

13th National Convention on Statistics (NCS)
EDSA Shangri-La Hotel, Mandaluyong City
October 3-4, 2016

**INDIGENOUS KNOWLEDGE SYSTEMS AND PRACTICES (IKSPs)
IN THE TEACHING OF SCIENCE**

by

Xylene Grail Donato-Kinomis

For additional information, please contact:

Author's name	Xylene Grail Donato-Kinomis
Designation	Education Program Specialist II
Affiliation	Human Resource Development Section, Department of Education – Baguio City
Address	
Tel. no.	
E-mail	xylene_grail@yahoo.com

INDIGENOUS KNOWLEDGE SYSTEMS AND PRACTICES (IKSPs) IN THE TEACHING OF SCIENCE

by

Xylene Grail Donato-Kinomis

ABSTRACT

Indigenous Knowledge Systems and Practices (IKSPs) are local knowledge developed over centuries of experimentation and are passed orally from generations to generation. It was found to be an important catalyst to sustainable development due to their direct connection to resource management and conservation. However, these knowledge, systems and practices are at escalating rate of deterioration due to consistent assimilation that resulted from the continuing loss of interest of these practices from young people. Thus, empirical evidence to showcase importance to environmental protection and cultural preservation are encouraged. Likewise, studies connecting these indigenous knowledge and practices to academic curriculum are highly regarded to be influential in their preservation. Moreover, this paper seeks to find out the relevance of indigenous knowledge systems and practices in the teaching of science among secondary public science teachers in Baguio City.

This study aimed to investigate the Indigenous Knowledge Systems and Practices (IKSPs) used in the teaching of science among secondary public science teachers in Baguio City and to determine their extent of effectiveness in achieving the objectives of the subjects and the problems that they encounter from using it.

Introduction

Indigenous Knowledge Systems and Practices (IKSPs) are local knowledge developed over centuries of experimentation by our ancestors and are passed orally from generation to generation. It was proven to be a perfect scaffold to sustainable development connecting the past, the present and the future. However, these knowledge, systems and practices are at escalating rate of deterioration due to consistent assimilation that resulted from the continuing loss of interest of these practices from young people. Thus, empirical evidence to showcase importance to environmental protection and cultural preservation are encouraged. Likewise, studies connecting these indigenous knowledge and practices to academic curriculum are highly regarded to be influential in their preservation. According to Baguilat (2009), IKSPs cover a broader scope that included all traditional skills, laws, philosophy, rituals, livelihood, sciences and technologies of the community.

IKSPs were incorporated in several public secondary subjects, e.g. Music Arts and Physical Education (MAPEH), Filipino, Science and Araling Panlipunan. For Science, it has always been connected to history and to philosophy with several observations, theories and facts developed. Several educators and most students had proven that teaching and learning science should be made with a touch of technology as part of the Science and Technology (S&T) development. However, indigenous knowledge should not be disregarded with the context of these subjects, because without it, advancement in S&T would not be possible.

The Cordillera Administrative Region has always been known for having a rich or vast coverage of IKSPs. It is composed of the six provinces of Apayao, Kalinga, Abra, Mountain Province, Ifugao, and Benguet, plus the chartered city of Baguio. Collectively, the people are popularly known as Igorot, which are grouped into a number of ethnic or ethno-linguistic identities, such as Apayao or Isneg, Tinggian, Kalinga, Bontoc, Kankanaey, Ibaloy, Ifugao, and Bago.

With this background, this paper sought to identify the relevance of indigenous knowledge systems and practices in the teaching of science among secondary public science teachers in Baguio City where teachers experience multicultural students.

This study determined the Indigenous Knowledge Systems and Practices (IKSPs) used by teachers and the extent of effectiveness in the teaching of Integrated Science, Integrated Biology, Chemistry, Physics; and the problems encountered by teachers in the teaching of Science while integrating IKSPs.

This study adopted the descriptive survey method of research in determining the IKSPs used and the extent of effectiveness as well as the problems encountered by teachers while incorporating it in the teaching of science subjects. Seventy-one (71) science teachers were respondents in the study. These respondents were asked to identify which among the list of IKSPs identified from the questionnaire are incorporated during science discussions. Mean was used to represent the extent of effectiveness of these IKSPs in teaching science subjects, while frequency and percentage were used to present the dominant IKSPs used as well the problems encountered in incorporating these IKSPs in teaching science subjects. One way analysis of variance was used to determine the statistical difference of the effectiveness of the IKSPs in teaching the subjects. The Scheffe's test was used to further investigate the difference between the subjects. Data were analyzed using the Statistical Package for Social Studies for accuracy and precision of results. Statistical values were tested at 0.05 level of significance.

Findings

The top three ranked IKSPs used by teachers in Integrated Science are traditional ways of measuring; the use of herbal, botanical plants and insects as medicine; knowing and preparing native wines / beverages as well as indigenous health practices. On the other hand, Integrated Biology teachers made use of IKSPs that concerns the naming and characterization of trees, shrubs and other plants found on land even the use of herbal, botanical plants and insects as medicine as well as maternal and childcare; making of indigenous or native recipes and knowing and preparing native wines or beverages; and naming and characterization of birds and other animals found on air and in land. In Chemistry, the top three ranked IKSPs used are knowing and preparing native wines or beverages; traditional measuring and making of indigenous or native recipes as well as uses of herbal, botanical plants and insects for medicine. Lastly, in Physics, the top three ranked IKSPs used by teachers are traditional ways of measuring, musical instruments from natural resources, and indigenous people practices on their communal forests.

