



**BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION**

**INTEGRATION OF INDIGENOUS KNOWLEDGE PRACTICES IN ORDINARY
LEVEL BIOLOGY TEACHING AND LEARNING AT CENTENARY HIGH SCHOOL**

BY

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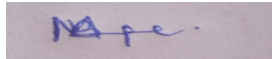
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(BIOLOGY)**

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DECLARATION

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

Signed:



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Date: 04.07.24

(Supervisor)

Chairperson signature:



Date: 14/10/24

DEDICATION

I dedicate this dissertation to my father, husband and children whose love, support and encouragement always gave me hope and determination.

ACKNOWLEDGEMENTS

My profound gratitude goes to the Almighty for his guidance and protection throughout this period of research. I am most grateful to him for strength, health, wisdom and understand He has given me.

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Lastly, sincere gratitude goes to my family for their love and support that brings me this far.

ABSTRACT

This research sought to gain an insight in the integration of Indigenous Knowledge practices in Ordinary Level Biology teaching and learning activities. Data generation, analysis and interpretation was grounded in interpretivist paradigm and qualitative approach. In generating data, focus group discussions and personal interviews were used. Purposive sampling method was used to select 15 learners and 4 teachers who teach Biology at Ordinary Level. The data generated was analysed according to emerging themes. The findings revealed that participants are familiar with IK practices and gave culture, beliefs, values, language, traditional agricultural practices, medicinal practices and local food as examples of IK. It was also revealed that IK practices were integrated into ordinary level biology learning through project-based learning and inquiry-based learning. The research study revealed that some challenges are encountered when integrating IK practices into ordinary level biology learning. From the findings it can be concluded that to some extent IK practices were being integrated into Ordinary Level Biology learning at the selected school. Based on the findings of this study, the researcher recommends that curriculum developers should include IK in curriculum documents to promote awareness of its integration in teaching and learning.

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CHAPTER 1

PROBLEM AND ITS CONTEXT

1.1 Introduction

In this chapter, the problem and its setting are outlined through the following; 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 chapter summary.

1.2 Background to the study

The quest for education has been promoted by UNESCO (2017), which called for education for all. This call focused on enabling improved education that promote more inclusive forms of educational experiences. As education has become more inclusive in terms of numbers, gender and different communities, the concept of integrating learners' prior knowledge that they bring from home is still limited in the science curriculum (Semali, 2015). Learners from disadvantaged and rural communities tend to find a poor fit between their home experiences and what they learn at school. Such learners tend not to see the relevance of school curriculum knowledge and concepts with respect to their personal and community life (Magni, 2016). In so doing, the hope is to enhance the relevance of curriculum concepts in learners' lives. Knowledge that learners bring from home may simply be experiential in the form of specific practices and can therefore be described as indigenous knowledge practices (De Beer, 2016). Abah (2015) defines Indigenous Knowledge (IK) as values, beliefs and world views that are unique to particular communities or societies.

For thousands of years, IK systems existed and have their own educational systems, long before western education was introduced by the European colonialists' ad missionaries (White, 2015). The introduction of western education meant that learners faced the conflicting demands of the new education and those of their home cultures because the purpose, content, and processes of knowledge transmission conflicts with those of IK (UNESCO, 2018). In the context of education, the most efficient way of strengthening indigenous knowledge is integrating the

knowledge in school science (Zinyeka 2013). The introduction of IK into school science curriculum is an essential element of science education and might present science more appropriate for a student in the culturally different classroom (Hwande & Mpofu, 2017).

Studies (Kim & Layman, 2022; Onwu & Mufundirwa, 2020), have submitted that in order for schools and science curricula to positively respond to the need of making teaching and learning more culturally inclusive, there will be a need for a paradigm shift from the currently Eurocentric curricula and the local school systems that include IK. So, it is important that local education developers evolve strategies that integrate the IK system in the teaching of sciences which has the potential to make our education culturally inclusive and make the teaching and learning of science easier for both teachers and learners (Keane, 2017).

Biology, a science that studies the natural world of living organisms is an abstract subject for both teachers and learners possibly because of the way it is taught and learnt- not relating it to day-to-day activities and prior knowledge of the learner (Umoh, 2011). The teaching is isolated from indigenous knowledge and practices (Gwekwerere, 2013). The science of biology is being practiced with the environmental resources within the context of IK at different levels of human societies unknowingly (Lemke, 2015). It therefore, becomes imperative to integrate IK into Biology teaching in order to dispel the notion that the subject is abstract and has no relevance to common daily activities.

1.3 Statement of the problem

Biology education is essential for developing scientific literacy and critical thinking skills, but many students, especially indigenous students, struggle to connect with the subject (Botha, 2017). Despite the importance of Biology education, there is a significant gap in the integration of IK practices, leading to lack of cultural relevance and inclusivity in Biology teaching and learning (van Wik, 2017). It is in this context that the researcher sought to gain insight into this issue guided by the following main question: To what extent are IK practices integrated into Ordinary Level Biology learning?

1.4 Research questions

From the above main research question the following questions were derived:

1. What IK practices are integrated into Ordinary Level Biology learning?
2. How are these IK practices integrated into Ordinary Level Biology learning?
3. What challenges are encountered when these IK practices are integrated into Ordinary Level Biology learning?

1.5 Significance of the study

This section articulates the significance of this study to the following:

1.5.1 Policymakers

The study findings will be useful to policy makers in the Ministry of Primary and Secondary Educations' curriculum development unit to institute changes in the curriculum so as to ensure the integration of indigenous knowledge practices in teaching and learning activities.

1.5.2 Science teachers

The findings of this study will influence the teachers' use of indigenous knowledge practices in the improvement of the teaching process. It will also be useful in determining the teaching approaches which will be suitable for different topics and environments.

1.5.3 Learners

The findings of this study will stimulate students' interests in learning biology and its comprehension through learning of concepts more relevant to their daily lives and environment. This may help them see the value of science and in turn helps them to make sense of what they learn.

1.5.4 Bindura University of Science Education

The institute will benefit as they will include the final research into their open repository where everyone will have access to it for research purposes and enrich research collaborations.

