



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

# IJDR

International Journal of Development Research

Vol. 12, Issue, 05, pp. 55889-55897, May, 2022

<https://doi.org/10.37118/ijdr.24262.05.2022>



RESEARCH ARTICLE

OPEN ACCESS

## DESTIGMATISATION OF INDIGENOUS PHYSICS AND PROBLEMS IN AFRICA: PERSPECTIVES FROM PHYSICS TEACHERS AND COMMUNITY ELDERS

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### ARTICLE INFO

#### Article History:

Received 10<sup>th</sup> February, 2022

Received in revised form

17<sup>th</sup> March, 2022

Accepted 20<sup>th</sup> April, 2022

Published online 20<sup>th</sup> May, 2022

#### Key Words:

Destigmatisation, Indigenous Physics (IP), Western Physics (WP), Indigenous Physics Knowledge (IPK).

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### ABSTRACT

**Introdução:** A avaliação clínica farmacêutica contribui para o acompanhamento da saúde na hipertensão, reduzindo riscos e promovendo o bem-estar do paciente. **Objetivo:** Elaborar um algoritmo para auxiliar no raciocínio clínico e na conduta do farmacêutico diante do paciente hipertenso baseado nas recomendações das Diretrizes Brasileiras de Hipertensão Arterial 2020. **Resultados e discussão:** O algoritmo sugere a classificação dos resultados da aferição da pressão arterial, a estratificação do risco cardiovascular, as recomendações farmacológicas e/ou não farmacológicas e encaminhamentos. O algoritmo contribui para a adesão à farmacoterapia, para a autonomia dos pacientes e proporciona padronização das ações.

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Citation: Edson Mudzamiri and Ensem Tashayenyika Madzudzo. "Destigmatisation of Indigenous Physics and Problems in Africa: Perspectives from Physics Teachers and Community Elders", *International Journal of Development Research*, 12, (05), 55889-55897.

## INTRODUCTION

Indigenous knowledge (IK) in different nations has persistently been ignored, misunderstood, decimated, vilified, stigmatized, and relegated as valueless for many centuries (Kwanya, 2020; Tharakan, 2017). This paper presents the views of Advanced level physics teachers (ALPT) and Elders on destigmatisation of the teaching, learning, and practice of Indigenous Physics (IP). The study focused on their views on destigmatisation of IP in relation to the solving of social and economic problems in Africa. This research is based on the realization that IP provides valuable knowledge and technology resource base that has immense potential to alleviate many socio-economic problems in indigenous communities in Africa and even beyond (Emeagwali & Shizha, 2016; Tharakan, 2017). Indigenous Knowledge promote local solutions and a healthy, sustainable lifestyle and environmental protection (Bredlid, 2013). As IP is part of IKS, it is often well-suited to addressing local needs using available resources (Baquete, Grayson, & Mutimucio, 2016). The IPK empowers members of indigenous societies with abilities and capabilities to deploy and employ practical techniques and skills to manage their environment and to find solutions to their problems (Emeagwali & Shizha, 2016).

This paper presents views of ALPT and Elders on the need for the destigmatisation of IP. It reminds indigenous people of their lost heritage and develop positive attitude towards their IP inclusive of its associated practices. It also challenges the inaccurate stereotypes about IP and highlight factual information that induces perspectives transformation. The paper tries to challenge the cultural domination, universalization, and rationalization of western science which negates other forms of knowledge. It provides a counter narrative to romanticisation of WP that it is universally accepted, objective, culture independent and representative of the highest form of logical reasoning (Baquete *et al.*, 2016). The other objective of the study is to challenge and interrogate the dilemma of exclusively introducing western-based scientific knowledge in cultural contexts based on indigenous epistemology with the hope of creating not competing but complementary frameworks. A background to the study is going to be discussed first and key terms are defined in context. Research questions that guided the study are cited and findings are also discussed. The paper finally proposes some recommendations that may be adopted to destigmatise IP and its practices.

**Background to the study:** The term 'Indigenous Physics'(IP) denotes the study of knowledge of matter, energy, forces, skills and

philosophies developed by societies during interaction with their natural surroundings (Mathias Sithole, 2016). Indigenous physics or science used interchangeably by Mathias Sithole (2016) is experiential knowledge based on a worldview and culture that is basically relational. Indigenous Physics constitutes the local knowledge which was critical in decision-making and fundamental aspects of day-to-day life. Indigenous physics is a reservoir of critical scientific knowledge, skills, technology, and practices that are compatible with the African contexts (Govender & Mudzamiri, 2021). This gives it power to offer effective solutions to social and economic problems in Africa such as droughts, energy crisis, environmental degradation, pollution, global warming, and wars (Mapira & Mazambara, 2013). Indigenous physics is part of Indigenous knowledge (IK) known for its resilience and ability to describe, explain, predict, and negotiate nature (Shizha, 2011). It has always been generated in order to solve, societal and natural challenges like weather changes, shelter, communication, food, wars and diseases (Chirimuuta, Gudhlanga, & Bhukuvhani, 2012; Mathias Sithole, 2016)

