Onwu and Mosimege on "Indigenous Knowledge Systems and Science and Technology Education: A Dialogue" Some Remaining Issues

By

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Review Article

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ABSTRACT

This paper presents an analysis of an article written by Onwu and Mosimege (2004) "Indigenous Knowledge Systems and Science and Technology Education: A Dialogue". The analysis was undertaken against a backdrop of ongoing discussion and debate on how to integrate IK into school science curriculum in a valid and legitimate way. In their article, Onwu and Mosimege raise epistemological, metaphysical and axiological questions regarding Indigenous Knowledge Systems (IKS) and Western science, particularly from a pedagogical point of view. The first part of this paper considers the epistemological questions that dominate the article. Epistemologically, the article seeks a definition of IKS, its nature and relationship to other bodies of knowledge and the ways in which it is acquired and accepted. For Onwu and Mosimege (2004), IKS can be a rival or complement to Western science. Therefore, an underlying concern that this paper intends to study is given the epistemological differences and commonalities between indigenous knowledge (IK) and school science, what are the remaining issues? In the second part of this paper a critical assessment of the metaphysical issues raised by Onwu and Mosimege, namely, the existence of IKS and the existence of spiritual entities postulated by IKS will be done. The key metaphysical concerns are the existence of IKS and the existence of spiritual entities that IKS assumes. Finally, an examination of the arguments Onwu and Mosimege give for the value of IKS will be done. From the axiological point of view, the writers are unequivocally appreciative of the value of IKS for learners not only in particular socio-cultural contexts, but also in developing synergies with other systems of knowledge. In this article, the intention is to engage with the arguments made by Onwu and Mosimege. The methodology that was adopted in this paper is philosophical arm-chair analysis. This was undertaken specifically to check on the validity and soundness of arguments presented in the article by Onwu and Mosimege in relation to other scholars' views.

Keywords: Integrating IK into school science. Epistemology. Metaphysics. Axiology.

INTRODUCTION

Literature reveals that for the past fifteen years or so, many scholars are getting more interested in studying and writing in the area of indigenous knowledge systems (IKS) and the learning of science (Dube and Lubben, 2011; Fakudze, 2004; Gumbo, 2003; Jegede, 1997; Maika and Laubser, 2003; McKinley, 2005; Odora-Hoppers, 2001; 2002; Onwu, 2005; 2009; Onwu and Mosimege, 2004; Onwu and Kyle, 2011; Ogunniyi, 2007; 2011; Roberts, 1996; Zinyeka, 2011). Arguments for the value of integrating IK into the school science are prevalent not only in the advocacy for emancipatory learning of science, but also in recognition of the relevance of science science and its usefulness to society (Onwu and Kyle, 2011 and Sadler, 2009). However, a cursory review of literature seems to suggest that there is consensus among scholars that one of the major challenges for an inclusive Science-IK Curriculum is the need for a better interrogation of IK epistemologies (Emeagwali, 2003; Le Grange, 2004; Onwu and Mosimege, 2004; Ogunniyi, 2004, 2011; Zinyeka, 2011). In light of this challenge, "...science educators have been battling with epistemological issues that could effectively limit or expand the scope and remit of science education" (Onwu, 2005, p.3). Against this background, it was seen important to engage in this article with the arguments presented by Onwu and Mosimege (2004) as an attempt to provide valid and sound worldviews that could strengthen classroom practice by informing instructional skills and strategies.

THE EPISTEMOLOGICAL QUESTIONS

The initial epistemological question tackled by Mosimege is a definition of IKS. Mosimege admits that there is no one definition of IKS. However, he provides a definition that highlights the following aspects: IKS constitutes the knowledge of a community or people; that knowledge has evolved over time as people in that community have adapted to an ecosystem; and the knowledge includes technological (agriculture, engineering, medicine),
mathematical and social knowledge (Onwu and Mosimege, 2004). It seems the diverse range of subjects in IKS gives it the epistemological and axiological advantage of being holistic. This is so partly because IKS readily synthesizes knowledge from disciplines normally considered discrete in western knowledge systems. From a pedagogical point of view, IKS gives the learner a more comprehensive world-view and the ability to interact with a broad range of entities in his or her environment (Onwu and Mosimege, 2004).