1.5.5 Researcher

The study sharpens the research skills of the researcher around science education as well as other future study areas. It enables the researcher to fulfil the educational research requirement for Bindura University of Science Education.

1.6 Delimitation of the study

The study is limited to Centenary High school in Muzarabani District and the findings may not be generalized to other contexts or locations. The school offers basic education, in line with the Heritage-Based curriculum from forms 1-6 and has an enrolment of 780 learners. The science department has 8 teachers and only four teachers teach biology ordinary level. Thus, the study is also limited to the perspectives of biology teachers and students and does not include the views of other stakeholders such as parents, administrators or community.

1.7 Limitations of the study

The findings of this study have to be seen in light of some limitations. The first concern is the sample size of teachers and learner, not large enough to provide generalizable conclusions. Also, limitations in technology and instruments used to collect **data** This may have increased the risk of biased responses and reduced the credibility of the findings. Future studies could increase the sample size to enhance the accuracy and generalizability of the results.

1.8 Definitions of terms

1.8.1 Indigenous Knowledge

Is a comprehensive knowledge that incorporates technologies and practices that have been used by native people for their continuation and adaptation in a change of environment, such knowledge evolves in the local environment so that it is specifically adapted to the requirements of local people and conditions (Mawere, 2022).

1.8.2 Integrating

It refers to the process of combining or bringing together different components, ideas, or approaches to form a unified whole (Smith, 2017). In this study it's an act of incorporating indigenous cultural practices, beliefs, and values in the Ordinary Level Biology teaching and learning process (Robbins, 2018).

1.8.3 Ordinary Level Biology

This refers to a secondary school level biology course that is typically taught to students after primary school, in Zimbabwe for example it refers to form 3 up to 4 educations (Deya, 2019).

1.8.4 Teaching and learning

Teaching is an act of imparting knowledge or skill from teacher to learner while learning is an act or experience of one that learns knowledge or skills. It involves changes in behaviors which are demonstrated by people implanting knowledge, skills or practices derived from education (Anka, 2016).

1.9 Chapters layout

In chapter 1, the problem and its setting are put into context; chapter 2 identifies the gaps in literature which this study intends to fill; chapter 3 explains how the data is going to be generated, analysis and interpretation strategy; chapter 4 provides the platform for data presentation, analysis and interpretation chapter 5 focuses on the articulation of the study summary, conclusion and recommendations.

1.10 Chapter summary

This chapter which is an introduction to the study, provided a brief background of the study, the focus and purpose of the study, the rationale behind the study, the problem statement, the critical research questions and definition of key terms. The next chapter focuses and explores literature around indigenous knowledge practices and integration of indigenous knowledge in science education.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Introduction

The previous chapter was centered on giving an overview of the problem and its setting. This chapter will be focusing on the identification of gaps to be filled by the study. In this this chapter, the researcher will outline the theoretical framework, indigenous knowledge practices that should be integrated into Biology teaching and learning, how to integrate it and the challenges faced when integrating.

2.2 Theoretical framework

This section centres on the theory that contributes to the lens through which the issue under discussion was interrogated. Socio-cultural approaches – particularly the work of Vygotsky was used as lenses for the analytical process of the study (Ellis, 2021). Socio-cultural theory is built on the premise that learners construct knowledge (George, 2019). This construction is supported by the key features of sociocultural theory, which claim that knowledge is not just transferred to learners (Maree, 2020). They actively construct knowledge using the knowledge they have gained from a knowledgeable other at various levels, usually a parent or other teachers, including knowledgeable peers (George, 2019). Learning, according to Vygotsky, is the development of higher psychological functions, which he referred to as higher mental functioning (Daniels, 2018).

Learning is therefore the outcome of a learner interacting with other people as well as with the tools provided to facilitate the learning process (Knight, 2016). Such dyadic interactions either involve a knowledgeable other or they occur between peers (Warford, 2016). A learner may interact with physical tools, artefacts or psychological tools while learning with a knowledgeable other such as a teacher (Engeström, 2017). This means that individuals first experience the world through social processes where language, knowledge and experiences are culturally shared via other learners, adults, mediating tools and artefacts or a teacher (Grange, 2017). Through the socialization process, symbols (language and prior concepts) are formed and cognitive

development then becomes a process of ordering, patterning and finding connections between the symbols (Daniels, 2018). This enables the development of thought and thought processes, a process Vygotsky calls internalization (Bennet, 2018). During internalization, the externally generated and mediated experience is converted into the internal form, with the mediated experience undergoing a complex transformation process in the mind (Warford, 2016).

2.3 Indigenous knowledge as a concept

Indigenous knowledge is the vehicle through which the principles of indigenous worldviews, beliefs, traditions, practices and institutions are transmitted and put into practice (McNulty, 2018). It is characteristically local in scale, transmitted orally, collectively owned, holistic in perspective and adaptive in nature (Wilson, 2015). Although it was previously largely ignored in the fields of education, development and conservation, IK is currently living a revival and its incorporation into educational curriculum is seen as essential (Kala, 2015). IK is dynamic, as each generation chooses to adapt the knowledge to suit their needs and value (Tella, 2017). But IK is unique to the place and thus is tied to the context. The IK system is often tied the sustainable livelihood of the people (Burford, 2016).

Generally, the system represents generations of observations, analysis, and experimentation. Understanding IK in traditional communities is fundamental to the design of any learning environment (Mertyl, 2017). Learning environments have to take into consideration several aspects of community. These include the community of the classroom, the school, and the connections between the connections between the school and the larger community including the home (Bell, 2016). Thus, the effective instruction begins with taking into account what learners bring to the setting; this includes cultural practices and beliefs as well as knowledge of academic content. Finally, an educational initiative on sustainability that embraces IK would help learners negotiate different worldviews and value systems about development and livelihood (Palmer, 2018).

