ISSN: 2278-4012, Volume:3, Issue:3, July 2014

Indigenous Knowledge for Plant Medicine: Inclusion into school science Teaching and Learning in Zimbabwe

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Abstract: *Indigenous knowledge practices of medicinal plants in Chivi, Zimbabwe, were investigated. The study aimed at documenting IK of medicinal plants and finding the opportunities available for the multicultural approach of integrating indigenous knowledge of medicinal plants in the teaching of science in schools. This paper argues that traditional medicinal knowledge could be harnessed as a teaching strategy for classroom science in schools. A total of fifty participants were used in the study. These consisted of a traditional healer, village head, doctor, nurse, 44 form four students and 2 science teachers. Data were obtained from a case study of IK of medicinal plants through interviews and questionnaires from the purposively sampled respondents. Questionnaires were completed by teachers and students only, while interview questions were asked to all participants. Then data analysis was done using tables and use of quotations from the participants. The study was guided by the socio-cultural theory and the post-colonial theoretical frameworks. The African indigenes paradigm guided the interview discussions. All participants concurred that local knowledge of plant medicine could be integrated into school science teaching. The study revealed that essential concepts such as neutralization, fermentation, food preservation, reproduction, and human diseases could be taught in classes basing on the IK of medicinal plants. It was found also that the knowledge held by the community could be harnessed for the teaching of science in schools. Thus, curriculum planners need to carefully include some forms of traditional medicinal knowledge into schools for teachers to build upon what students already know.*

Key terms*: indigenous knowledge, multiculturalism, multicultural science education, school science, medicinal plants, inclusion and integration*

Introduction

In developing countries, attempts to broaden the context of science education have been accompanied by curricula changes (Matsika, 2012). Such a desire to change the curriculum has been a result of the need by various curricula to include relevant contexts in science learning in schools. With it has been the shift in curricula emphasis from that which is concerned with the acquisition of the scientific facts to that which encompasses the cultural aspect of science as human activity (Hodson, 1993). Some literature indicates that science education reform is a worldwide trend that has been influenced by various international implementation force (Hassard & Dias, 2009). Among these forces include: constructivist views on learning, cross-national studies of student learning, globalization, and advances in science, technology and

ISSN: 2278-4012, Volume:3, Issue:3, July 2014

information technology. Several climates of opinions became conspicuous for shifts in science curriculum notably during the 1960s and 1970s with emphasis directed on scientific theories and processes of inquiry, and in the 1980s and early 1990s focus was on science as a cultural phenomenon (Cobern & Loving, 2001). Such curricula changes, probably explains the reason why current curricula in some African countries have adopted the concept of multiculturalism as a teaching strategy to characterize school science.

In spite of these vivid attempts by various science curricula worldwide towards integrating the cultural aspects, school science context in Africa is still Western in both form and content. To note also is that, currently there is debate on what actually constitute school science in Africa ranging from the dimensions of the multiculturalism perspective to a contrast with the universalistic perspective of science (Snively & Corsigilia, 2001). By universalistic view of science, I mean a perspective that regards all scientific things deriving from one European centre. Cobern and Loving (2001) argue that those who hold principle of universalism view Western Science as the only Science in school curriculum. This means that indigenous people are seen as primitives who needed the colonizing superior cultures, that is, Western Science. On the other end, some like (Snively & Corsigilia, 2001) argue that science would still be universal even if we incorporate indigenous knowledge (IK) as scientific. This argument places science education within a multicultural paradigm that calls for the appreciation and tolerance of the existence of other cultures within societies without any domination of one knowledge domain over the other.