In Zimbabwe and other African countries IP has been stigmatised with the advent of colonialism, modern religion, continuing colonial modernity, urbanization and western scientism (Kwanya, 2020; Ndongwa, 2017). Stigma is a mark of disgrace that sets a person apart from others (Stone, Frost, Van Norman, & Casey, 2010). It also refers to the negative regard, inferior status, and relative powerlessness that society collectively accord to people who possess a particular attribute or belong to a particular category (van Schalkwyk, 2018). The stigmatised are ostracized, devalued, scorned, shunned, ignored and their identity is spoilt. They are denied their rights by exclusion and marginalization. In the context of this study a stigma is the negative regard, negative connotations, inferior status, and relative ineffectiveness that society has accorded to IP, its owners, custodians and practitioners. Stigma originates and is perpetrated with those in power against others with less power (Link & Phelan, 2001) like what the colonialists have done to African indigenous physics. The stereotyped attributes have led to its exclusion in the African problem-solving discourse. The norms and practices regulating the acquisition and transfer of IPK have also been stigmatised. The teaching and learning of IP have also been stigmatised in both formal and informal education systems. This has resulted in limiting its transmission and application amongst people and ultimate contribution to socio-economic development of indigenous communities and their countries at large. Indigenous physics has been stigmatised as being at odds with scientific knowledge (Baquete *et al.*, 2016), unsystematic (Tanyanyiwa, 2019) and as dangerous to non-indigenous people if freely shared (Handayani, Wilujeng, Prasetyo, & Tohir, 2019). Stigmatisation has forced Africans to underplay, underestimate, despise, and abandon IP to adopt WP (Tanyanyiwa, 2019). Western Physics practices are alien to Africans inclusive of their physical, social, cultural and economic contexts (Govender & Mudzamiri, 2021; Ndongwa, 2017). Western Physics which is part of WS commonly called 'scientific knowledge' is a cultural artefact of 'Western' culture often well-suited to addressing western social and economic problems (Baquete *et al.*, 2016). Western refers to Eurocentric, and includes countries outside Europe where the dominant cultural identity is derived from Europe, such as the USA and Australia (Dussel, Krauel, & Tuma, 2000). Africans have abandoned their rich IP which has unfolded over the centuries and sustained a number of generations since the dawn of human history (Handayani, Wilujeng, Prasetyo, & Triyanto, 2019; Peter, 2015). Indigenous Physics like other IK disciplines is now less widely known and valued in Africa and is in the danger of being lost (Chirimuuta *et al.*, 2012; Tanyanyiwa, 2019). Stigmatisation of IP is among the factors that contributed to a plethora of social and economic problems in Africa as the alien WP cannot fully address them. Africa is also reeling under a series of chronic, physical, social, economic, and political crises (Ndongwa, 2017; Simons & Keil, 1995) as a result of the exclusion of IP knowledge from the problem-solving equation because of this stigmatization. Destigmatisation is an understudied social process in which the negative outcomes for a previously stigmatised group improve (Negro, Williams, Pontikes, &

Lopiano, 2021). It involves removing association of shame or disgrace and negative connotation from something once regarded as shameful or disgraceful (Stevenson, 2010). In the context of this study it refers to removal of shame, marks of disgrace, and negative connotations from IPK, its associated practices including teaching and learning. This is done in order for IP to be reclaimed, revitalized, adopted, applied and shared freely amongst people with the hope of minimising problems in Africa.

**Statement of the Problem:** Africa is experiencing social and economic problems which can perhaps be solved by ideas from IP or its integration with WP. Europeans have stigmatised African IP knowledge resulting in its exclusion in solving African's socio-economic problems. These problems in Africa include droughts, food insecurity, energy crisis, environmental degradation, pollution, global warming, and wars. Africa has become a net importer of food and agricultural products (Rakotoarisoa, Iafate, & Paschali, 2011). Western science adopted by Africans has been implicated in many of these problems including world's ecological disasters (Snively & Corsiglia, 2001) like drought. Western physics has led to excessive draining of atmospheric water through cloud seeding (Shukla, Singh, Sarkar, & Mehta, 2021) leading to drought and climatic change. Western physics is seen as increasingly problematic and counterproductive (Snively & Corsiglia, 2001). Western Physics has not always provided innovative and long-lasting solutions in arresting Africa's developmental woes (Ndongwa, 2017). If African IP is taken seriously, it can help in generation, provision and enhancement of knowledge that can be used in solving some of these problems (Mathias Sithole, 2016). Focusing on IP would shift people from the preoccupation with the scientific knowledge that has generally failed to sustainably improve the lives of the majority of the poor in African countries over the last decade (Kwanya, 2020). Although a lot of work has been carried out on stigma reduction (Heijnders & Van Der Meij, 2006), less work has been done on the reduction of stigma on IP so that it can be taught, learnt, practiced freely and embraced in socio-economic development programmes.

This background of the realization that IP is compatible with Africa's environments and socio-economic contexts and can offer solutions to problems in indigenous communities has motivated the researcher to undertake the study. Indigenous Physics need to be destigmatised and demystified so that Africans can comfortably teach, learn, and apply it. The purpose of this paper is to challenge and interrogate the dilemma of exclusively adopting western based physics knowledge at the expense of IP.

### Research questions

- What are the conceptions of Advanced Level Physics Teachers and Elders in Masvingo District about IP and its stigmatisation in Zimbabwe?
- What are the socio-economic problems in Zimbabwe that can be solved by application of IP according to Advanced Level Physics Teachers and Elders in Masvingo District?
- How can destigmatisation of IP be done according to Advanced Level Physics Teachers and Elders Masvingo District.