2.4 Strategies used to integrate indigenous knowledge into science learning

2.4.1. Choosing suitable teaching and learning methods

The inclusion of indigenous knowledge practices into science education would not be complete without appropriate teaching and learning methods. This implies that teachers need to be native and creative (Mkosi, 2015). One way to integrate IKP into teaching science is through the use of traditional stories and oral histories. These stories can be used to teach lessons about the natural world; biodiversity and conservation of natural resources (Naidoo, 2016). Another approach that brings IKP into science learning is seeking how best IKP fits into science. This could be through hands on, observation or investigation (Ngcoza, 2015). Koff (2019) suggest that use of local language as one of the most appropriate method to use in the science classroom and this will help in integrating IKP into teaching and learning

2.4.2 Curriculum

Indigenizing the curriculum involves the incorporation of IK into the educational framework and the inclusion of often unheard indigenous perspectives (Moyo & Kizito, 2014). A contextually relevant science curriculum should take into consideration the knowledge, language and teaching and learning practices of its citizens (Hunter, 2015). Therefore, incorporating cultural elements into science teacher programs is essential for creating a successful, culturally relevant teacher education initiative (Higgs, 2016). This approach can have a significant and engaging impact on science teachers to employ diverse resources and design approaches to meet curriculum objectives. According to Seehaewer (2019), there is room for creative strategies that enable the integration of IK without deviating from the curriculum, without compromising teaching time or without explicitly mentioning IK in the curriculum.

2.4.3 Human and supporting resources

Jackson (2015), have identified several key barriers to effective integration of indigenous knowledge, including a lack of skilled personnel, insufficient documentation and cultural differences among teachers and learners. The author added that teachers who lack knowledge of IK, thus possessing underdeveloped pedagogical content knowledge become demotivated when attempting to incorporate it into their teaching (Burns, 2017). Therefore, the recruitment of indigenous educators is crucial for successful integration of IK into teaching and learning of

science. Inviting or hosting parents as guest speakers can serve as an alternative approach in the absence of suitable candidates.

Thaman (2018), discovered that educational goals can only be achieved when the curriculum embraces cultural inclusivity in both content and instruction. However, the science curricula contain a few, if any mention of IK. Thus, the integration of IK is up to the teachers' creativity which is possibly an advantage for the science teacher, for example taking the learners to places like wildlife parks where they can learn about natural ecosystems and biodiversity conservation by indigenous people (Riley, 2019). Textbooks and other resources should be designed in such a way that they incorporate the activities and practices of the indigenous people (Bennet, 2018). The local settings should be considered in the design of the learning materials. Stories of how indigenous people engaged in scientific practices should be compiled for use in science classrooms (George, 2019).

2.4.4 Assessment and Evaluation

The curriculum needs to be updated to align with current standards, culturally appropriate, and supported by effective pedagogical and evaluation methods as emphasized in the study by Preston and Claypool (2021). Assessment methods should consider the value of students' home cultures which are often overlooked, de-emphasized due to their conflicts with the values promoted by the educational systems (Barker, 2017). Such methods may include group work on practical work, real life simulations and project-based assignments which are more collaborative and involves oral exchanges between learners and teachers (Preston, 2017).

2.5 Challenges encountered when integrating IK into Science learning

This section centres on the following challenges:

2.5.1 Building trusts and relationships

Successful integration of indigenous knowledge practices in science classroom depends on establishing positive relationships with indigenous communities and building trust to facilitate meaningful collaboration and knowledge sharing (Austin, 2019). Indigenous communities always want to be full partners in planning, designing and implementation of a subject that involves their participation (Owuor 2015). Furthermore, even though even the involvement of

indigenous people in sustainability science has been increasing, it continues to vary systematically among disciplines and country, sometimes creating an illusion of including indigenous participation and integration due to still existing power imbalance (ARCUS, 2022). This discourages an atmosphere for discussions in classroom where the practices of indigenous community people such as community elders could be used to facilitate learning process and integrated in constructing classroom knowledge (Brunetti, 2020). This might be a challenge to the present discussions on the integration of African indigenous knowledge in education and for sustainable development (Owuor, 2017).

2.5.2 Language of instruction

The other challenge of bringing indigenous language practices in classroom science languages of instruction. It is crucial to support and promote the survival and the use of indigenous languages and in indigenous education as one of the essential elements of indigenous cultures and identities (Preston, 2017). The knowledge, the specific ways of thinking and interpreting the world, and the cultural values of a society, community or group are contained and reflected in their language and transmitted inter-generationally through this medium (Jackson, 2016) UNESCO (2017) supports the view that in order to gain a deeper understanding of other cultures, the cultural component of language teaching and learning should be strengthened. So, the integration of IK practices in biology teaching and learning encounters many problems such as lack of recognition of indigenous languages, and lack of materials written in local languages. (Hopper, 2015).

2.5.3 Cultural sensitivity and appropriation

Similarly, most educators are hesitant to integrate indigenous knowledge in the classroom as a result of fear of infecting classroom teaching with pseudoscience (De Beer & Whitlock, 2017). Nevertheless, the effort in transferring indigenous knowledge from daily lives to school works remains without any value or recognition by educators because of their attitudes and beliefs about IK (Owuor, 2017).

2.5. 4 Lack of resources

Incorporating IK into teaching and learning requires resources. Textbooks used in class give little or no proper information about IK (Creswell, 2015). While some textbooks provide information

on IK in the form of examples, hardly any attention is given to strategies and practical work that can be done in the classroom (Mothwa, 2019). As most of the IK is transmitted verbally, some people regard it as a myth because it can't be tested scientifically.

2.5.6 Teacher training

Quality indigenous education also depends on the teachers. Science teachers should be trained to teach in more than one language and culture. Unfortunately, it is not the case that they are. Science educators have been trained mainly in the scientific rather than the IKS modes of inquiry (Ogunniyi 2015). In addition, there is no guidance in the curriculum on what aspects of diverse Zimbabwean indigenous way of knowing and practices are to be integrated into science learning. More so, some research has found out that among the challenges faced by educators in integrating indigenous knowledge in Biology classrooms are educators' lack of understanding of the nature of science and pedagogical content knowledge (PCK) in addressing indigenous knowledge systems (De Beer & Van Wyk, 2012). This may lead to a danger of inappropriate knowledge integration in which treatment of indigenous knowledge is superficial in the classroom.

