaglay (2005) who highlighted that incorporating indigenous knowledge into chemistry learning can promote a more equitable and inclusive learning environment were students from diverse cultural backgrounds feel valued and empowered to contribute their unique perspectives and experiences. The researcher also observed that, during a practical lesson, the teacher spent more time trying to explain to the learners about the materials and chemicals they were using and the ones which were supposed to be used but were not available due to financial constraints. The researcher observed that western chemistry labs were expensive to cope up with the needs than chemistry labs which utilized indigenous resources. This concurs with Diabi (2009) who highlighted that leveraging locally sourced materials can significantly reduce the overall operational cost of a Chemistry laboratory, making it more accessible and sustainable for institutions with limited budgets.

4.6 Ways to implement the suggested approaches of infusing indigenous knowledge into ordinary level chemistry learning

Participants highlighted on some ways which they thought would help implement the approaches to infusing indigenous knowledge into ordinary level chemistry which they had suggested earlier on. One participant indicated that:

In order to decolonize the curriculum, there is need for a curriculum review so that indigenous knowledge is included in the learning of Ordinary Chemistry (Teacher 1)

In addition, another participant said:

There should be incorporation of indigenous knowledge holders in the planning of the reviewed curriculum (Learner 6)

Another participant had this to say:

For learners to appreciate and embrace chemistry indigenous knowledge projects, chemistry indigenous knowledge project-based learning should be part of the examinations (Teacher 3)

The researcher observed that from the participants responses, in order to implement all the approaches of infusing indigenous knowledge into ordinary level chemistry there has to be a change in the curriculum from its planning to implementation. Indigenous knowledge holders are to be a special and very important part of the curriculum. This concurs with Ogunniyi (2007) who in his study highlighted that curriculum review is the most important process for infusing indigenous knowledge into chemistry learning and the rest will fall into place. In relation to the matter another participant said:

Schools should invite community elders as speakers and also arrange field trips for chemistry learners in order to attain an ethno centric chemistry era (Learner 17)

Another participant also said:

*Integrating indigenous languages in the teaching and learning of ordinary level chemistry can help infuse indigenous knowledge through giving learners translations and explanations which they understand bette*r (Teacher 2)

The researcher during lesson observation observed that whenever the teacher used Shona Language to explain a concept, the learners showed a greater understanding and even asked questions but when English Language was used, the responses were few and almost none of the learners asked interrogating questions. This shows that the use of indigenous languages in

Ordinary Level Chemistry can help infuse indigenous knowledge because learners will be taught using the terminology they know. This concurs with Liwali (2010) who highlighted that using indigenous language allows students to better understand the context and nuances of this knowledge rather than having it translated and potentially losing important details. The researcher also acknowledged that there is no way the infusion of indigenous knowledge into chemistry learning can be successful without indulging its holders. This concurs with Sen (2005) who highlighted that there is no indigenous knowledge if its holders do not pass it on.

4.7 Chapter summary

This chapter mainly focused on presenting the findings of the study and analyzing them. The data was analysed thematically in line with the research questions in chapter 1. The next chapter will present a summary of the study, conclusion and recommendations.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

On the previous chapter, the researcher dwelt on data presentation and analysis. In this chapter, the writer will focus on the summary of the research and conclusion then give recommendations. The chapter summary will also be included at the end of the chapter

5.2. Project summary

In chapter one the researcher dwelt on the problem and its context of the study, which was further broken down into the background of the study, statement of the problem, research questions, significance of the study, delimitations of the study, limitations of the study, definitions of key terms, chapters layout and the chapter summary. Chapter two was rooted on the literature review of the study which outlined the researches and finding which were done by other scholars on infusion of indigenous knowledge into Ordinary level chemistry learning. The literature review was done in order to identify the gaps to be filled. Chapter three highlighted on the research methodology which was broken down into the research paradigm, research approach, methods, sample and sampling procedure, data generation procedure, data analysis, and integrity of the study. Chapter four focused on data presentation, analysis and discussion, the findings of the study were analysed based on the research question. The major findings were as follows:

- Participants acknowledged IK as the traditional knowledge within a community and it is passed from one generation to the other.
- Infusing IK into Ordinary Level Chemistry is relevant in the context that it gives learners the privilege of learning using local resources and the education they get from it is relevant for their day-to-day livelihood.
- The best approach to infusing indigenous knowledge in the learning of ordinary level chemistry is to totally decolonize the western science chemistry curriculum and come up with an indigenous based knowledge-based curriculum.

- In order to come up with the best and effective IK-based Ordinary Level curriculum, indigenous knowledge holders should be involved in the planning and implementation of the curriculum and consulted time and again.

