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Integrating Ethiopian indigenous knowledge and international knowledge: Special emphasis on stem education

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Abstract
Indigenous Knowledge System is knowledge produced within a specific society. There are differences and similarities between the indigenous knowledge system and the International knowledge System. Integrating the indigenous knowledge system with the International Knowledge system is important for the sustainability of education. It is also vital to use appropriate technologies that are important for overall development. The integration of the indigenous knowledge system into the International knowledge system enriches the current system of education in many ways. Indigenous knowledge systems must be studied, evaluated and then integrated with the international knowledge system. Indigenization plays a significant role to use the knowledge which is found in the society for a very long period like traditional medicine, agriculture, nutrition, environmental protection and other aspects of life that enable the local people to survive for centuries. Indigenous knowledge systems now days have been receiving increasing attention in development issues. It started playing an essential role in fostering peace, economic growth, and sustainable education. This paper systematically discusses the importance of integrating the indigenous knowledge system with that of the International knowledge System, which is a new paradigm of knowledge system having a holistic approach. The paper mainly provides a framework on how to integrate the two systems of knowledge. In other words, the paper is focusing on the need for curriculum reform to integrate indigenous knowledge with an international knowledge system to enrich the science curriculum. The Implication is also raised on how to integrate the two knowledge system and develop a curriculum which is important to realize sustainable education. Hence, the curriculum reform initiative has to be taken for advancing science education.

Keywords: indigenization, indigenous knowledge system, international knowledge system, science curriculum integration

Introduction
Indigenization is integrating indigenous knowledge into the school curriculum. Integration is indigenization in the sense that the international knowledge system is dominant over the indigenous knowledge system in the present school curriculum which needs amalgamation. Integration, in this case, is making the indigenous knowledge system part of the international knowledge system to serve as the foundation of the curriculum. Indigenous knowledge System is holistic that can enrich the school education. "Indigenous Knowledge system is rich in information built through experiences accumulated for a long period" (Teshome and Sobha 2017) [23]. Integrating knowledge enriches the skill of learners from the knowledge of the local area and far from the local. Integrating indigenous knowledge with international knowledge refers to the mixing of indigenous knowledge in the current international knowledge system mainly produced in the universities and research centers. In Ethiopia, the curriculum reform agenda that focuses on the incorporation of indigenous knowledge with the international knowledge system is still in infancy. Furthermore, the emphasis given to indigenous knowledge is very minimal. The integration of the indigenous knowledge system into the school curriculum provides the necessary foundation for sustainable education. Sustainable education requires education programs that are locally relevant and culturally applicable. The present western dominated curriculum has to institute indigenous knowledge to fit into the local context and knowledge. Indigenizing the school curriculum plays an important role in developing indigenous life skills (Teshome and Sobha 2017) [23] which is significant for STEM education. STEM is an integration of four distinct fields of science, technology, engineering and Mathematic (Mpofu and Vhurumaku 2017) [15] In Ethiopia, at the policy level, the emphasis given to STEM, Science, Technology, Engineering, and Mathematics education compared to other disciplines is 70% to 30%. However, the school curriculum is largely what is copied from the western countries which are an obstacle for achieving the objective of education. Hence, to achieve the education goals in African countries like Ethiopia integrating indigenous knowledge with STEM is the key issue (Mpofu and Vhurumaku 2017) [15].

Research Methods
In this study, the content analysis focused on the analysis of selected textbooks from grade one to grade eight of the Addis Ababa School curriculum was made. The study involves a largely qualitative and decolonizing study based on text analysis. And at the same time, the historical analysis was made by the researcher for investigating the situation in the Ethiopian education system and to understand how the system was colonized and excluded the indigenous knowledge based on secondary sources. The discussion of the study will engage the various interpretations of indigenous knowledge generated from different researchers through an analysis of key texts, materials, and sources of inquiry.