2.5.7 Belief systems

Fundamentalists religious beliefs can have a negative influence on the teaching of IK in the classroom. Some people are sceptic about traditional healing because they equate traditional healing with communication with ancestors (Pettersen, 2016). Christians for example may find this offensive

2.6 Chapter summary

In this chapter the literature pertaining to the integration of IK practices in biology teaching and learning was highlighted. The researcher highlighted on how to integrate IK into classroom and challenges that are encountered when integrating it. The next chapter focuses on the research methods adopted for the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter looked at theoretical framework that formed the lens through which the study will be observed as well as reviewing related literature with the view to pinpoint knowledge gaps. The present chapter outlines the research design, sample and sampling procedures, research instruments, data generation, presentation and analysis procedures. In addition, this chapter will look at research integrity that encompass trustworthiness and ethical considerations.

3.2 Research paradigm

Research paradigm refers to the beliefs and assumptions that provide the structure of the research (James, 2016). In this study, interpretivism paradigm was used. Interpretivist paradigm research is conducted within the reality of those being studied, not in a contrived environment such as a laboratory (Dammark, 2015). Based on people's experience and how they interpret them, the interpretivism paradigm contends that both knowledge and truth are arbitrary and are historically culturally located (Gemma, 2018). Because of the nature of interpretivist studies, their results are only valid under the particular circumstances of the study and are usually not generalizable. This approach supports qualitative research and is based on naturalistic approach of data collection such as interviews and focus group discussions (Pius, 2020). Interpretivism takes into account differences such as culture, situations, and events that contributed to the development of distinct social realities (Taylor, 2015). This study adopted the interpretive research paradigm because the interpretivist researcher tends to rely upon the participants' views of the situation being studied.

3.3 Qualitative approach

A qualitative approach is an umbrella term covering an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning of naturally occurring phenomena in the social world (Sarantakos, 2016). For Fouche (2016), qualitative approach to research is concerned with subjective assessment of attitudes, opinions and behavior.

More so, qualitative approach can be used to establish the socially constructed nature of reality, to stress the relationship between the researcher and the object of the study, as well as to emphasize the value laden nature of the inquiry (Rehman, 2016). Creswell (2017) views qualitative research as a flexible approach that seek to generate and analyze holistic data on an issue of interest systematically using sufficiently rigorous, trustworthy and ethical methods and techniques in a manner that pays attention to the unique circumstance of the context and participants. As contended by Morse (2015), in a qualitative approach the investigator usually works with a wealth of rich descriptive data, collected through data collection tools like participant observation, interviewing and document analysis. Qualitative approach deals with subjective data which is generated by the minds of respondents and interviewees (Pius, 2020). This study employed a qualitative research approach. The approach was considered appropriate to this study interest in the participants' perceptions and opinions on IKP in biology teaching and learning.

3.4 Sample and sampling procedure

According to Babbie (2016) a sample is a sector of the population selected to represent the population as a whole. The sample is the section of the wider population that will be engaged in the survey and sampling is the process of identifying who you will aim to contact from that population. Sampling is the inclusion or exclusion criteria for certain components from a population.

In an attempt to answer the research questions, a researcher needs to establish the sample of participants who provide data in the study. A purposive sampling technique was applied in order to select the student participants and teacher participants. It is a non-probability sampling technique that involves choosing a case because it illustrates some feature or process in which a researcher is interested (Silverman, 2015). This approach is generally associated with small in-depth studies with research designs that are based on the gathering of qualitative data and focused on exploration and interpretations of the experiences and perceptions (Ross, 2017). A purposive sample is the one that is selected based on the characteristics and knowledge of a population and which are deemed by the researcher to be crucial to understanding of phenomenon being investigated (Neuman, 2016). This study adopted a sample size of 4 teachers teaching Ordinary Level Biology at the selected school. These were selected on the assumption

that they had experience in facilitating Ordinary Level Biology teaching and learning. In addition, 15 learners were purposively sampled from the Ordinary Level Biology classes also on the assumption that they had experience in teaching and learning activities.

3.5 Methods

Kumar (2016) defines data collection instruments as tools used to gather data. In this study, data was generated using focus group discussion and personal interview.

3.5.1 Interview

Interviews are believed to be one of the most important and rich sources of data in qualitative research. This is because they allow participants themselves to report their thoughts and experiences thereby giving important insights (Greef, 2019). Personal interviews refer to a set of questions that are asked personally directly to the respondent (Kumah, 2016). Gillham (2020) notes that individual interviews when only there are small number of participants accessible. Interviews may be open ended or closed ended (Morrison, 2016). Whether open or closed, the interview usually draws on an interview schedule which comprises of questions that direct the interview focus in order to answer research questions. In qualitative research, open ended questions allow deeper exploration of responses by participants, probing and exploring dimensions while diminishing the threat of a respondent going out off track (Richards,2019). To obtain accurate information through interviews, a researcher needs to obtain maximum cooperation from the respondents and allow the interviewee to communicate their experience and their interpretations (Frey, 2015).

Due to the qualitative nature of this study and the desire to get deeper understanding of participants IK experiences, open ended interviews were considered suitable in the investigation of the biology teachers' understanding on integration of IKP in teaching and learning. An interview guide was prepared with questions to find out their understanding on issues to do with integration of indigenous knowledge practices into science teaching and learning. Open ended questions were preferred because it allows the researcher to have an in depth understanding of the phenomenon under study. The research objectives were used to guide the researcher when preparing the guide that seeks to find out views of teachers on the integration of IK practices in teaching and learning of biology and challenges that they face. For confidentiality purposes, no

names were used when recording data. The researcher did not disclose information to the participant and it was used for educational purposes only

3.5.2 Focus Group Discussion

A focus group discussion is a research method that brings together a small group of people to answer questions in a moderated setting and is used to generate qualitative insights or produce direct quotes that can represent the views of the group concerned (Ntabo, 2017). It is a research technique that collects data through group interaction on a topic determined by the researcher (Morgan, 2017). These are facilitated discussions, held with a small group of people who have specialist knowledge or interest in a particular topic (Bennett, 2017). Greef (2019) notes that participants selected for focus group discussions usually have certain characteristics in common that relate to the topic. She states that the group is focused in that it involves some kind of collective activity. A well-planned focus group encourages participants to share perceptions, point of views, experiences and concerns (Casey, 2019). Focus group discussions are typically carried out with between 10 - 12 people. They are normally based around a short list of guiding questions, designed to probe an in-depth question.