**Theoretical Framework/ Conceptual framework:** The study is premised upon Post-colonial theory and Afro-centricity theory ideas grounded in interpretive indigenous research paradigm to allow a systematic challenge to western epistemology. Post-colonial Theory illuminates the link between the past, present and the desirable state of the Indigenous physics knowledge. It is the social and political context under which stigmatisation of IP was perpetrated. Indigenous physics knowledge has undergone stages of colonization, decolonization, and recolonisation. There is negation of IP as a valuable knowledge and this is similar to what Kapoor and Shizha (2010) view as a form of cognitive imperialism that denigrates some other forms of knowledge. Post-colonial theory challenges the formally colonized to reclaim and revitalize their lost intellectual, social, political, economic, and cultural values to re-establish a rich knowledge base (Mashoko, 2014). Post-colonial theory rejects the

hegemonic power of one knowledge system over another (Mashoko, 2014). Afro-centricism brings in the theoretical framework, African identity and expresses the intense need for Africans to be re-located scientifically, socially, historically, economically, politically and philosophically. Afro-centricism asks questions like "What would Africans do if there were no whites?" to answer the questions, Africans would live the way they used to live if there were no whites (Molefi Kete, 1998). Afro-centricism is against all that takes western things as worthy and disregards African way of doing things (Montle, 2020). The two theories emphasize that there is the need to revisit, recognize, acknowledge, and revitalize African cultural ways of doing things to bring back the lost heritage of wisdom and African identity. In the context of this study the two theories that formed the theoretical framework do not seek to allow IPK to occupy all space and time or to replace western physics which dominates the world. But suggests pluralism in philosophical and scientific views without hierarchy. Popp (2018) notes that both WP and IP approaches have their strength and can complement each other.

**The Paradigm:** The study was based on the interpretive African-indigenous paradigm. The choice of this was premised on the fact that the study was done through an African perspective. The study also focused on generating views from people within their Shona culture. It allows information of indigenous people which is not documented to be captured through discussions thus integrating indigenous voices in the study. Lowan (2012) posits that, in an indigenous paradigm, knowledge holders (participants) share community knowledge with the researchers as cultural associate, a community, and also as a family member. The researcher needs to operate within the Indigenous Interpretive Research framework to provide an insider description of the community and the researcher's IK.

## METHODOLOGIES

Qualitative data were collected from the descriptive multi-case study using interviews, and focus group discussions for teachers and cultural talks for Elders. The use of multiple methods and sources for gathering data from the participants improved the trustworthiness of findings and authenticity of the research process. Questions for the interview were both open and closed-ended, based on the respective specific objectives of the study. There were 40 participants in the study: 18 physics teachers who were purposefully and conveniently selected from eight (8) local high schools and 22 elders from a rural community who were selected by convenience sampling in Masvingo District, Zimbabwe. Permission to apply the data gathering instruments to elders and schools was granted by the District Administrator (DA) and the ministry of primary and secondary education respectively. The authors also worked through various levels of local authorities to gain access to the respondents. It was disclosed to the participants that their participation was voluntary. Data was collected separately from the community elders and physics teachers because the two groups of participants could not be brought together for the purposes of the study because of the school timetable.

The researcher used conversational thematic data analysis (Kothari, 2005). Data analysis proceeded from pre-coding, actual coding, categorizing data, and production of themes. Themes are illustrated with direct quotes from the focus group discussions, field notes, and one-on-one interviews. Themes are units derived from conversations, vocabulary, recurring activities, meanings, feelings of participants (Braun & Clarke, 2006). Data related to the themes was presented in narrative form supported by excerpts from responses of the participants. The excerpts were inserted to validate the themes. Only participants' validated verbatim English translations of excerpts were given to save space. Pseudo-names were used to ensure anonymity and confidentiality of the participants and their respective institutions. Authenticity of data was ensured by taking detailed field notes and allowing the participants to check the information on written account as informed by (Lincoln & Guba, 1985).

**The participants:** In multi-case research, the cases should be similar Stake (2013). In this study all the participants were involved in interactions with Indigenous physics knowledge and practices in some way. Masvingo district where the study was conducted is one of the seven districts of Masvingo Province which is largely populated by Karanga tribe with a sizeable number of groups still observing their traditional lifestyle and cultural practices (Makamure, 2015). These people mainly practice subsistence agriculture and mining of gold. They also developed traditional musical instruments like the mbira and drums which are used in cultural ceremonies like rainmaking (mukwerere). While 60-80% are now Christians, some still worship and respect (as in Uhnu/Ubuntu) their ancestors (Makamure, 2015). Their traditional cosmology belief is in the existence of the Supreme Being (Musiki) or Creator of Human Beings (Mwari in Shona) that controls the universe (Rutsate, 2010). Colonization occurred when the Portuguese invaded parts of the country in the 16th Century and the British in 1890 and their colonizing influence still permeates this society today, suppressing the indigenous way of living and distorting the cultural and intellectual norms of the indigenous people.

**Elders:** The Elders were purposively and conveniently sampled from Karanga speaking Zimuto community. Most of the elders had been in the area for more than 40 years and their average age was 65 years. All of them grew up in the area with their parents who were mainly peasant farmers living traditionally and depended mainly on local resources and traditional technology for their livelihood. The majority of elders had not attended school beyond ordinary school level. The sample had 22 elders and represented a broad spectrum of Indigenous Physics knowledge specialists. The sample of elders included peasant farmers, hunters, fishermen, traditional healers, "witch doctors" (masvikiro in Shona), Traditional / Sacred practitioners, and assistant to the chief. The sample of elders had a fair representation of both men and women which enabled the researcher to get information about Indigenous physics knowledge associated with both men and women. Rifkin (2016) posits that demographic diversity strengthens research. Elders in the community were considered the repositories of IK and its associated Indigenous physics knowledge.