5.3 Conclusion

From the data discussed and analyzed, it can be concluded that the participants viewed the infusion of IK into Ordinary Level Chemistry learning as a way of enhancing the learners interaction with their environment, the passing on of knowledge from one generation to another and providing learners with sustainable education.

5.4 Recommendations

The researcher proposes the following recommendations:

- Curriculum planners are urged to decolonize the Ordinary Level Chemistry curriculum from Western science concepts.
- Teachers are urged to use indigenous examples linking them to Western science so that learners have a better understanding of concepts

5.5 Areas of further study

This study was only limited to one school with only four teachers and thirty learners as participants and the school is only in Mashonaland East Province which constitutes of only one tenth of all the provinces in Zimbabwe. There is need to carry out wider research involving all the provinces in Zimbabwe and a number of different districts.

5.6. Chapter summary

This chapter focused on the summary of the findings, conclusion of the research and recommendations of the study**.**

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APPENDICES

Appendix 1: Introductory letter

SAMED

P Bag 1020
BINDURA
ZIMBABWE

Tel: 0271 - 7531 ext 1038
Fax: 263 - 71 - 7616

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 02/05/24

TO WHOM IT MAY CONCERN

NAME: Tasara Linda REGISTRATION NUMBER: B2249771B

PROGRAMME: BSc Ed Ch PART: 2:2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the Bachelor of Science Honours Degree in CHEM programme. The research topic is:

In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

Your co-operation and assistance is greatly appreciated.

Thank you

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
9 APR 2024
P. BAG 1020
BINDURA

Z/Ndemo (Dr.)
CHAIRPERSON - SAMED

Appendix 2: Approval letter from the responsible authority

Takura Secondary School

P.O Box 15

Bromley

07 May 2024

Bindura University of science education

P. Bag 1020

Bindura

Zimbabwe

Dear sir/madam

REF: PERMISSION FOR MS LINDA TASARA TO CARRY OUT HER STUDY AT TAKURA SECONDARY SCHOOL IN FULLFILMENT OF HER STUDIES AT BINDURA UNIVERSITY.

This letter serves to inform you that Ms. Linda Tasara has been granted the permission to carry out her study at Takura secondary school. However she is to follow all the research ethics during her study.

Thank you

Yours faithfully

Masiya .T

THE HEAD
TAKURA SECONDARY SCHOOL
SIGNATURE: M Masiya
DATE: 07/05/2024
P.O. BOX 15
BROMLEY

Appendix 3: Lesson Observation Guide

This observation is designed to gain insight into current attitudes and feelings about teachers experiences on the infusion of IK into Chemistry learning.

Topic:

Class:

Date:

Time:

Area of observation	**Comments**
Lesson introduction • Conceptualization of Chemistry learning activities. • Linking the previous concepts with the current lesson. • Objectives are well articulated.	
Lesson development • Types of learning activities (practical activities) • Methods of learning. • Infusion of IK into learning activities	
Conclusion • How well did the learners understand the concepts? • How well did the activities infuse IK?	

Appendix 4: Interview guide for Chemistry teachers

Thank you for agreeing to take part in this interview. I am going to ask you some questions and l believe you can make a significant contribution with regard to gaining insight into the matter under investigation. I would like you to know that your personal and school details will not be included in the final report.

1. Briefly tell me something about yourself (with specific reference to professional qualifications, teaching experience in general)
2. What science subject do you specialize in?
3. What are your views about IK?
4. What the importance of IK to teaching and learning? (With specific reference to Ordinary Level Chemistry)
5. What are some of the methods that you are using to integrate IK into Ordinary Level Chemistry teaching and learning?
6. Through your experience as a teacher, how have you been integrating IK into Ordinary Level Chemistry teaching and learning?
7. What challenges have encountered when integrating IK into Ordinary Level Chemistry teaching and learning?
8. Thank you for participating in this interview.

Appendix 5: Interview guide for Ordinary Level Chemistry learners

Thank you for agreeing to take part in this interview. I am going to ask you some questions and l believe you can make a significant contribution with regard to gaining insight into the matter under investigation. I would like you to know that your personal and school details will not be included in the final report.

1. Briefly tell me something about yourself (with specific reference to how many years you have been learning chemistry).

2. How do you rate Chemistry as subject amongst other subjects you are studying? (Elaborate your answer)

3. What do you understand by the term Indigenous Knowledge?

4. Do you think will happen to your Chemistry teaching and learning if Indigenous Knowledge is integrated in the activities?

5. How is the IK into Ordinary Level Chemistry teaching and learning activities by your teachers?

6. What challenges do you encounter when IK is integrated into your Ordinary Level Chemistry teaching and learning activities?

7. Thank you for participating in this interview