In light of the foregoing insights, a multi cultural education paradigm is designed to mirror the concerns of the different cultural groups in a society. However, the modalities of implementation in schools for countries with a diverse culture like Zimbabwe can be a mammoth task. There are many ethnic groups in Zimbabwe. These include: the Shona, Ndebele, Tonga, Nambiya, Kalanga, Venda, and the Shangani (Bourdillion, 1987). The Zimbabwean cultural policy allows the Ministry of Education, Sport, Art and Culture (MOSAC) to teach science in schools using indigenous knowledge systems (IKS) locally available in the communities so as to make science relevant to the learners (Chigwedere, 2007). Furthermore, the MOSAC policy says "our traditional knowledge should provide sources for the curriculum needs to our societies and such knowledge should be infused into the mainstream school curriculum" (p. 14). This policy resonates very well with the Zimbabwe science and technology policy (STI, 2012) which states that STI would seek to " develop courses on IKS that are suitable for inclusion in the school curricula" (p. 11). This means that both policies acknowledge the importance of IKS in the teaching of science in Zimbabwe. In spite of this provision for science curriculum at the teachers' disposal, there is a low usage of the indigenous forms of knowledge in the teaching and learning in schools (Matsika, 2012; Shizha, 2006). Apart from this, little research has examined how multicultural science classrooms can be done with specific reference to medicinal plants (Kazembe, 2010; Kazembe & Mashoko, 2008). The study therefore posits that since the current science teaching strategies are not including learners' experiences, it is necessary to make use of

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the complimentary role of IKS of the medicinal plants to school science with reference to the Shona ethnic group in Zimbabwe.

Theoretical framework

The study hinges upon two theoretical frameworks. These are: the socio-cultural theory and the Post-colonial theoretical frameworks. The socio-cultural perspective examines how the social environment and cultural learning influence our behavior, thoughts and feelings (Santrock, 2003). The socio-cultural approach in science is based on the understanding that human activities take place in cultural contexts. This implies that we cannot learn science divorced from the socio-cultural settings. The post-colonial theory emphasizes the power of the IK as a way for competitive scientific advantage (Mapara, 2009; Pedzisai, 2013). The theory challenges the formerly colonized to reclaim their lost intellectual, social, political, economic, and linguistic cultural values to establish their new form of knowledge base. Hence the post-colonial theory allows the indigenes to assert their presence and identity through reclamation of their past which colonialist had done everything to dismantle. Everything that linked to the indigenes was viewed as backward, thus the theory challenges the indigenes to speak for themselves, in their own voices, for a return to some of their cultural knowledge like IK of medicinal plants.

The concept multicultural science education

The use of IK of medicinal plants in the teaching of science is a form of a multi-cultural approach to science learning. According to Woolfolk (2000) multiculturalism is the diversity of cultures within a country. This is backed by Borich and Tombari (2003) who define multiculturalism as when there is existence of many different cultures within a group encouraging different cultures to maintain their distinctive qualities within a larger society. In other words, multiculturalism refers to the existence of different cultures within a society. The concept multi-cultural science education is an idea that seeks to create equal opportunities for all students so that it reflects the diverse cultures and groups within society and classrooms (Banks, 2008). While Woolfolk (2000) posits that multicultural education seeks to develop the ability of various groups to accommodate with one another and to appreciate one's another way of life and points of view without losing touch with their own cultures. Hodson (1993) asserts that multicultural science education can take three forms: first, assimilationist approach, encompassing the transmission of the cultural beliefs and norms of the dominant group; secondly, integrationist approach, advocating equal opportunities within culturally diverse and mutually tolerant society; and, ethnic and cultural imperialism, which accepts and promotes diversity. Similarly, Banks (2008) proposes that multicultural education can take many forms but its focus is on two central issues. These are: on the concept of culture and problems resulting from the clash of cultures. It is these critical issues that Banks (2008) believes that are pertinent to consider by students when they examine the conflicting demands of home versus school as well as the conflict between cultures of the powerful and the powerless. Hence, multi- cultural

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education uses ideas of multiculturalism by creating educational procedures and curricula that are responsive to the different cultures and languages of students with the goal of attaining high quality education for all children. To this end, Banks (2008) contends that multicultural education falls within the dimensions of content integration, equity integration, the knowledge construction process, prejudice reduction, and an empowering school culture and social structure.