In this study, the researcher divided twenty ordinary level biology learners into groups of four meaning that each focus group had a total of five learners. These were selected on the basis of the relevance to the topic under study. The participants were provided with the questions of interest to the study and the order of the discussion. The researcher's role in the discussion was to explain the study purpose, seek consent from the participants, record and write important notes of the discussion and remain passive during the discussion. The major issues under discussion include the

3.6 Data generation procedure

Armed with an introductory letter from the Bindura University of Science Education, Faculty of Education, the researcher sought approval from the responsible authority to carry out the study. After being granted the approval to conduct the study by the responsible authority the researcher had a meeting with the target participants where the aim of the study was outlined. There after the researcher selected the participants for the study (learners and teachers). A focus group

discussion was held with the learners followed by a series of interview sessions with the selected teachers. Ethical issues were considered during the data generation process.

3.7 Data analysis

Data analysis in qualitative research is an ongoing, emerging and iterative process (Henning, 2018). Stevens (2021) defines data analysis as the process of collecting, modelling and analyzing raw data to extract meaningful insights that support decision making. Babbie (2017) defines qualitative analysis as non-numeric examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships. Cresswell (2015) notes that there is no single right way to do qualitative data, no single methodological framework; however, this study applied the guidelines of Devos (2015) on thematic analysis. Thematic analysis is a qualitative data analysis method that involves reading through a data set such as transcripts from in depth interviews or focus group and identifying patterns in meanings across data to derive themes (Stevens, 2021).

The raw data from focus group discussion and interviews was first transcribed before organizing, reducing and describing. The researcher looked closely at the data to find out common themes, repeated ideas, topics or ways of putting things. She searched through the interview data and focus group discussion looking for segments relevant to the study research questions and assigned a word that captures its meaning. All similar categories were combined to form themes.

3.8 Trustworthiness of the study

In all research, particularly qualitative research, readers are increasingly finding it necessary to include details of steps they have taken to make sure their studies can be trusted (Bassegy, 2015). Trustworthiness in a study is achieved by giving attention to the study's transferability, credibility, dependability and conformability. According to Jwan (2018), trustworthiness is ensuring that the research process is truthful, careful and rigorous enough to qualify to make the claims it does. The use of two research methods for data generation increased the credibility of research findings in this study. Probing participants during interviews enabled the study to clarify facts and explain concepts that would be rather confusing to the researcher. Thus, trustworthiness

was rooted in considering whether or not the findings answered all research questions by reflecting on the credibility of the original data shared by participants (Madondo, 2018).

3.9 Ethical issues

Consent will be sought from participants before interviews are conducted and before a questionnaire is issued. Participation by respondents is voluntary during the survey. Individual's wish to participate will be esteemed as they will be given the room to step down if they no longer want to participate as informed consent of the subjects will be the goal of the researcher. The researcher will also take her time to explain the purpose of the study to potential participants for them to be fully aware of the nature and scope of the research including their role in it. The researcher will take obligatory steps to ensure anonymity and confidentiality of all the respondents who participated in this research. To ensuring anonymity, pseudo names will be used to refer to contributions made by accomplices in this study.

3.10 Chapter summary

This chapter looked at research methodology to be used in this study. A qualitative research approach was used in this study Purposive sampling strategy was applied in this study and has been elaborated. The data generation methods for this study include focus group discussion and personal interviews. Have been explained and the data generation process outlined. The thematic analysis is the method used to analyze the qualitative data that was generated. The trustworthiness of the data generated is considered and how the complex ethical issues were resolved. Lastly, the chapter looked at the research integrity. The next chapter will present, analyze and interpret data.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The previous chapter highlighted the methods through which relevant information was the sub research questions as basis for analysis and discussion which are: demographic characteristics of participants, IK practices are integrated into Ordinary Level Biology learning, IK practices and their integration into Ordinary Level Biology learning and challenges are encountered when these IK practices are integrating into Ordinary Level Biology learning.

4.2 Characteristics of participants

Thus, analysis and discussion of generated data was done through a thematic approach where data was grouped according to the sub-questions. This section centers on demographic characteristics of participants which are teachers and learners participating in Ordinary Level biology learning process.

Table 4.1 Demographic characteristics of Ordinary Level learners (n=15)

Attributes		(n)	(%)
Sex	Males	7	47
	Females	8	52
Age range (years)	15 – 18	15	100
Form	3	6	40
	4	9	60

The learners were purposively selected; all the learners were in the age ranging of 15 -18 years and doing Ordinary Level Biology at the selected school. Further, it was noted that these participants were enrolled according to the demands of the Education Act. The number of males and females was balanced; 7 males and 8 females. Form three learners constituted 40% whilst form four learners constituted 60%. This enabled the researcher to researcher to interrogate the general data to understand with clarity the extent to which the integration of IK in Ordinary Level Biology earning activities from learners ‘experience.

Table 4.2 Demographic characteristics of selected teachers (n=4)

Attributes		(n)	%
Sex	Females	1	25
	Males	3	75
Professional qualifications	Diploma in Education	2	50
	Degree in Education	2	50
Teaching experience (years)	0 – 5	1	
	11 – 20	2	
	Above 20	1	

Table 4.2 shows the distribution of four teachers according to gender qualification and teaching experience. Of the 4 teachers who participated in the study, 1 was female (25%) and 3 were males (75%). The table also shows that 2 teachers (50%) have diploma in science education and 2 teachers had Honors Bachelor of science Education. All their qualifications are related to science teaching. The teaching experiences of the teachers are also shown by the table. One teacher falls within the range of 0-5years, 2 teachers fall within the range 11-20years and one teacher has more than 20years teaching experience. These levels of experience made it possible to give different contributions to the study.