**Teachers:** The eighteen physics teachers from the eight local high schools who were interviewed together with the other teachers formed the focus group (a total of eighteen). The teaching experience of the teachers ranged from 6 years to 25 years, with an average of 8 years. They were all trained and qualified to teach physics. All of them had teaching qualifications from teacher training institutions in Zimbabwe. The average age of the teachers was 32 years. Fifteen of the eighteen teachers came from Masvingo Province. Teachers were involved in the study as they act as filters through which knowledge and experiences are screened for meaning (Zipf & Harrison, 2002).

**Findings and discussions:** Findings were based on the experiences and views of the participants as shared in their own voices. The following themes emerged from thematic analysis of data from the participants: Acknowledgement of awareness of the existence of Indigenous Physics knowledge; Effects of stigmatisation of the teaching; learning and practice of Indigenous physics knowledge; Problems that can be solved by application of IP with subtheme that included IP and Technological problems IP and Environmental problems and IP and food security and views of participants (teachers and elders) on possibility of destigmatisation IP. These themes are presented and discussed below.

**Theme 1: Acknowledgement of awareness of the existence of Indigenous Physics knowledge:** This theme emerged from the analysis of the responses of participants that indicated that they were aware of the existence of IP. The analysis also revealed that the majority (95%) of the participants inclusive of all the teachers were aware of the existence of IP. Some of the participants during an interview commented that

*We inherited this important knowledge that is being used in our community which you are calling Indigenous Physics from our*

ancestors who have been using it for a very long time. Our Elders would tell us this Knowledge during our traditional cultural meetings (Elder Moyo). We find IP in our IK. It is that knowledge that people in communities apply when designing and making their tools and managing their environments (Teacher Tom).

The quotations indicate that IP is known by people who are also aware that it has been in use for a long time. This agrees with M Sithole (2016) who argues that “Indigenous physics knowledge” has been there from time immemorial and was used to provide solutions to societal problems and natural challenges. FAO, IFAD, UNICEF, WFP, and WHO (2018) argue that IP has been repeatedly and continuously been employed for centuries in everyday activities of indigenous people and was effective (or was locally perceived as such). The excerpt also indicates that IP is generally transmitted orally from generation to generation through informal traditional learning platforms and this is confirmed by Khupe (2020). However, only 5% expressed ignorance of the existence of IPK. This might have been as a result of personal indiscriminate where IP was not being recognized as important. Some were not conscious of the fact that some of their IK and practices were actually IP or its application as the knowledge was expressed in non-conventional science terms and nomenclature in their communities and was not conforming to formal aspects of “standard scientific account.”

**Theme 2: Effects of stigmatisation of the teaching, learning and practice of Indigenous physics knowledge:** Some elders confessed that they were no longer applying their IPK and practices well. They indicated that some IP practitioners and custodians have abandoned the practices completely because of some stereotypical threats and the interrupting cognitions produced from stereotype awareness. This is captured in the excerpt below:

*Europeans have allowed all IPK and practices to fall under the rubric of witchcraft, sorcery, and wizard because of their little knowledge about this knowledge and associated practices. We are now ashamed of being caught using some of this type of knowledge but long ago it was an acceptable norm. Nowadays things have changed (Elder Magumbo)*

The excerpt indicates that there is good and bad IP and the colonizers have categorized them all as bad (witchcraft /uroyi/ubuthakhathi). Unlike bad IP which is used to harm and fix other people, good IP include that IPK that can be applied in the solving communities’ socio-economic problems. The excerpt also shows that IP practices were acceptable in their societies before colonization. This is similar to the observation by Sibanda (2013) that early anthropologists, missionaries and colonial administrators tended to describe African indigenous knowledge through misleading terms such as primitive, superstition, magic, witchcraft and fetish because they misunderstood Africa. This also agrees with Khupe (2020) who asserts that Colonial authorities, the world over, have persistently ignored, misunderstood and even decimated indigenous peoples and their knowledge. Chishti and Chishti (1991), posits that IK was labeled as primitive, out-dated and to a certain extent as witchcraft. These labels indirectly forced elders and other IP practitioners to conceal the “useful” stigmatised physics practices. Frost (2011) called this behavior “stigma concealment.” Participants indicated that Practitioner of IP would normally switch between cultures which involve demonstration of bicultural competences to avoid being noticed and even hide from other people to avoid discrimination. The problems that were revealed by the participants are captured in the following excerpts.

*Aaaaa. We live within societies structured in ways that perpetuate IP stigmatisation. We enter into social interactions with an expectation that we would be rejected by others because of our stigmatized social status and indigenous physics practices. This is not good (Elder Moyo).*

*Indigenous Physics practitioners live a stressful life every day. They are directly discriminated from participating in some events, receive poor services in public places like stores because of*

*stereotype, and prejudice as a result of their stigmatized status, and labeled indigenous physics practices (Teacher Mufari). Aaah....We sometimes become targets of assault, harassment, and bullying. We are not protected from all forms of discrimination. We are normally targeted by witch hunters Tsikamutanda or tsikamutandas-plural who are usually hired by our chiefs and village headmen. These would sniff out and pounce indiscriminately on our indigenous physics artefacts some of which are used in our indigenous atmospheric physics practices associated with rain making. The Tsikamutandas would declare us scornfully as dangerous witches in the area. This is painful, particularly when people view us with suspicion and horror (Elder Dumbu).*