In Zimbabwe, multicultural education focuses on the indigenous ethnic groups as well as language issue in schools. Hence, this study was argued for the integrationist and cultural pluralism types of multiculturalism in school classrooms in view of the multiplicity nature of the Zimbabwean ethnic groups. Classroom is a micro- culture where different cultures of learners converge to form a unique culture. Educators need to transmit and interpret the knowledge of both the dominant (macro-culture) and of the micro-cultures, so as to provide education that is multicultural (Haralambos & Holborn, 2008). To this end Banks (2008) argues that educators need to be knowledgeable about the different kinds of micro-cultures that might influence teaching and learning in class. Among these include inter alia gender, socioeconomic class and language. This study argued that the problems related to science learning in schools can be solved by seeking recourse to multicultural education approaches. In this case, indigenous knowledge on medicinal plants can facilitate learning in schools.

The concept of Indigenous knowledge (IK)

There is need to unpack the controversial concept indigenous. The term 'indigenous' according to (Owuor, 2007) refers to a specific group of people defined by their cultural territories, collective cultural configurations and historical ties. While UN (2003) says indigenous is a term given to a person who has a strong attachment to land and to a particular culture. Hence, indigenous people are peoples defined as having a set of specific rights based on their cultural or historical distinctiveness from the populations that are often particularly dominant. Indigenous knowledge is the local knowledge, basis for decision making in agriculture, education, health care, food preparation (Warren, 1991). With these comprehensive dimensions of applications given by Warren, this is probably the why Barnhardt and Kawagley (2005) view IK as a system of survival. While both Semali and Kincheloe (1999) ,and Odora-Hoppers (2002) view IK as ways of knowing. As a result of the application of IK in the communities, there are various forms it can be understood as. These include: local knowledge, traditional knowledge, traditional ecological knowledge, peasant knowledge, indigenous technical knowledge and folklore knowledge (Williams & Muchena, 1991). This is probably the reason why both Odora-Hoppers (2002), and Ogunniyi (2004) view IK as holistic, and transcendental view of human experiences with the cosmos. Hence, this paper defines IK as information base or skills for a society which facilitates communication and decision making. The term IKS is a controversial as well. To start with, IKS is the sum total of the knowledge, skills which people in a particular geographical area possess (Odora-Hoppers, 2002). In agreement to this view, Onwu (2004) argues that IKS is inclusive knowledge covering technologies and practices that have been and are still used by

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indigenous people for existence, survival, and adaptation. This implies that IK is part of IKS. Hence, this paper looks at the IK of the medicinal plants people in Chivi hold that can be infused into the science curriculum.

Knowledge system integration

Horsthemke (2008) cites three kinds of knowledge. These include, first, knowing a person, a place, and the like; secondly, knowing- how (practical or procedural knowledge), and thirdly, knowing- that (theoretical, factual or declarative knowledge). While the first definition is a familiar one, the second indicates a skill or custom that is passed on from one generation to another. The third one indicates justified truth. This write up argues for both know-how and know-that types of knowledge. Knowledge integration is seen as a process of merging two or more world views which appear to be in conflict (Diwu, Ogunniyi, & Langenhoven, 2011). While Ogunniyi (2013) views knowledge integration as the process of synthesizing multiple models or representations into a common model. This implies that knowledge integration involves determining how the new information and the existing knowledge interact, how existing knowledge should be modified in light of new information, and how the new information should be modified in view of existing knowledge. In this paper, the term inclusion will be used interchangeably with integration. Pedzisai (2013) proposes that inclusion of IKS in the curriculum is propelled by three approaches: an incorporationist (bringing IKS into mainstream science by seeking how best IKS fits into science); separatist (holding IKS in juxtaposition with scientific knowledge), and integrationist (linking and making connections between IKS and science). In this paper, a parallel integrationist form is argued for, where both IK and Western science are allowed to be used in school science teaching on equal basis, making connections to each domain.