4.3 Participants’ understanding of IK as a concept

This section explores the teacher and learners' understanding of IK. The first participant responded:

IK is the same as traditional knowledge, traditional beliefs and lifestyle of people and it is passed from generation to generation by word of mouth (Teacher 1)

In support of this another participant said:

It relates to local language such as chi Shona or isiNdebele, values and ethics. It is something that changes depending on location. IK is full of myths and it is not documented (Teacher 2)

Another participant had this say:

It is useful and important knowledge related to the existence of people and important for survival (Teacher 3)

The findings from the teachers share many common concepts. All participants included culture, value and beliefs as an integral part of indigenous knowledge. Language was also recognized as an important aspect of indigenous knowledge. This shows that teachers realize that indigenous knowledge is adapted to a specific group of people and that each ethnic group has its own IK different from other ethnic groups. The findings concur with Greef (2019) definition of IK. He defines IK as the sum total of values, belief and skills which people in a particular area possess and which enable them to get the most out of their natural environment. Generally speaking, such knowledge evolves in the environment, so that it is specifically adapted to the requirements of local people and conditions (Bassey, 2015).

4.4 IK practices are integrated into Ordinary Level Biology learning

In this section, data generated from ordinary level biology learners and teachers is presented analyzed and interpreted with the view to provide answer to research question one raised in chapter 1. In this context a participant revealed that:

IK is the knowledge you acquire from home or in the community you come from (Focus Group Discussion Participant 3)

Another participant provided that:

IK is the knowledge we gather from elders such as traditional healing methods, medicinal practices, traditional agricultural practices and local food system (Focus Group Discussion Participant 1)

According to McNulty (2018), IK is the vehicle through which the principles of indigenous world views such as beliefs, traditions, practices and institutions are transmitted and put into practice. In their definitions, learners appreciate that IK is the knowledge that exist within the community that one comes from. Thus, in their definition for IK, learners referred to their childhood memories and the knowledge and experiences as they grew up within their communities. This is in line with Vygotsky social-cultural theory which states that learners construct knowledge (George, 2019). Learners actively construct knowledge using the knowledge they have gained from a knowledgeable other at various levels, usually a parent, teachers or knowledgeable elders. IK is strongly rooted in the cultural history and traditions of the country's many indigenous communities (Tamang, 2023). It includes traditional ways of doing things. In addition, Layman (2022) defines IK as a collection of observations, practices, and ideas passed through generations by indigenous people living close to their surroundings. Another participant highlighted that:

I think traditional agricultural practices such as crop rotation and organic farming can be connected to ecology (Teacher 4)

In support of this, another participant said:

Conservation practices such as hunting and gathering can be tied to conservation Biology. Use of totems, taboos and sacred places have been used to protect and preserve the environment. This is conservation of biodiversity (Teacher 2)

The above information shows that biology teachers are familiar with IK practices that can be integrated into biology learning. Integrating IK practices like traditional agricultural practices shows how important different ways of learning and knowing are as we continue to live in a global world that is becoming more and more connected (Newberry, 2018). The other participant contributed the following:

The traditional use of plants as food, and as herbs for traditional medicine and healing can be linked to modern biology such as Pharmacology and Botany (Teacher 1)

This was congruent with Shava (2016) noted that IK was embedded within indigenous agricultural practices is local knowledge on the use of plants as both herbs and food. Shava (2016) calls for all stakeholders to indigenize the science curricula against a background where IK has been undermined and marginalized. A participant indicated that:

In Biology laboratories and projects, learners make traditional crafts and prepare food, this is hands on learning and skill building (Teacher 3)

In support a participant acknowledged that:

Traditional ecological knowledge that concerns the relationships of living beings to one another can be incorporated in laboratory experiments and discussions (Teacher 4)

The above information from teachers shows that IK practices can be integrated in biology learning. This can be done through making use of learners' prior knowledge. So, trying to bridge the gap between IK practices and scientific thinking could help make a science classroom more inclusive and sensitive to culture (Moorman, 2021). By recognizing the importance of both IK and science education, teachers can ensure that all students learn in a more connected and exciting way.

4.5 Integrating Indigenous Knowledge practices into Ordinary Level Biology learning activities

Integrating IK practices into biology learning is a transformative that respects cultural diversity, promotes environmental friendliness, and encourages a more complete knowledge of science (Mekoa, 2018). In this section, the researcher explores different strategies that can be used to integrate IK into Ordinary Level Biology learning. One of the participants noted that:

When teaching Biology I look for the information in textbooks or the internet or any source. I can also bring in my experience to the learner and say my grandmother used to get this leaf as medicine. We then discuss (Teacher 1)

The teacher is showing how an individual can bring IK concepts to the classroom to help learners connect what they learn in their everyday lives and at school and how both worldviews are related and relevant in their current contexts. In addition to this another participant responded:

Make the subject come alive by bringing in artefacts, researches, electronic media or organize storytelling and oral tradition (Teacher 4)

Mekoa (2018) observed that story telling can be used to teach biological concepts. The author added that these stories share knowledge about the importance of protecting natural resources and methods used by indigenous communities to conserve and manage these resources. The stories also share knowledge about interconnectedness of living organisms. In a study conducted

by Manke (2018), he indicated that using artefacts brings strong images, memories and feelings to mind. This is the reason why teachers should use support materials such as physical objects to introduce and reinforce biology concepts. A participant also gave other ways in which they include IK practices in Ordinary Level Biology teaching as:

You work from the principle of known to the unknown and this helps to ease the fear of science subjects (Teacher 2)

This participant implies that as a teacher, one should start first by what the learner knows and then move to what they do not know. In a study conducted by Mawere (2015), he talks about the same teaching approach and he reports that IK, being that knowledge, learners have before they enter the academy, will no doubt inspire and stimulate their minds to be abstract and even seek solutions to their problems using locally generated solutions. Based on the results of this study and literature, using this strategy to introduce biology concepts could be beneficial to learners in that they will be able to make links between science concepts taught in the classroom. It is also interesting to note that learners acknowledged carrying out activities in Ordinary Level Biology lessons that involves IK practices. A participant noted that:

We dried a variety of vegetables (mufushwa) and meat (chimukuyu) as a way of preserving food for future use (Focus Group Discussion Participant 5)

In support, another participant indicated that:

We planned traditional meals and identified the nutritional values of the meals. Their meals were balanced (Focus Group Discussion Participant 10)

From the above information, it can be included that IK practices can be integrated through learner centered approaches such as investigations and practical work. These findings concur with Higgs (2015) who pointed out that IK practices can only be infused into learners through hands on and investigations which enables learners to observe and draw conclusions from phenomenon.