The excerpts indicate that those people who are seen to be associated with IP and its practices are always stressed by the way they are treated in their communities. They revealed that even the strategies they device to cope with the stigmatisation like stigma concealment are also stressing them. This resonates well with an observation made by Frost (2011) that stigma concealment is stressful because it produces cognitive burden resulting from fear of being discovered. Frost (2011) also observed that the expectation of rejection, regardless of whether the rejection occurs or not produce a cognitive burden that constitutes stigma related stress. Participants bemoaned the ineffectiveness of the existing laws in protecting them. The participants revealed that IP practitioners are not protected from people like Tsikamutandas who used to harass them. Tsikamutanda/tsikamutandas (plural) refers to a group of self-proclaimed illegal male prophets and traditional healers who are neither registered as prophets nor traditional healers as required by the Zimbabwe Traditional Medical Practitioners Council Act, Chapter 79 (Duri, 2017). The lack of protection of IP practitioners is captured in the following excerpts:

*There are Witch hunters called Tsikamutanda who are sometimes sanctioned and blessed by the traditional chiefs and headmen to go and hunt for witches in communities. Honest Indigenous Physics users are also caught in the crossfire and forced to admit that they are witches yet what they have is not witchcraft, but it is useful knowledge and practices that have sustained their people for generations. What is wrong with their indigenous rain making practice if I may ask? (Teacher Moyo)*

The excerpt indicates lack of protection of IPK custodians and practitioners from the government and even the local leadership like chiefs. The quotations indicate that the people are convinced that IPK is useful and not bad although it can be abused in some cases like in the case of “Bluetooth sex”. This agrees with van Schalkwyk (2018), who argues that although laws prohibiting mankind from discriminatory life events related to stigmatized status exist, many stigmatized individuals are not protected from multiple forms of discrimination even by policy. Also emerging from the excerpt is the willingness of Elders to share the knowledge once the stigma is removed.

**Theme 3: Examples of problems that can be solved by application of IP:** Participants argued that there are socio-economic problems in their communities and Zimbabwe in general that can be solved by applying IP. They indicated examples of problems that can be solved by application of IP if people can be allowed to freely use the knowledge.

**Subtheme 1: Indigenous physics and Technological problems.** Areas where IP can be applied in solving technological problems were consciously and unconsciously given by the participants as they tried to expand their responses during the interviews and cultural talks. Analysis of data indicates that 95% of the respondents believe that IP can go a long way in helping in solving technological problems. This statistic suggests an overwhelming support for the need to revitalize indigenous physics knowledge arguing that the methods involved are effective in solving technological problems if all traditional rules and regulations are explained and followed. On the

contrary 2.5% of the respondents saw nothing being offered by the traditional approach in solving technological problems. The 2.5% expressed reservations. This might have been caused by the lack of knowledge on Indigenous Physics Knowledge. Participants revealed technology related problems that could be solved by IP. The IP that were revealed included creation of man-made lightning (mheni) which can be used for electric power generation and indigenous lightning arresters which could be used to protect people and animals from lightning. This is captured in the excerpts below.

*Our ancestors taught us traditional ways of creating lightning and using lightning but those who still remember how it is done normally do it privately because people have labelled the practice as witchcraft (Elder Shungu). Some Indigenous Physics practitioners in our community can create and control lightning. I believe people would benefit if the power from lightning can be harnessed and channelled into the national power grid. There is a huge voltage that is associated with lightning strikes (Elder Juru). People used to fight using manmade lightning (mheni) as one of their indigenous weapons. In some cases the targeted enemy would divert or diffuse the lightning strike to protect himself from the strike. This Knowledge on how to divert lightning strikes which is found in Indigenous Physics Knowledge associated with creation of lightning/mheni may be applied in the designing of Indigenous lightning arresters which can also work as over-voltage protectors to save life, properties, and forests from veld fires. These indigenous lightning arresters may be used to harness lightning strikes from both natural and man-made lightning which can then be converted to heat for thermal power stations or mechanical energy (Teacher Munda).*

The three excerpts indicate that the IPK has been orally passed on from past generations. However, some people have already forgotten how some of the practices are done. Baquette *et al.* (2016) and Handayani, Wilujeng, Prasetyo, and Triyanto (2019) confirm that IK is at risk of being lost in many parts of the world. Covert practice of indigenous practices is also evident in the excerpts. There is also evidence of abuse of the knowledge where it is used in fights although society does not approve it. Western physics views lightning as an electrical discharge caused by imbalances between storm clouds and the ground, or within the clouds themselves. Participants also suggested that IPK should be formally protected just like WP as captured below

*Our Indigenous Physics Knowledge should be recognized and protected. Since there are a number of international standards of lightning protection systems our own African standard may also be crafted and get registered so that we can openly apply this type of physics knowledge (Teacher Guyo).*

In the excerpt participants reveal that IP needs recognition and protection. The participants indicated the need for establishment of African standards for indigenous lightning protection systems. The international standards for lightning protection systems include NFPA 780 and 781 which are based on American standards (Ullah, Baharom, Ahmed, Luqman, & Zainal, 2017). In western physics a lightning arrester (also called lightning diverter) is a device used on electric power systems and telecommunication systems to protect the insulation and conductors of the system from the damaging effects of lightning. Some lightning arresters are made of Zinc oxide. The views from the participants indicate that the need to use IP particularly in creation and arresting of lightning. This may lead to solving of problems such as shortage of power for industry, load shading, use of unclean sources of power that cause pollution like biofuels. Indigenous remote Communication systems were also cited as another area where IP has a role to play in solving problems. The existence of remote indigenous communications practices is also confirmed by van Schalkwyk (2018) who metaphorically called the practices "African Bluetooth system". In the study the existence of "African Bluetooth system" is implied in the following excerpts