The study undertook to document medicinal plant knowledge and gain insights into the implementation of science teaching and learning with reference to medicinal plant knowledge of the Shona ethnic group in Chivi, Zimbabwe. The rationale for this study centred on the Shona proverb that says: “Rume rimwe harikombi churu”. This is translated to “A man cannot do it alone”. What this implies here is that science alone cannot provide relevant learning experiences for students in schools. Hence, use of traditional medicine may compliment classroom science. This places science within the discourse of community-based indigenous knowledge that emphasizes building upon what pupils know. The study addressed the following questions: 1. What IK of medicinal plants do the community members in Chivi district hold?

2. What aspects of this IK can be taught in a science class?

3. How can this form of IK be taught in school science in Zimbabwe?

Methodology

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The study was a concurrent mixed method using a case study design. In the study, questionnaire was used to survey the teachers and students' medicinal knowledge. At the same time, the IK of medicinal plants was explored using semi-structured interviews with participants in the community and at schools. The reason for combining both qualitative and quantitative designs is inter alia to better understand a research problem by conveying broad numeric trends from quantitative research and the detail of qualitative research, and to obtain statistical, quantitative results from a sample and then follow –up with a few individuals for more insights (Cresswell, 2009). Miles (2001) define a case study as an in-depth study of either one individual or a small number of individuals or organization. While Haralambos and Holborn (2008) define a case study as a detailed examination of a single example of something. This means that a case study focuses on one thing that is to be investigated. This selection is based on typicality of cases (Denscombe, 2005). In this study, the case is the medicinal plant knowledge of the indigenous people in Chivi rural areas.

The Paradigm

This study hinges upon the interpretive African- indigenes paradigm. The choice of this perspective is premised on assumption that world views serve to create intellectual spaces for the creation of analytical, conceptual and understanding for the development of IK within a curricula for sustainable development (Goduka, 2005). Hence, the study was done through an African perspective, generating views from people within their Shona culture. The interpretive African-indigenes approach allows information of the indigenous people which is not documented to be captured through discussions and this integrates indigenous voices (Louis, 2007). This suggests that these African- indigenes paradigm are related to qualitative research (Henning, 2004). Hence, the structure and procedures of the interpretive African indigenes paradigm will resemble qualitative research.

Study area and Participants

The study was conducted in areas around the Chivi Growth Point, Zimbabwe. The study sought for data from the community elders that included Traditional healer, Doctor, Nurse, Councilor, Village Head, Form four Students and two Teachers from two Secondary schools in Chivi District.

Sampling and Ethics

The study used a total of fifty respondents. These consisted of: a traditional healer, medical doctor, nurse, councilor, village head, forty-three form four students and two science teachers. In this study, permission was sought from the Ministry of Primary and Secondary Education (Regional Office- Masvingo) and individuals involved in the study were personally consulted. For schools, access was obtained from the Headmaster concerned and the teachers acting in loco parentis for students. All participants were told of the purpose of the study and that their

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information would be treated with confidentiality. The participant's consent for audio recording while interviewing was sought from them. Pseudonyms were used to identify both individuals and schools.

Data collection

For data collection, the study used two kinds of instruments: questionnaires and interviews. Both instruments were pilot tested to test questions for inter alia ambiguities and vagueness. Both the questionnaire and the interview questions were compiled to seek for information on drugs for the following five conditions: snake bites (anti venoms), dysmenorrheal (jeko), stomach aches (diarrhea and acids), reproductive organs problems and infertility, and wound healing (external). Questionnaires were completed by teachers and students and then returned, which had an overall return of 100 per cent. A total of 50 participants were used in the study. Interviews for traditional healer and village were done at their homestead while for other participants it was done at their place of work. All interviews were audio recorded and later on transcribed for analysis.