Indigenous knowledge System and International Knowledge System

There is no universal definition of indigenous knowledge. In naming also some said traditional knowledge (TK), indigenous knowledge (IK), and local knowledge and so on. However, for Ellen and Haris (1996), Indigenous knowledge is knowledge unique to a specific culture or society. It is a knowledge system developed independently of modern science in different societies (John 2015) [11]. It is the knowledge that is not easily accessible to outsiders and limited to the native residents (Awor 2013). Indigenous Knowledge is knowledge rooted in a specific culture of a community living in specific geographic areas (Teshome and Sobha 2017) [23]. The international knowledge system is the knowledge generated by universities, research institutions, and other firms (John 2015) [11]. This knowledge system is not holistic. To make the existing science and technology curriculum important for the country's development effort the integration of indigenous knowledge is significant. Currently, as the researcher conducted the content analysis of the Addis Ababa elementary school curriculum, the curriculum is purely western. It is very insignificant in promoting sustainable lifestyles. Several issues are raised about the superstitious, domination and exploitation of the indigenous knowledge system due to colonization, especially in Africa. The indigenous science and technology which can easily fit the situation of the society and the local natural environment is suppressed and not part of the system of education in today's Ethiopia. In the Ethiopian context in the name of modernization, the education system completely ignored the indigenous knowledge system. Above all, the curriculum of the county is either copied or designed by a foreign expert in the country's educational history. In terms of integration, it is possible to say that the two knowledge system is integrated only to a limited extent (George 1999) [7]. The integration of the indigenous knowledge system into the school curriculum helps to enrich the science, technology, engineering, and mathematics curriculum. Indigenous knowledge and International knowledge System can be thought together, which enables students to learn from both perspectives to formulate the practical solution, and to have diverse knowledge that develops the science and technology curriculum in many ways. In this article the various way of representation of indigenous knowledge like Traditional knowledge (TK), Local Knowledge (LK), and Indigenous environmental knowledge (IEK), 'indigenous technical knowledge (ITK)', traditional environmental/ecological knowledge (TEK)', 'people's science or ethnology' identical with indigenous knowledge(IK)(Ellen 2002: [4] 236, Posey 2002: [19] 27, Gupta 2011:59) [9] and international knowledge as western knowledge and modern knowledge are summed up.

Integrating Indigenous Knowledge system with the International education system.

For centuries the two knowledge systems are not integrated into the Ethiopian school curriculum. To integrate the two knowledge systems. It is important first to identify whether there are differences between the two knowledge systems. In school curriculum Priority is largely given to modern education and indigenous knowledge is excluded (George 1999) [7]. This implies that there is a difference between the indigenous knowledge System and the International knowledge system. For Kumar and Shao (2011) [13] indigenous knowledge system is the product of empirically tested life experiences (Kumar and Shao 2011) [13]. It goes beyond the anthropocentric importance of the environment. The Indigenous Knowledge system gives intrinsic values to the environment compared to modern knowledge (White 2009). The International knowledge system is largely confined to a specific area of specialized research (Ross *et al* 2011) [20]. It is also considered as exclusive knowledge in its nature because it considered only that knowledge that can be validated through pure reason to be taken, which in other words it is a reductionist view (Sardar 1988) [21].

For Berks (1993) Traditional ecological Knowledge is qualitative, intuitive element, and holistic which does not confine to the laboratory system, unlike the quantitative, rational and reductionist approach of the modern one. Hence, integrating the two systems of knowledge help to gain diverse knowledge on how to deal with both the natural and manmade environment. It helps the local people to contribute the knowledge accumulated over centuries through experiences for the development effort.

Indigenous knowledge is holistically composed of the physical and metaphysical world linked to a moral code, and that emphasis on everyday application of skill and knowledge practically. International knowledge, on the other hand, is employing experimentation tools of measurements and theories (Branhardt and Kawagley 2005). Comparing indigenous knowledge with that of science in terms of the knowledge base, indigenous knowledge has a 'long-term information' base while science has a short-term knowledge base (Emery 2000) [6]. There are many features of indigenous knowledge that supplement science. In science to gain the same information which already found in the hands of indigenous people, one has to carry out a new investigation. However, in the case of indigenous knowledge, it is what already existed in the local system for a long period (Emery 2000) [6].

Significances of Indigenous knowledge for STEM education

Like "indigenous" or "African knowledge," the emphasis on "indigenous science and technology" is a fairly recent phenomenon. Indigenous science is usually taken to cover indigenous astronomy, indigenous physics, "ethnomedicine," "ethnobotany," "ethno zoology," as well as "ethno psychiatry," while indigenous technology refers to the application of indigenous science, the whole body of methods and materials used in such application, that is, the body of knowledge available to a civilization that is of use in fashioning implements, practicing manual skills and arts, and extracting or collecting materials(Horsthemke 2017) [10]. In some countries like India and China indigenous medicine like (Ayurveda) in India and China (Acupuncture) is given an important place in the countries health system. Traditional medicine is the main health services in Kenya. However, many of the educated citizens consider traditional medicine as primitive and give less emphasis in today's Kenyans life (Njoki 2010). Likewise in Ethiopia traditional medicine is used by many especially in the rural part of the country. However, its contribution to the overall health system of the country is insignificance (Kebede *et al* 2006) [12]. The various areas which are communicating with the people to its member associated with faith system and other experiences related to plant growing or crop cultivation,