4.6 Challenges encountered when IK practices are integrated in Ordinary Level Biology learning

Despite a growing body of published literature on the methods of integrating IK practices in science learning, challenges still exist in successfully integrating it into biology learning activities. In this section, the researcher is interested in the challenges faced by both teachers and

learners in integrating indigenous knowledge in ordinary level biology learning. In context to this, one participant had this to say:

At college we were not taught about indigenous knowledge, not even a lecture on how to integrate it in science teaching. We only knew the science gurus such as Gregor Mendel, Isaac Newton, not even one from IK. So how can I teach stuff that I was not trained for? (Teacher 1)

Another participant responded:

This is not found in biology national syllabus so it's up to the teacher to include it or not. Furthermore, it is not examined, so integrating it or not would not make any difference (Teacher 2)

The above findings show that teachers are not trained on how to integrate IK in science learning, teacher education does not prepare teachers to integrate IK and the IK practices are hardly specified in the curriculum. Teacher training and development programs exclude IK practices and how to use them in science classes (Creswell 2020). Thus, no guidance in the curriculum on what aspects of the IK practices to include and how to include them. Another challenge noted by teachers and learners in this study is lack of resources. They had this to say;

IK requires resources, no textbooks and no teaching material. Besides oral tradition, where else can I get information about IK? (Teacher 2)

Another participant responded that:

Me, my teacher and my peers may know different IK practices. Which one should we learn? (Focus Group Discussion Participant 15)

Lack of resources and lack of access to IK are major challenges that were revealed by the findings of this study. In this context, Hewson (2019) remarks that efforts to document and make available relevant IK for teachers are in its very formative stages and to date, science teachers receive western type of education that regards IK as inferior. Today many teachers found themselves with Shona, Zulu and Chewa learners in the same classroom, all of them with different backgrounds and IK practices, whose IK should be taught?? It's a complicated situation. One of the key challenges emerged from this study is language of instruction. One participant has this to say:

Since it is indigenous, it should be taught using mother's tongue. All information about IK from elders is narrated in local language. Some of things have no English translations. This makes it hard to understand (Focus Group Discussion Participant 13)

From the above contribution, it is crucial to support and promote the survival and the use of indigenous languages and in indigenous education as one of the essential elements of indigenous cultures and identities (Preston, 2017). The knowledge, the specific ways of thinking and interpreting the world, and the cultural values of a society, community or group are contained and reflected in their language and transmitted inter-generationally through this medium (Jackson, 2016).

4.7 Chapter Summary

The chapter presented and discussed the findings using thematic analysis. The data was analyzed thematically using themes that are derived from the research questions. The themes include the IKP that is integrated in biology teaching, how these IK are integrated and challenges encountered when integrating these IK in ordinary level biology. Views from other scholars were also discussed in this chapter. The next chapter will focus on summary, conclusion and recommendations.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter data was presented, analyzed and interpreted. This chapter focuses on summary of the project, conclusion and recommendations. Areas for further study are also be suggested. The chapter summary will also be given at the end of the chapter.

5.2 Summary of the project

Chapter one lays the foundation to the research study by defining the research problem, background to the study, statement of the problem, research questions, significance of the study, delimitations of the study, limitations, key terms definition and layout of chapters. Chapter 2 was dedicated to literature review which opened knowledge gaps and brought off the theoretical framework for the study. The third chapter focused on research methodology which ushered the approach that was to be used in data gathering, presentation, analysis and interpretation. Chapter 4 then gave an outline of the following major findings:

- The participants articulated their understanding of IK practices and gave the following examples: traditional agriculture methods; language, local medicine and healing practices, traditional crafts and food preparation, lifestyle, traditional ecological knowledge and totems and taboos used to preserve natural resources.
- It was revealed that IK practices were integrated into Ordinary Level Biology learning through project-based learning, inquiry-based learning, etc.
- It was acknowledged that some challenges were encountered when integrating IK practices into Ordinary Level Biology learning and these include: lack of resources, poor documentation of IK practices, difficulty in translating adapting IK into classroom, no

standardized curricula requirements and difficulty in finding qualified teachers who are knowledgeable in IK.

5.3 Conclusion

From the findings it was noted that the participants had an understanding of IK practices that were integrated into Ordinary Level Biology learning through different approaches. In addition, some challenges were encountered when integrating IK into Ordinary Level Biology learning. From these findings it can be concluded that to some extent IK practices were being integrated into Ordinary Level Biology learning at the selected school.

5.4 Recommendations

Based on the findings of this study, the researcher recommends that:

- Curriculum developers should include IK practices in curriculum documents.
- Sharing of research findings on integrating IK practices in education with educators, policy makers and indigenous communities to promote awareness and implementation.

5.5 Areas for further study

Other researchers could investigate whether integration of IK practices really results in better school science education. In addition, further research could include integration of indigenous knowledge in different countries and context.

5.6 Chapter summary

The chapter presented the summary of the research, conclusions and recommendations for the study. Areas for further research were also suggested by the researcher.

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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:

TO WHOM IT MAY CONCERN

NAME: BONIFACE JAIRS REGISTRATION NUMBER: B1026593
PROGRAMME: HBSCED.BZ 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.