*We have our own indigenous ways of communicating even with relatives who are not in our sight, we can even show videos as we communicate with them in a similar way that people would do when using Skype and Watsup video calls (Elder Moyo).*

*There is Indigenous Bluetooth technology in the communities which looks more advanced, simple, and cheaper than western physics I am surprised to hear that scientists are celebrating blue tooth technology as a recent and modern invention which came in the 1990s when we had it since time immemorial (Teacher Gura).*

In the excerpts the participants are indicating that some aspects of IP were used well before their WP counterparts. His views resonate well with Peter (2015) who asserts that people have embraced WS and technology and assimilating Africans' science and technology as though there was nothing like that before. Zeadally, Siddiqui, and Baig (2019) note that, Bluetooth technology was developed by L.M. Ericsson in 1994. Bluetooth's technology allows devices to communicate with each other without cables or wires (Zeadally *et al.*, 2019). In the IPK case two bodies or devices also communicate without coming into contact.

The reason was captured in responses below.

*The Indigenous-blue-tooth technology practitioners were never given a platform to freely give details of the practice because of stigma associated with it. The morally acceptable applications of indigenous blue tooth technology remain a secret and only the immoral application is published and publicized like mubobobo which is described as magical, mystical, and spiritual. This is painful (Elder Hari).*

Participants revealed that people usually publicize the immoral application of African Bluetooth technology like Mubobobo which Sibanda (2013) describes as mystical and magical remote sexual intercourse. This selective approach was an attempt by colonialists to discredit the biophysics involved and justify its exclusion from the scientific discourse.

*Western physicists have been given a platform to disclose that their Bluetooth technology relies on short-wave radio frequency and employs radio technology called frequency-hopping spread spectrum. With more research the technology which started as an optimal "short-link" radio technology standard for transmitting signals between personal computers to wireless headsets is now being applied in many spheres of life. I wish to see this also being done with our own Indigenous blue tooth practitioners (Teacher Muti).*

The responses of the participants indicate that there is good and evil application of IP. The use of "Mubobobo" is one of the evil applications. Participants advocated for the Indigenous blue tooth technology practitioners to be given a platform to explain their practice. This may allow them to reveal some of the good uses of indigenous blue tooth systems. If more research is on African Bluetooth is allowed, more uses will be discovered just like in the Western Blue Tooth Technology.

Transport problems were also cited as one of the technological problems that can be solved by application of IPK. Some participants gave the following examples which demonstrate that IPK was being used in transport and the practice has been stigmatised. Participants revealed indigenous transport systems that have also been labeled which could be harnessed to augment the current transport systems. The reed basket (Rusero) flying, use of traditional canoes (magwa), Slide (*mutserendende*) and the riding of nocturnal animals like hynas are some of the IP practices that emerged from the data.

*In this community, some people also ride nocturnal animals like hyenas and use them as means of transport like we do with domesticated versions of wild animals such as donkeys, horses, and cameras. We do not know how they do it because they do it*

secretly (Elder Moyo). I strongly believe that if the indigenous bio-physics involved in the riding and terming of these nocturnal animals is destigmatised and demystified transport problems will be reduced. People would freely teach each other the indigenous bio-physics involved in the practice and also improvements would be made through research where necessary (Teacher Moyo). If the aerodynamics, aviation physics, and aerospace physics involved in flying of Rusero are destigmatised, demystified, adopted, and adapted people would do away or minimize the use of aircraft and drowns which causes air and noise pollution and requires expensive infrastructure and specialized training. Transport problems will be reduced (Teacher Zulu).

The excerpts indicate acknowledgement of the use of Rusero and nocturnal animals as modes of transport. Literature also indicates that indeed the two are used as indigenous modes of transport (Sibanda, 2013). van Schalkwyk (2018) indicates a story in The Sunday Mail of 12 April 2015 of someone who confessed that she had “flown” unimaginable distance in a reed basket. van Schalkwyk (2018) adds that the same newspaper, in 2014 reported that the residences of Budiriro in Harare discovered two people whose reed basket “crash-landed” in the suburb. The two claimed that they had flown from a rural location during one of their several night-time escapades. Flying or riding the backs of night animals through the darkness of the night is labeled as humanity’s dark side in the Zimbabwean imagination (Mbiti, 1990). Night runners of the Bukusu of western Kenya are also among tribes who ride on nocturnal animals and do not consider the practice as witchcraft (Blunt, 2020).

#### Theme 4: Indigenous physics and environmental problems:

In Zimbabwe many rural communities are now vulnerable to drought and, hence, experience hunger and malnutrition from time to time (Gasana, Bell, Kajume, Mupindu, & Smith-Jon, 2011; Shava, 2016). Data indicated that environmental problems like drought can be solved by application IPK. Indigenous physics’ atmospheric management practices were also revealed. These practices had stood the test of time, embodying the knowledge of dealing with different atmospheric problems and challenges accumulated over several generations. Analysis of data shows that 97.5% of the respondents believe that indigenous knowledge can go a long way in helping in solving environmental problems in Africa. This belief was supported by a sentiment from one of the teachers in an interview captured below

*Oooh..., Western science is damaging our environment. I think we need another way of knowing like our own indigenous African ways of managing the environment (Elder Taru).*

This is also supported by literature which indicates that scientists have recognized that indigenous people have managed the environments in which they lived for generations without significantly damaging the local ecologies (Tanyanyiwa, 2019). On the contrary the 2.5% of the respondents saw nothing being offered by IP in solving environmental problems. Indigenous physics strategies of managing the environment were captured in the following excerpts