human nutrition, motherhood, pregnancy, foodstuff preparation and preservation, medicine, animal and plant husbandry, and others area of knowledge, help to make potential to indigenous knowledge to contribute an essential component of 'global knowledge 'on various issues (Mawere 2015) [14]. The integration of indigenous knowledge is significant for STEM education in issues related to climate change. The reason is that indigenous people have long experiences in close relation to the environment. They easily understand and identify the change that occurs in the natural environment which is important to bring 'cost-effective' and sustainable 'mitigation' and alteration systems according to Robinson and Herbert (2001), and Hunn (1993) (cited in Nyong *et al* 2007). Hence, it is essential to include climate knowledge of the community in STEM education. Recently, the indigenous knowledge system is taken as signs that help to have available facts about the local environment and provide guiding practices that are indispensable for sustainable development (Gupta 2001:60). Indigenous knowledge is an informal education that is close to 'nature' (Barva 2010:65). It helps students to learn from their surroundings using the natural environment as their experimental laboratory which is important for STEM education. It serves as an additional input for the STEM student to have a skill that can solve unique problems specific to their living areas and bring the knowledge to the world of education. The integration of indigenous knowledge with STEM education ensures the sustainability of education. Education for Sustainable Development expresses with a core idea of employing a program that is 'locally relevant' and 'culturally' applicable. Every sustainable development program together with education for sustainable development must consider the native, eco-friendly, social and economic settings (McKeon 2002www.Estd toolkit). Sustainable education encompasses Four main issues such as 'sustaining', which refers to supporting the people to endure, 'tenable', which is an ethically strong function to honour, impartiality, esteem and all-inclusiveness, 'healthy' a feasible system representing and fostering strong relationships and appearance at various system levels, and 'durable 'which kept for a long time through practicing it (Sterling, 2008:63-68) [22]. The sustainability of education can be described in terms of the importance it gives to the environment in which science education gives less concern. Scientific disciplines are by nature narrowly focused; however, indigenous knowledge gives much concern for the natural environment and can serve as an alternative discipline that gives importance for the interdependence of natural phenomena like in agriculture which helps to promote sustainable development (Bridled 2009:142). Different from the scientific discipline indigenous knowledge arises from the thoughtful long-lasting observation of natural happening (Apusigah 2011:9) [1].

Some of Ethiopian IK for Integration into STEM

Ethiopia is a country having more than 80 ethnic groups with diverse languages. Ethiopian society has diverse knowledge that they cope up with the natural and human-built environment. Before the introduction of a western-oriented curriculum, Ethiopians have their education curriculum mainly offered by religious institutions. This ancient Ethiopian knowledge and curriculum are underestimated in the present western-oriented curriculum. However, the ancient curriculum was rich in equipping students with knowledge from both natural and human-built environments. It was also significant in enriching the knowledge of the world with different input. Failure in investing in the indigenous knowledge and its integration into the school curriculum marginalizes the importance of indigenous knowledge to contribute to the national endeavor of the country in all aspects. Some of the elements to be integrated into the school curriculum from the Ethiopian IKS, and categorizing into a different discipline are seen as a sample below.

Table 1: Sample combination of indigenous knowledge System with STEM

No	IK element	The Course integrates
1	Traditional medicine from elder & (Elemetish) about medicine,	Medicine
2	Small handy craft(Muya)including home economics (Balitena)	Vocational Study
3	The number from (Book Bahire Hassabe) & Emelhesab(mathematics),	Mathematics
4	Meshafe Abele (book studying about the rock)	Geology
5	Meshibe(manuscript on Agriculture)	Agriculture
6	(Awude Negest) including calendar & Emerrnejub (Astronomy)	Astronomy

The above table is simply to show some samples for integration. However, further studies help to mobilize the indigenous knowledge system in the country for sustainable education development.

How to integrate indigenous knowledge with STEM?