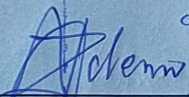
The student has to undertake research and thereafter present a Research Project in partial fulfillment of the programme. The research topic is:

INTEGRATING INDIGENOUS KNOWLEDGE PRACTICES
INTO ORDINARY LEVEL BIOLOGY TEACHING AND
LEARNING AT CENTENARY HIGH SCHOOL

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

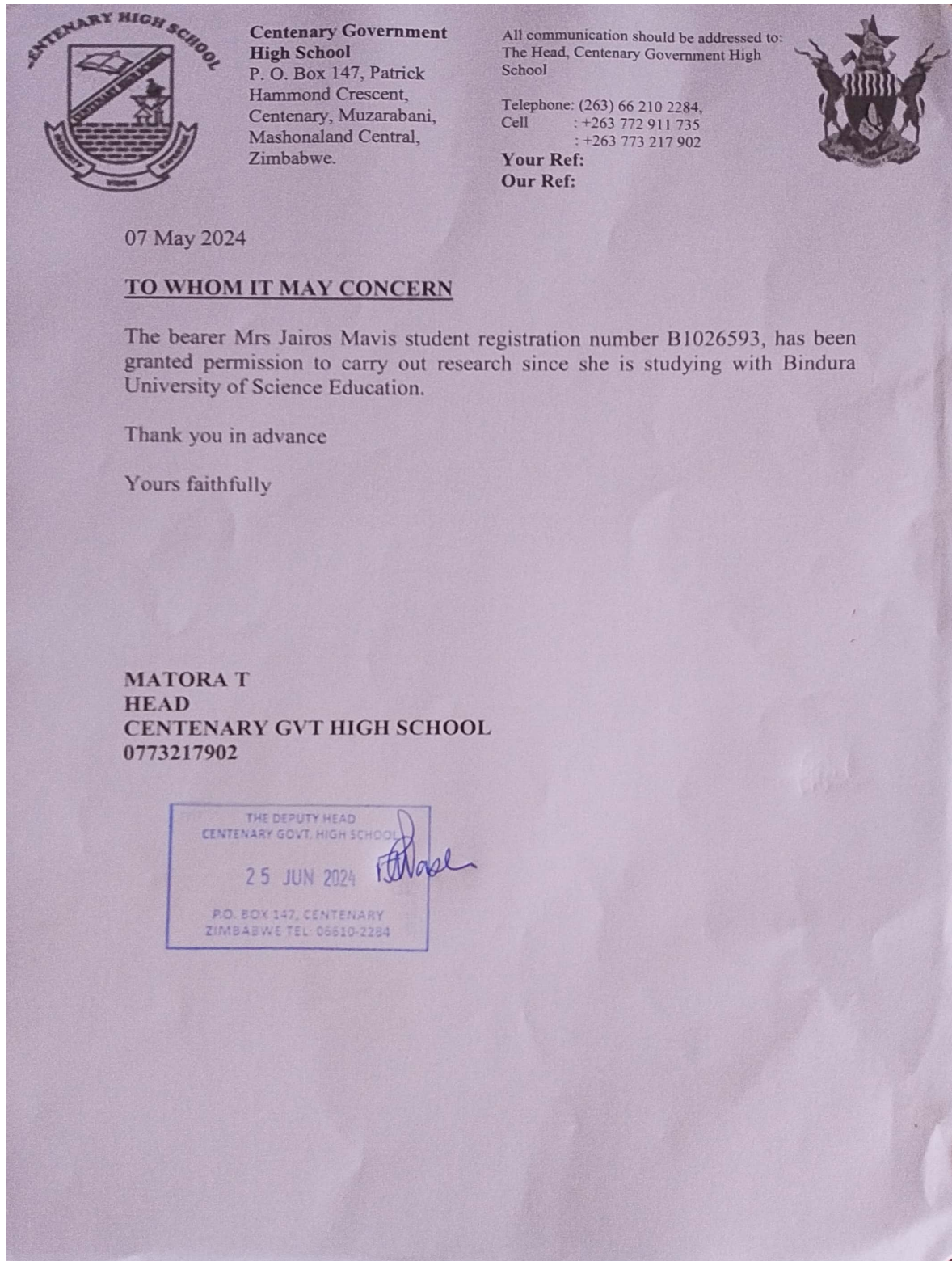
Your co-operation and assistance is greatly appreciated.

Thank you


Z Ndemo (Dr.)
CHAIRPERSON - SAMED

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

Appendix 2: Approval letter



Appendix 3: Interview guide for selected teachers

Thank you for agreeing to be interviewed. I am hoping that you are going to make a significant contribution with regard to gaining knowledge on the issue under investigation. I will be asking you some questions, feel free to explain in any way you consider appropriate. In the event that you do not feel like answering the question, you are also free to say so. The results from the study are used for education purposes only and any information is treated as private and confidential and names will not be included in the study and final report.

1. Can you please tell me about your professional qualifications and your experience in Ordinary Level Biology teaching?
2. What are your thoughts on IK practices, and how do you think they relate to Ordinary Level Biology teaching and learning?
3. Have you had any experience incorporating IK into Ordinary Level Biology teaching and learning? (Elaborate your answer)
4. What strategies do you think would be the most effective in integrating IK into Ordinary Level Biology teaching and learning?
5. What challenges do you think teachers might face when trying to integrate IKP into Ordinary Level Biology teaching and learning activities?
6. Thank you for sharing your insights.

Appendix 4: Focus Group Discussion guide for the selected learners

Introduction: Welcome and thank you for coming to take part in this important discussion. Your views and contributions are very important. I am very excited to hear your thoughts, experiences and insights on this topic, and how we can work together to advance our understanding. Your contributions will be invaluable in shaping the research and its impact. Feel free to share your thoughts and questions as we go along. Once again thank you for your participation.

1. Are you familiar with the concept of IK?
2. What is the importance of IK in Ordinary Level Biology teaching and learning?
3. What activities did you do that involved the use of IK in your Ordinary Level Biology teaching and learning?
4. What challenges you encounter when integrating IK into your Ordinary level Biology learning activities?
5. Thank you so much for participating in this interview.