*We used to conduct rain making ceremonies (mukwerere) which greatly reduced the frequency of droughts and famine in our land. The chief would call for a meeting with the elders when he saw that people were starving and live stock was dying. This was good (Elder Doro). Some people in our village can disperse rainclouds using indigenous physics. Even when it is about to rain they can cause the clouds to disperse or disappear from the sky. This is a way of reducing possibilities of heavy rainfall that can cause floods and loss of life and property. I am sure there are stubborn members of the community who do this to fix other people, this is not good and is against the spirit of Unhu/ Ubumthu (Elder Tugu). Indigenous Physics Knowledge of atmospheric physics associated with rain making (Mukwerere) may also be applied to minimize*

*instances of droughts in Africa in place of cloud seeding which causes acidic rainfall among other problems. Acidic rainfall has rendered the world communities vulnerable to dreadful threats of climatic change, global warming, disappearance of biodiversity and desertification (Teacher Gura)*

The excerpt indicates that indigenous people have scientifically valid conception of indigenous weather predictions and manipulation. This was also noted by Riffel, Luckay, Angaama, and Magaseti (2016). The people are skeptical about the use of modern methods of mitigating drought like cloud seeding. State-of-the-art cloud-seeding methods have been adopted before but are costly, less effective, risky, and time-consuming (Shukla et al., 2021). Cloud seeding is the dispersion of substances into the air (clouds) that saves as cloud condensation nuclei or ice to increase precipitation (Shukla et al., 2021).

#### Theme 5: Indigenous physics and food security problems,

Agriculture probably comprises the largest collection of indigenous practices worldwide (Aluma, 2004). Zimbabwe has faced numerous disasters ranging from recurring droughts and floods, which have threatened the country’s food security (Chikoto & Sadiq, 2012). Food security is “when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for a healthy and active life” (FAO et al., 2018). Analysis of data indicates that 97.5% of the participants agreed to the fact that IPK can improve food security as it can be applied in Agricultural practices. This agrees with arguments made by Ponge (2011) and Ebhuoma and Simatele (2019) who posit that IK plays a substantial role in food security and improvement of agricultural productivity. Only 2.5% of the participants disagreed and argued that it is only a belief not a reality. Elders gave examples of how they used to ensure food security in their communities and the IP methods which they disclosed are captured in the quotes below.

*Aaa. We have been using our IP such as sky, clouds observations and wind direction to forecast weather, determine when to prepare our fields, the type of crops to plant and even the quantity of crops to grow in a particular season. For example hot and sweaty weather indicates a high probability for the onset of seasonal rainfall (Elder Chuma).*

*Divisi used to make people in communities have enough food for their families but the people who used to practice it have abandoned it and are starving because they now claim to be Christians. We have failed to demystify this seemingly enigmatic practice which was eventually labeled witchcraft despite its power in ensuring food security and food sovereignty (Elder Shumba).*

The excerpts reveal that IP can improve food security. They also reveal the covert application of the IPK and also the negative influence of religion on the use of this type of knowledge. A few farmers use IK to adjust their farm practices or diversify their production to respond to local climate variability (Ebhuoma & Simatele, 2019). Also, very few farmers use a combination of meteorological information and IPK for their weather and seasonal climate forecasting decisions (Humbe, 2018; Nyadzi et al., 2018). There are strong calls to integrate scientific and indigenous forecasts to help farmers adapt to climate variability and change (Kwanya, 2020). By combining both indigenous and scientific knowledge, the farmers can have a holistic understanding of agricultural resources, expected outputs, and policies needed to address shortfalls (Chikoto & Sadiq, 2012). *Divisi* is an agricultural enhancement practice that has been labeled as charm of magic (Humbe, 2018). This is believed to be a form of witchcraft among the Shona people and is common among Shona people in poor rural areas, which are largely dependent on rain-fed agriculture (Humbe, 2018). A number of participants supported the use of *Divisi* and one of them said the following

*If the force involved in the operation of divisi are destigmatised and its creation and demystified like the forces in the gravitational field of the earth, electric field and magnetic field it*

*can be fully applied and the force field associated with it will be unpacked and improvements can even be made (Teacher Badza). People do not understand how Divisi works as a result they have labeled it as an anti-social practice which has serious repercussions (Elder Tudy).*

It was also noted from the participants that Divisi breeds conflicts and causes a social security risk as also noted by (Humbe, 2018). Sadly food insecurity and poverty remain permanent features in Zimbabwe, exacerbated by persistent threats of drought (Moyo, 2011). An increasing number of national agricultural research institutions in developing countries include the study, development, and commercialization of indigenous knowledge-based production practices (Aluma, 2004).

**Theme 6: Views of participants (teachers and elders) on possibility of destigmatisation IP:** This theme also emerged from the data. Analysis of data revealed that 97.5 % of the participants believe that destigmatisation of IPK is possible and beneficial to Zimbabweans and to Africans in general. Teachers and the Elders proposed strategies that could be adopted to minimize stigmatisation of IP and its associated practices. These strategies are reflected in the following quotes.