Data analysis techniques

The data were analysed using both descriptive statistics for questionnaires and qualitative procedures for interviews using themes. Braun & Clarke (2006) argue that themes are units derived from conversions, vocabulary, recurring activities, meanings, and feelings on community member. From this argument, data sets were searched to find repeated patterns of meanings. The IK from the participants were also analysed for their use in classroom science using a culturally aligning theoretical framework developed by (Mpofu, Otulaja, & Mushayikwa, 2013). The framework indicates that for science to embrace a multicultural science frame, teaching should focus on four domains of knowledge (product, process, enterprise and paradigm). The people involved (enterprise) generating knowledge with indigenous ways of knowing (paradigm) that guides them in their ways of inquiry (process) to produce knowledge (product) and put into action at classroom level. This research was focusing on the product knowledge, which are skills, materials or know-how.

Authenticity of the data

Authenticity is term used to refer to the qualitative language for validity and reliability (Lincoln & Guba, 1985). For authenticity of the data, detailed field notes were captured and participants were given the chance to check for their information on written accounts.

Results and Discussions

The analyses of the questionnaires indicated that the drugs used for various ailments were common in all participants. Their views were shown as in Table 1 below.

Tab1e 1: Some Medicinal Plant Knowledge in Chivi

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Condition	Some drugs Used
Snake bites	Ruvhunabadza, Gomarara renyoka , Chidzororo
Dysmenorrhoea (jeko)	Jekacheka , Mupanda
Stomach aches	Mupfura , Munhengeni , Murumanyama , mufufu
Wound healing (external)	Mupfura , Gavakava
Reproductive organs problems- infertility	Rukato

The data which was sought was mainly in terms of drugs for stomach aches (including ulcers, diarrhea and dysentery), dysmenorrheal, anti venoms for snake bites, infertility problems and external wound healing. The results indicate that the people in the Chivi have a full knowledge of the traditional plant medicines to use for various ailments. For example, the traditional healer (referred to as 'VaSekuru') revealed that 'Ruvhunabadza' causes the patient to vomit foam, taking poison out of blood and stomach when used in the treatment of snake bites. It was interesting to note however that 'VaSekuru' had a clear understanding of what he was doing but lacked theoretical explanations which could not be equated with ignorance. From one of the interviews held, VaSekuru commented that "You young people do you think traditional medicine is for the old guys? No, everybody benefits from it, even the educated use it secretly when they find that drugs from the hospitals are not helping them". However, most participants (80 %) expressed worrisome view that there was an unclear collaboration of traditional medicines with biomedicines that existed, which inherently triggered fears of bio piracy of their medicines. Health practitioners involved in the study acknowledge the importance of traditional drugs however they indicated that they could not explain the mechanisms of cure of some of the traditional drugs people were using.

The study then related this traditional knowledge to the teaching of science in schools. A summary of their responses was given as shown in Table 2 below.

Table 2: Summary of respondents on indigenous knowledge of medicinal plants (N= 45)

Statement	% Agree	% Disagree	% Not sure	Total %
I use traditional medicine	30	70	0	100
Indigenous knowledge is useful	95	5	0	100
Traditional medicines are derived from plants	90	5	5	100

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Traditional knowledge on medicinal plants could be used in science lessons by teachers	60	30	10	100
There is science in IK of medicinal plants	50	40	10	100
Old people should only be treated by traditional healers	80	20	0	100
Traditional medicines have an advantage over biomedicine(modern medicine)	60	40	0	100
Plant medicines are useful in schools	70	10	20	100