The integration of indigenous knowledge helps the production of knowledge and social relations that were ignored and marginalized by western dominated knowledge. It also allows knowledge production to give space for indigenous knowledge. This requires ways of incorporating indigenous knowledge into the science curriculum. The following is an essential process for first studying the various contents that can fit to integrate indigenous knowledge in science, technology, engineering, and Mathematics

1. Survey: identification, registration, and categorization of indigenous knowledge.
2. Selection: based on objective criteria for curriculum inclusion
3. Standardization: to make it fit for formal education, for instance, bringing together and very careful synthesizing of minor local variations (without making it lose its contextual relevance).When where and how to integrate
4. Integration:

- When to integrate: identifying when it is appropriate, integration is for the near and long future or immediate purpose.
- Where to integrate: level of education that integration is essential or possible (primary, secondary or tertiary)
- How to integrate: into the curriculum (curriculum

development) where the balance between a common fountain of wisdom in a single world and our specific lived experience are at a maximum equilibrium. Here it is important to classify the indigenous content into different hierarchy local, regional and national level classification.

5. Implementation and Feedback:

- A pilot project for the test would be advisable before a full-scale implementation, for it will provide an opportunity to refine our project of an integrated curriculum in a practical setting. This integration process has to be continuous. Especially in the education system in which it is marginalized, continuous process of identification is vital. Evaluating the success and failure of the integration based on feedback is also important.

The researcher developed the following framework of the integration process.

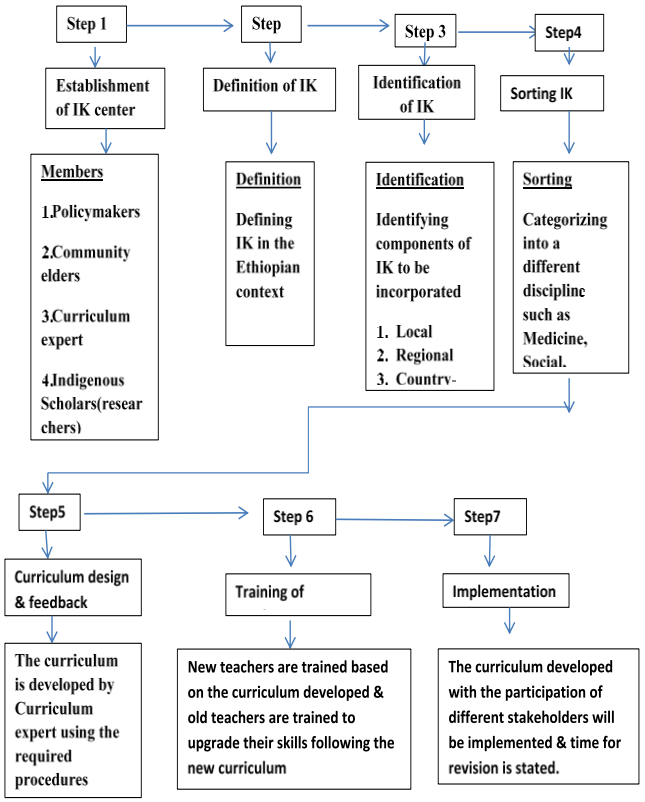

Fig 1

Conclusion

Today indigenous knowledge gets wider recognition. However, Ethiopia still gives less consideration in indigenizing the colonial curriculum under implementation. Ethiopia is the only African country that is not colonized. Though the country was independent for centuries the system of education is colonial education. This is mainly attributed to the modernization education process that Ethiopia followed. In this modernization process, the curriculum is either borrowed or designed by Westen experts. The ancient indigenous curriculum is rejected and marginalized. To bring marginalized knowledge into the curriculum (de) marginalization is important. In this regard STEM education is one area that the integration has to be given emphasis.

