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7. INDIGENOUS PHYSICS AND THE ACADEMY

INTRODUCTION

Contributions made by Africa and its people to history and civilization are conspicuously missing from textbooks for formal education and remain unknown to many (Ngara, 2007). It is against this background that the various aspects of indigenous physics knowledge systems should be resuscitated. This chapter analyzes some aspects of the indigenous physics knowledge systems (IPKS) and argues that IPKS did not die as a result of colonial conquest (Mapara, 2009). Further, the chapter's thrust is to heighten awareness, stimulate new thoughts and generate discussion on the wealth of IPKS as such. The analysis in this chapter is divided into four parts. The first part is an introductory analysis of what physics as indigenous knowledge is all about in relation to definitions of *physics* and *indigenous*. The second part explores the characteristics of indigenous physics, while the third section examines the existence of physics education, the methods of physics knowledge transfer, and development in indigenous African societies. Part four looks at the rationale for including indigenous physics into science education in schools. Finally, the chapter is summed up by making a conclusion to issues raised.

PHYSICS AS INDIGENOUS KNOWLEDGE

The discussion of indigenous knowledge systems (IKS) has recently taken different dimensions and scope. However, for the sake of analytical tidiness and rigor, this chapter limits its analysis of IKS to a specific type or manifestation, namely the existence of IPKS as well as its academic developmental role in the past, in the present and, by all means, in the future. Indeed, the analysis is further limited to the narrow issue of norms and practices regulating the acquisition, use and transfer of IPKS. Knowledge of 'physics' and its methods of investigation cannot be divorced from a people's history, cultural context and worldview (c.f. Shizha, 2014). Societies acquire physics concepts through their cultural values and norms. This construction of cultural physics is based on the historical and cultural worldview that shapes the people's consciousness, which in turn forms the theoretical framework within which knowledge is sought, critiqued and understood (Young, Longboat, & Kulnieks, 2013). It is indeed most gratifying to see that some African scholars (Shizha, 2013; Tanyanyiwa & Chikwanha, 2011; Mapara, 2009; Pence & Nsamenang, 2008; Mkabela, 2005) have taken on the important yet daunting task of making science

and knowledge relevant to the African realities, and criticising the Western theories and constructs that marginalize IKS and methodologies. The theories include those related to knowledge acquisition, readiness of the mind to assimilate the information as well as the methodologies used to transfer information from generation to generation.

The first term that warrants defining in this chapter is 'physics'. Physics involves the study of matter and energy in its different forms, and the transformation of matter and energy. It involves the study and understanding of the physical world and the relationship between the natures of energy and matter. Some examples of concepts in physics include forces, friction, buoyancy, cosmology, string theories, quantum theories, materials and cooling systems. All these are aspects of nature in which human beings exist as well as co-exist. The second term, 'indigenous', refers to being grown or produced in a locality. The indigenous aspects could refer to the customs or homemade tools available in and benefitting a society at a particular time. Therefore, indigenous knowledge involves experiential knowledge and addresses diverse and complex aspects of indigenous peoples and their livelihoods, taking into account their cosmos, spirituality, ontological realities, land, socio-cultural environment and historical contexts (Shizha, 2013). The discussion narrows on various forms of the nature of experience, the methods of knowledge transfer, and the pull and push factors for having such knowledge, one of which is survival. It is within these contexts that the three key terms, indigenous, physics and academy, are taken. Academy, in this sense, refers to schools, colleges and universities.

THE CHARACTERISTICS OF INDIGENOUS PHYSICS KNOWLEDGE

It is crucial at this stage to discuss the characteristics of indigenous physics. According to Mkabela (2005), indigenous knowledge systems are the complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographical centre. Indigenous physics or science, here used interchangeably, is experiential knowledge based on a worldview and culture that is basically relational. Indigenous physics may also be perceived as a way of knowing and a way of life. For that reason, the power of indigenous science seems to lie in its ability to make connections and perceive patterns across vast cycles of space and time (Worldwide Indigenous Science Network, 2013). Everyday experience indicates that indigenous science relies upon direct observation for forecasting and generating predictions. Unlike Western science, the data from indigenous science are not used to control the forces of nature. Instead, they tell us the ways and the means of accommodating nature. Again, the purpose of indigenous science is to maintain balance – balance between cold and heat and balance between biotic and environmental factors.

In addition, indigenous science is concerned with relationships. This entails the relationships between the environment and members of society. In other words, society succumbs to the dictates of the environment so as to continue surviving and to avert