The responses for strongly agree and agree were pooled together to Agree for easier analysis. The same was done for Disagree and strongly disagree. From Table 2 above, a majority (60%) agreed that traditional knowledge on medicinal plants could be integrated in science curriculum. However, some participants expressed that caution need to be taken when doing so. Among the issues they raised, language of the learners dominated their discussions. For example, one teacher indicated that such inclusion of the IK in science could be a problem. He commented that "Currently in our country, there is a lot of movement of people, either from urban areas to rural areas or vice versa. As a result of this learners from different ethnic groups have mixed together making it hard for teachers in classes to cater for the needs of all students". This, combined with the problem of a low level of acceptance of IK in schools by some people could be the reason why it is not integrated in schools by both learners and teachers. However, half of the respondents (50%) indicated that they would consider IK of medicinal plants to have science in it if it appears in textbooks and only taking it as a teaching aid. A significant percentage of the respondents (70%) agreed that IK of medicinal plants is useful in schools.

In spite of the acceptance of the complimentary role of traditional medicines to modern practices, the participant's reluctance to use traditional medicine (70%) seems to indicate that they value such practices for their survival. A significant number of them also said there is no science in

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traditional medicines. This could probably be a result of them not understanding the nature of science.

Further interview with teachers, indicate that they had mixed feelings towards the use of traditional practices in schools. One teacher lamented: “plant medicines are useless since most of the times they do not work and it is just a belief in the stuff”. However, another teacher had a different view altogether. She commented: “traditional medicine work very well especially on some diseases such as cancer and heart diseases. If you seek treatment of these diseases from the biomedical clinics you risk being amputated one of your organs”. However, both teachers indicated that the medicinal plant knowledge could be helpful in science lessons when teaching topics such as human health and diseases, neutralization, reproduction, and classification of organisms. One teacher argued that: “the idea of patients vomiting foam after taking anti venom drugs could be used to teach Biological aspects such as excretion of waste products”. This implies that the role of Kidneys as excretory organs can be understood if the knowledge expulsion of snake poisons using traditional drugs can be used in lessons. Related to this, one student said the idea of traditional drugs treating diarrhea may be used to teach concepts such as acids and bases, especially when they react to form a neutral solution. One of the student commented “The reason why traditional drugs from the barks of the Murumanyama tree can treat stomach pains is probably they contain a base or a salt that can neutralize the acids in the stomach”. Another argument was given by the traditional who said “With my traditional drugs, I can treat all sexually transmitted infections and if there is person who does not reproduce, the drugs can help effectively”. This suggests that science teachers can make use of the traditional ways of treating diseases as they develop their lessons, for example when teaching concepts like Human fertility.

However, caution need to be taken before using these drugs since it necessary to establish scientific efficacy of the drugs before their use for humans. There is need for science teachers to select these IK of traditional medicine and decide where and when they can fit into the science curriculum. This calls for practitioners to carry out some scientific tests so as to ascertain the applicability of the drugs in science lessons. Since the names of the plants were given in local vernacular language, there is need for teachers to check whether the language is suitable for all students or not.

The knowledge that this study was focusing on was the IK of medicinal plants held by the Chivi community. Participants indicated that this form of knowledge is obtained from the community elders as its custodians. Examples of these elders include traditional healers, herbalists and any person entrusted with a post of social responsibility in the community. From the discussions during interviews, some participants indicted that for learning to be meaningful, there is need for schools to consider the knowledge from these knowledge holders. This suggests that despite differences in terms of cultural groups communities can have, teachers can still use valuable knowledge in the school science. However, not everything from IK can be useful in science

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classes. There is need for teachers to select suitable materials from IK that they can use in their science lessons.

Conclusion

This study revealed that the people in Chivi District hold that the knowledge of traditional medicines is important and relevant to the teaching of science in schools. However, not all aspects of IK of medicinal plants are relevant to the teaching of science in schools. Such community knowledge could be regarded as experiential knowledge that teachers can extend upon and use it as scaffolds in concept development. There is need for the teacher to check from students in lessons what they regard as real to them and use them to develop lessons. Modern science cannot do it alone hence there is need for integration of IK from the community into science to ensure relevant learning of concepts in schools.

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