In the task of comparing and considering integrating IKS with school science, however, a methodological uncertainty arises. IKS contains components such as traditional beliefs which are considered inadmissible in western scientific discourse specifically considering the nature of science (see table1). This makes it more difficult to assess the truth value of claims of IKS in relation to western science. From the pedagogical perspective, teaching a holistic IKS can confuse learners who are accustomed to the division of disciplines in the western science paradigm. Without some fragmentation, such learners may be led to believe, for instance, that the truth value of an indigenous proverb is similar to that of an indigenous agricultural technique. Therefore, in order to fit IKS to some learners, elements of IKS would have to be “amputated”, thus diminishing their holistic value. One way out of this dilemma is to separate IK into elements corresponding to the western pedagogical paradigm, but at the same time to encourage learners to develop a synthesis.

The crucial remaining step that has to be taken by those considering the integration of indigenous knowledge (IK) into the school science curriculum is demarcation. It is suggested in this paper that it is suitable to focus on aspects of IK which describe, explain, predict and try to negotiate nature (Emeagwali, 2003) that have to do with socio-scientific issues (Onwu, 2009, and Onwu and Kyle, 2011) and are compatible with science (Ogunniyi, 2011) because these studies are about the integration of IK into science education not about religion or history.

To the epistemological question “Is ‘western science’ the only valid interpretation of the universe?” Onwu and Mosimege (2004) would answer that it is not. They insist that IKS offers a complimentary and even opposing worldview to western science. However, Onwu and Mosimege (2004) find it difficult to demonstrate that IKS is a credible alternative or compliment to western science. They cite the chief obstacle as evaluating IKS vis-à-vis western science. Onwu and Mosimege (2004) argue that if IKS derives from a world-view and methodology that rivals that of science, then IKS should not be valued using the criteria of western science. Most IK is not verified in the laboratory, but is passed on from generation to generation in classified form; IKS thus privileges the community as a validation mechanism; therefore, an understanding of the cultural context is indispensable for providing answers on phenomena that western science considers unusual (Onwu and Mosimege, 2004). Onwu and Mosimege further observe that the attempt to use the same validation criteria has resulted in western science employing “gate-keeping” devices such as the “scientific method”, to exclude IKS. It is noted here that the epistemological differences between indigenous knowledge (IK) and school science is one major challenge for an inclusive Science-IK Curriculum that remains to be faced. A cursory review of literature also suggests that there is consensus among scholars that one of the major challenges for an inclusive Science-IK Curriculum is the need for a better interrogation of IK epistemology (Emeagwali, 2003; Le Grange, 2004; Onwu and Mosimege, 2004; Ogunniyi, 2004, 2011; Zinyeka, 2011). Considering this major challenge, it is expedient for researchers in science education studying the possibility of integrating indigenous knowledge into school science to try and develop truth-functional knowledge frameworks for identifying epistemologies as argued by Zinyeka, 2011). In this way it is envisaged that valid and legitimate arguments could be advanced for the kind of status IK ought to be accorded in any attempt to facilitate its integration into school science curriculum (Zinyeka, 2011).

Just to shade more light on the faced challenge, the epistemology for science is a positivist-empiricist one (Kourany, 1998 and Sandoval & Millwood, 2008), and on the other hand the epistemologies of IK are not specifically stated. It is not possible as is the case with science, to have a universal epistemology of IK due to the fact that the localized, community-based systems of knowledge are unique to given cultures (Grenier, 1998; Onwu & Mosimege, 2004; and Semali and Kincheloe, 1999). The epistemological differences between indigenous knowledge (IK) and school science (see table1 below) is one major challenge for an inclusive Science-IK Curriculum.
Encouraging the inclusion of indigenous knowledge into the school science curriculum invites critical questions which include, as noted by Le Grange (2004), questions as to whether seemingly disparate perspectives of ‘the world’ are competing or complementary or whether science (education) is universal or multicultural. Le Grange (2004) notes that what multiculturalists and universalists appear to agree on is that school science and indigenous knowledge should be taught to learners of all cultures. However, he farther notes that the epistemological differences between school science and indigenous knowledge give rise to the disagreement between the multiculturalists and universalists on the status that should be given to western modern science and indigenous knowledge in the science education programmes. Universalists have always argued that indigenous knowledge has inferior explanatory powers of understanding the natural world as compared to western science which has been successful in producing knowledge which is testable, predictive and explanatory (Le Grange, 2004).