References

1. Apusigah AA. Indigenous knowledge, cultural values, and Sustainable Development in Africa, 2nd annual Ibadan sustainable development summit, Nigeria, 2011, 1-15.
2. Berkes F. Traditional ecological knowledge in perspective. (Editor, Julian T. Inglish), Traditional Ecological knowledge, concepts, and Cases. International Program on Traditional, Ecological Knowledge. Ottawa, Canada: International Development Research Center, 1993, 1-10
3. Breidlid A. Culture, indigenous knowledge systems, and Sustainable Development. A Critical View of Education in an African context. International Journal of Educational Development, Elsevier, Journal home page:www.elsevier.com/locate/ijedudev, 2009, 140-148.
4. Ellen R. 'Déjà vu, all over again', again: reinvention and progress in applying local knowledge to development. In Paul Sillitoe, Alan Bicker, and Johan Pottie(eds.) Approaches to indigenous knowledge. London and New York: Rutledge, 2002, 235-258.
5. Ellen R, Harris H. Introduction. (Ellen and *et al* (Eds.). Indigenous Environmental Knowledge and Its Transformation. Critical Analysis Anthropological perspectives (U.K. Harwood Academic Publishers, 2000, 5.
6. Emery AR. Integrating Indigenous Knowledge in Project Planning and Implementation. Partnership Publication of the International Labour Organization, The World Bank, Canadian International Development Agency KIVU, Toronto, Canada: Nature Inc, 2000.
7. George MJ. Indigenous Knowledge as a Component of the School Curriculum. In L. Semali & J. L. Kincheloe (Eds.), What is indigenous knowledge? Voices from the academ London: Falmer Press, 1999, 79-94.
8. Gilbert Onw, Mogege Mosimege. Indigenous knowledge systems and science and technology education: A dialogue, African Journal of Research in Mathematics, Science and Technology Education. 2004; 8:(1):1-12. DOI: 10.1080/10288457.2004.10740556
9. Gupta AD. Does indigenous knowledge have anything to deal with Sustainable development? Antrocom online Journal of Anthropology. 2011; 7(1):57-69.
10. Horsthemke Kai. Indigenous (African) Knowledge Systems, Science, and Technology: The Palgrave Handbook of African Philosophy, 2017.
11. John Tharakan. Indigenous knowledge systems – a rich appropriate Technology resource, African Journal of Science, Technology, Innovation and Development. 2015; 7(1):52-57. DOI: 10.1080/20421338.2014.987987.
12. Kebede. A historical overview of traditional medicine and practices and policy in Ethiopia, Ethiopian Journal of Health Development, January, 2006, 127-134.
13. Kumar GP, Sahoo B. Indigenous Traditional Knowledge. (Orissa Review), 2011, 65-70.
14. Mawere M. Indigenous Knowledge and Public Education in Sub-Saharan Africa, in Africa Spectrum. 2015; 50(2):57-71. Retrieved from http://nbn resolving.org/urn/resolver.pl?urn:nbn:de:gbv:Accessed 12/01/2017

15. Mpofu Vongai, Vhurumaku Elaosi. Indigenous Knowledge and Nature of Science Interface: Context considerations for Science, Technology, Engineering, and Mathematics Education. World Academy of Science, Engineering and Technology International Journal of Educational and Pedagogical Sciences, 2017, 11(5).
16. Nijoki N. Wane Traditional healing Practices: Conversation with herbalists in Kenya. Indigenous Knowledge and learning in Asia/ Pacific and Africa, perspectives, on development, education, and culture (Edited by Dip Kapoor and Edward Shiza) Palgrave Macmillan, New York.
17. Nyong CT. Indigenous knowledge and Sustainable Development in Africa: a Case study in central Africa. In Emanuel K. Boon and Lue Hens (Eds.), Tribes and Tribal special volume no 1. Kamal Raj Enterprises. 2007, 121-139,
18. Owuor JA. Integrating African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development. Journal of Contemporary Issues in Education. 2007; 2(2):21-37. The University ofAlberta http:// ejournals. library. ualberta. ca/index. php/ JCIE.
19. Posey D. Upsetting the sacred balance: can the study of indigenous knowledge reflect cosmic connectedness? (Editors Paul Sillitoe, Alan Bicker, and Johan Pottier) Approaches to indigenous knowledge, Routledge, London, and New York, 2002, 24-42
20. Ross A. Indigenous people and the collaborative stewardship of nature, knowledge binds and Institutional conflicts. Walnut, Greece: West press Inc, 2011.
21. Sardar Z (Ed.). The Revenge of Athena Science, Exploration and the third World. New York: Mansell Publishing Limited, 1988.
22. Sterling S. 'Sustainable education - towards a deep learning response to unsustainability', Policy & Practice: A Development Education Review Spring. 2008; 6:63-68.
23. Teshome A, Sobha B. Indigenizing School Curricula for Life skill Development. Kerala Sociologist, 2017, 165-171.
24. Whitt L. Science, Colonialism, and Indigenous peoples: The Cultural Politics of Law and Knowledge. UK: Cambridge University Press, 2009.