*People should use indigenous terms to label same scientific phenomenon or equivalent technologies or technologies with similar designs or uses for example mheni in shone for lightning, rusero for aircraft or Indigenous Drown, Jerero for physics laboratories or Science research centers (Teacher Shuro).*

*Communities should acknowledge and celebrate the gains and achievements registered by practitioners in the indigenous physics field like Ndunge of Chipinge who is believed to have caused the historic Chimanimani floods disaster by his outstanding knowledge of indigenous atmospheric physics (Elder Shoko). The government should allow Indigenous physics to be taught and researched upon in schools and communities, establish in schools and communities laboratories with both indigenous artefacts and Western artefacts like Van Girraff generators from western physics used to demonstrate electrostatics and indigenous physics apparatus which are used to demonstrate electrostatics like those used to create lightning/Mheni (Elder Muto).*

This excerpt implies the establishment of integrated physics laboratories that tries to show that IP is also valued just like WP.

*Encourage people to design virtual indigenous communities representing community of practice of Indigenous Physics to facilitate more research on IKS and improving indigenous knowledge accessibility to people and learners in schools and communities. Textbooks on Indigenous physics and associated practices should be written and even posted on on-online and virtual learning and social platforms (Elder Danda).*

This excerpt implies the establishment of what we preferred to call "Indigenous Sim Communities" that allows people to appreciate the beauty of IP as it is applied naturally in the community of practice.

*Allow simulations of indigenous physics practices to be done as indigenous physics practical activities or assignments during both formal learning in schools and informal learning sessions in communities. An example may be doing practical assignments on how to create and use lightning (Mheni) using Indigenous Physics Knowledge in the same way western physics experiments on properties of lightning are done in high voltage laboratories. This way indigenous and non-indigenous people including learners would get firsthand information that Indigenous knowledge and Indigenous Physics in particular is scientific and derive from empirical processes and evidence (Teacher Kondo).*

*Allow the use of sacred places associated with indigenous physics to be used as important research sites like sacred cave (Ninga) and also allow people to visit these places freely so that more information is obtained that can lead to improvement of the effectiveness of the IP practices (Teacher Doro).*

*People should be encouraged to stop stigmatizing indigenous physics knowledge, researchers, research site (e.g. Ninga-sacred caves, graves), custodians (e.g. spirit mediums), and practitioners of the knowledge to promote archaeological inquiry (Teacher Shava).*

*Those who volunteer to divulge and demystify Indigenous Physics knowledge and practices should be accorded real authority and autonomy (Teacher Tsoro).*

The excerpts indicate ways the stigma can be minimized if not removed according to the participants. Generally, all their suggestions point to the need to improve the image of IP through the methods like using ICTs to view and share information about it. The strategies also highlight the need to prove to the people that IP is just like any other "genuine science" in terms of solving socio-economic problems in communities. Baquete *et al.* (2016) asserts that conventional 'scientific knowledge' is a cultural artefact of 'Western' culture. This implies that IP can also be considered as a cultural artefact of the indigenous people which must also be cherished. Taylor and Cameron (2016) argue that IK inclusive of its associated IP is also a science.

*Nevertheless abuses, good and bad practices associated with these heritages exists in African communities but if the Stigma is removed we will freely avail, teach, improve/refine and preserve the wealth of useful indigenous physics ideas and practices that can solve problems not only in Zimbabwe but in Africa if not the whole world (Teacher Moyo).*

On the issue of abuse of IP, the participants argued that any technology or knowledge in the hand of an evil minded person is dangerous as captured in the excerpt below

*A nuclear plant in the hands of the atomic bomb specialist is dangerous but is a useful innovation for electrical engineers who use it for the generation of thermal electric power. In the same vain indigenous lightning generation knowledge in the hands of an evil minded person is very dangerous, but for one with the heart of assisting people in power generation it is a blessing (Teacher Tsanga).*

The adoption of IP as a result of destigmatisation would liberate indigenous people from western thought pattern as also noted by (Hewson, 2015). This would allow Africans to escape from mono intellectual perspective on nature and are given freedom and opportunity for self-expression. It is like seeing the world with two eyes i.e. the WP eye and the IP one. Humanity needs two eyed seeing to deal with problems associated to humanity's well-being (Hewson, 2015). Two eyed seeing is about drawing upon the strength of WP and IP to help guide humanity through the twenty-first century.

**Implications to research and practice:** Basing on the findings of the study, the data may be suggesting that African through their traditional leadership find ways of destigmatising and demystifying of IP, their IP technologies. This would probably offer Africans chances to research on and document IPK. Africans should also reframe experiences of stigma related problems and take that as an opportunity for activism and social change to improve their social and economic positions. This may lead to social reforms which when successful can alter IPK discrimination structures. The data points to the need for organizing social marketing campaigns and advocacy that shift public attitudes regarding IP and its associated practices. Furthermore, it points to the need for efforts to correct misconceptions and incorrect ways of reasoning about IP need to be carried out. Findings also points at the need for policies and legislative frameworks against discrimination and also provide laws that encourage ethical and sustainable application of IKS and IPK in

particular. Physics dictionaries, and textbooks were complexities and mysteries around IP and its associated practices should be published and made available to people.

## CONCLUSION

The qualitative study applied postcolonial and Afro-centricism grounded in indigenous research paradigm to illuminate the issue of destigmatisation of IP in Africa. Findings of the study indicates that is destigmatisation allows people to revive, revitalize, adopt, adapt and share freely the previously labeled, stereotyped, prejudiced, discriminated and lost IPK including practices. Examples of problems that can be solved by application of IPK were revealed as power shortages, Environmental disasters, and food security. Generally, all the participants agreed that destigmatisation is possible and necessary. The study recommends that there should be efforts to provide policies and legislative frameworks against discrimination of other knowledge systems. Physics dictionaries and textbooks on indigenous physics should be published and made available to people.

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