In addition, as Onwu and Mosimege (2004) appreciate, there are methodological weaknesses in IKS, such as lack of documentation, the shroud of secrecy which makes its less universally accessible and an uncritical attitude. These weaknesses can be rectified if IKS interacts closely with western science. This kind of interaction is also one way in which IKS can expose and help fill the gaps in western science, for example the way in which only a small section of scientists, rather than the whole community, is involved in knowledge production and validation (Fatnowna and Pickett, 2002).

A comparative interaction can also clarify the competing knowledge claims of science and IKS. Mosimege cites the example of traditional beliefs which are not necessarily true but are used to foster certain kinds of behaviour (Onwu and Mosimege 2004). He notes that it is necessary to investigate such beliefs in order to find the reasons for holding them in the first place. Arguably, the process of investigation is accelerated when these beliefs confront western science and are shown to be false in the literal sense, but as serving some social function. Therefore, western science need not be seen as detrimental to IKS. A comparative study of IKS and western science can lead to a better appreciation of the respective schemes of knowledge, particularly their truth claims.

The Metaphysical Aspects Of IKS

We now turn to the metaphysical aspects of IKS considered by Onwu and Mosimege. According to Mosimege, IKS obviously exists (Onwu and Mosimege, 2004). It has similarities to western science, whose existence is not questioned. It is a body of knowledge that people (including some learners) have used in their environments. In addition, while there are difficulties with documentation, Mosimege cites the existence of a database of South African indigenous technologies that communities have survived on for many years. The question of the existence of IKS, then, is not in much doubt and the next step is to perform more research into IKS and then incorporate it in the school curriculum so that IKS can have a fair representation vis-à-vis western science.

A more pressing metaphysical question concerns the spiritual phenomena and explanations postulated by IKS but rejected by western science because they are empirically unobservable. Onwu clarifies the metaphysical distinction between western science, which is limited to material realities, and IKS, which in a holistic application of knowledge, considers all aspects of reality, some of which are spiritual (Onwu and Mosimege, 2004). Onwu believes that western science can benefit from the holism found in IKS. However, Onwu and Mosimege do not demonstrate how western science can benefit from accepting non-material entities. In making a case for their adoption by western science, it would have been helpful for Onwu and Mosimege to show what role spiritual phenomena play in IKS and also indicate why belief in them is justified beyond local cultural
contexts. Western science cannot be convinced by merely asserting that nonmaterial entities exist – reasons ought to be proposed and these reasons then subjected to analysis.

The problem of “gate-keeping” still needs to be surmounted especially where there are prejudices against the efficacy of IKS (Hountondji, 2002). It is advisable for IKS to submit itself to the standards of validation in western science. If a contested IKS entity is found by western science to work even in a local context, then it provides a basis by which it can be applied to other contexts too, regardless of the initial reservations scientists may have. On the other hand, if it is not evident how the IKS entity works, it provides a new frontier for western science and also a means for IKS to challenge western science as the dominant interpretation of the universe. Using Kuhnian discourse, IKS can expose sufficient anomalies in western science to precipitate a scientific revolution. This, however, requires communication between the IKS and Western science before scientists in one paradigm can be converted to the other (Kuhn, 1987).

The Axiological Aspects of IKS

With regard to the axiological aspects of IKS, Onwu and Mosimege (2004) argue that co-opting IKS into the science curriculum can make science more meaningful and accessible to learners. This argument is sound because the learner’s failure to see the relevance of what they learn emasculates the emancipatory power in science education. One of the reasons for integrating IK into the science classroom is the recognition for the emancipatory effect this move has. What it means is that the learners are liberated in learning processes. The argument here is that if learners are enabled to form personal opinions, motivation to learn science is likely to be increased, and willingness to apply the knowledge gained in real life situations is likely to be cultivated (Kyle, 2009 and Onwu and Kyle, 2011). This is especially the case among learners who do not find modern science directly relevant in their communities. Sadler (2009) concurs with this view when he argues that social significance of science should be taken seriously in the teaching and learning of science. In addition, learners can find synergies between science and IKS: “IKS can help fill the knowledge gaps in modern science and vice versa” (Onwu and Mosimege, 2004). To these advantages, one may add that promoting IKS in schools can have the effect of empowering learners when they notice that their knowledge is valuable and can be a complement or even a rival to western science. Learners should be able to appreciate the relevance of school science and its importance to socio-economic development of their communities (Onwu and Kyle, 2011 and Sadler, 2009).

The author concurs with Onwu and Kyle (2011, p. 5) when they argue that “Socio-Scientific issues should be considered in the course of students’ formal education in science as one of the ways in which science education ought to be connected to the goals of sustainable development”. This paves way for the need to include IK in science education. The argument can logically be presented in the following structure:

- **Premise 1 (P1):** It is true that Socio-scientific issues such as those cited by Onwu and Kyle (2011) often frame social transformation concerns of many countries such as those in Africa.
- **Premise 2 (P2):** It is true that there is urgent need for humanity to generate and implement effective responses to current challenges in order to improve the quality of human life and hence the need for an active and participatory citizenry (Onwu and Kyle (2011)).
- **Premise 3 (P3):** It is true that improving the quality of human life is desirable.
- **Premise 4 (P4):** It is true that relevance in respect to science education implies the incorporation of local issues and practices into the science curriculum and the use of community or community-based resources (Holbrook, 2009).

**Conclusion (C):** Therefore Socio-Scientific issues by way of logic including IK should be considered in the course of students’ formal education in science as one of the ways in which science education ought to be connected to the goals of sustainable development.

In short, if P1= true, P2=true, P3=true, P4=true therefore C.

This argument seems to be a good one on the basis that the truth value of the premises used to draw the conclusion in this argument seems to hold and the conclusion is connected to the premises. This is so since a good argument is that which is based on true propositions and its conclusion following from the given reasons.

**CONCLUSION**

Onwu and Mosimege (2004) have raised important issues regarding the interaction and integration of IKS and school science in the pedagogical context. It was noted in this article that, epistemologically and metaphysically, the scope of IKS differs in some ways from school science. It was noted that the epistemological differences between indigenous knowledge (IK) and school science is one major challenge for an inclusive Science-IK Curriculum. This can create difficulties in validating IKS in relation to school science and in teaching IKS to learners with background knowledge that is different from that of school science. With this in mind it was argued
in this paper that it becomes expedient for researchers in science education studying the possibility of integrating indigenous knowledge into school science to try and develop truth-functional knowledge frameworks for identifying epistemologies as argued by Zinyeka & Onwu (2013 in press). In this way it is envisaged that valid and legitimate arguments could be advanced for the kind of status IK ought to be accorded in any attempt to facilitate its integration into school science curriculum (Zinyeka and Onwu, 2013 in press).

However, it was also taken note of that there are also similarities between the two schemes of knowledge. These similarities can be emphasized in order to develop synergies and to present a comprehensible body of knowledge that can engage learners without an excess of conflict. It could be argued, however, that there are many points at which IKS and school science intersect (Ogunniyi, 2004). Emeagwali (2003) for instance, has identified several intersections of mainstream science and indigenous knowledge. There are areas of convergence and non-convergence for these bodies of knowledge. It is therefore beneficial to emphasize the similarities, instead of the differences, between the two schemes. For example, both indigenous knowledge and western medicine can benefit from the laboratory testing methodology of western science and then extend to the similarities, instead of the differences, between the two schemes. For example, both indigenous knowledge and western medicine can benefit from the laboratory testing methodology of western science and then extend to the whole world what was once a herbal treatment unique to a particular cultural context (Hoppers, 2002). Moreover, it is through interaction with western science that IKS can expose the anomalies in Western science and challenge it as the only valid interpretation of the universe. IKS practitioners can also develop a critical attitude similar to western science so as to avoid passing on IK that is of questionable value to learners. On the whole, therefore, it is beneficial to consider IKS as complementary rather than as opposed to western science.

It would have been constructive for Onwu and Mosimege (2004) to also consider the negative impact of integrating IKS into the science curriculum. As noted in the discussion on epistemological issues above, IKS can confuse learners who are already struggling to understand Western science. More worryingly, IKS can be harmful when aspects which compete with western science are accepted without sufficient inquiry. This would be the case, for instance, in preferring traditional medicine when a diagnosis in a modern medical institution would be more appropriate, as in the case of, say infertility. Further, as Ogunniyi (2004, 2011) has pointed out, science education should help in meeting modern challenges. Few indigenous communities remain unaffected by modernity and if IKS is over emphasized in place of modern science, they may fail to confront modernity. This indicates that there is need for adequate research into the content and weight to be given to IK in the effort to integrate it into the school science curriculum.

REFERENCES