The IKSPs identified were found to be effective in teaching the different Science subjects. However, post hoc test shows that IKSPs are more effective and applicable in the teaching of Integrated Biology and Integrated Science than that of Chemistry and Physics. This is supported by Orno (1996) where he stated that biological and physical systems are the core considerations of IKSPs.

The top three problems encountered by teachers teaching Integrated Science are first, the limited sources of IKSPs from books, internet and other sources in the library; second, the lack of sufficient evidences, visual aids and other resources during discussions; and third is tied up with

the students not having interest most especially those who cannot relate to the ideas of the IKSPs with that of the concepts of science and current policies on science are situated in Western cultural definitions, thus marginalizing indigenous knowledge which is misconceived as irrational and illogical.

On the other hand, the top three problems encountered by teachers teaching Integrated Biology are first, the limited sources of IKSPs from books, internet and other sources in the library; second, students not having interest most especially those who cannot relate to the ideas of the IKSPs with that of the concepts of science; and third, is tied up with teachers giving inappropriate knowledge on facts about IKSPs and the lack of sufficient evidences, visual aids and other resources during discussions.

Chemistry teachers however considered the lack of sufficient evidences, visual aids and other resources during discussions as their ranked one problem followed by students not having interest most especially those who cannot relate to the ideas of the IKSPs with that of the concepts of science; and lastly, teacher difficulty in motivating students to understand the IKSPs being mentioned during lectures.

Lastly, Physics teachers think that the lack of sufficient evidence, visual aids and other resources during the discussion is one of the problems they have encountered together with teachers relaying inappropriate knowledge on facts about IKSPs and limited sources of IKSPs from books, internet and other sources in the library.

Overall, the top two ranked identified problems in incorporating IKSPs in science subjects are limited books, internet and other possible sources of IKSPs as well as the lack of sufficient evidences, visual aids and other resources during discussions.

Conclusions

Based from the findings, it is concluded that secondary science teachers use several concepts on Indigenous Knowledge Systems and Practices (IKSPs) to elaborate, explain and help connect the students understanding on science to the local and traditional knowledge that is present in their surroundings. Moreover, comprehension on the similarities and connections of indigenous knowledge to modern science is determined by both parties to further explain the concepts discussed in the classroom.

Furthermore, the IKSPs identified differ in its effectiveness when incorporated in the teaching of different science subjects. Several IKSPs were found to be appropriate and highly effective as well as effective in specific subjects and moderately effective on other subjects. This then states that not all IKSPs can be used in one, two or all of the science subject topics as examples.

Lastly, the problems encountered by teachers rooted specifically from the system. Teachers only hold on to what the authority places on the table, impeding the willingness to grow and preserve their indigenous knowledge. With this, it is passed on to the younger generation producing students who are at the same time becoming gatekeepers.

Recommendations

It is therefore recommended that teachers should continue and add more Indigenous Knowledge Systems and Practices (IKSPs) during science discussions making sure that the concepts of the IKSPs being used to relate to the topic are appropriate while taking into consideration the different methods, strategies and learning competencies. Explaining the

relevance of the IKSPs examples to the students will further boost their interest to the subject and to indigenous knowledge.

Public secondary science teachers should have a solid understanding of IKSP, being able to explain, expound and deliver it effectively to the students. Requiring further readings, and personal experiences for teachers to undertake.

Educators should be more resourceful and responsible in a way that they have to make use of several interventions like interviewing Indigenous People (IP) they know who can share ideas on IKSPs or government units that are applicable, for example, National Government Units such as National Commission for Indigenous Peoples (NCIP).

Other Recommendations

- a. Teachers should take into consideration the interest of their students in learning. They need to expose students in several areas to better explain to them the relationship of science topics discussed with that of the IKSP. These may include the use of pictures and motion pictures, and/or documentary experiences, lectures with activities, drawings, etc. This intervention can eliminate gatekeepers and promote better comprehension.
- b. Schools and teachers should collect resources or make their own researches on the IKSP that has been observed on the olden days to present from their provinces or community which can be used during classroom discussions.
- c. Education sector can have IKSPs as mandated area of the subjects by including it in the curriculum; making it a part of the syllabus. This will help preserve the systems and practices that are still present as well as for sustainable development.
- d. Seminars, trainings, symposiums and other gatherings that can add to and improve the knowledge of students and teachers regarding IKSP can also be taken into consideration for schools to apply.
- e. School contests and the like regarding IKSP during science fairs for teachers and students to interact with each other, not just to improve their knowledge on IKSP and its relationship to science.
- f. Development of a manual inclusive of indigenization of materials or products for all science subjects covered under K to 12, specifically from Grades 7 to 11;
- g. With the help of project proposals, manuals and other programs initiated by educators and students, make use of a Pilot study to identify the success and problems that are encountered from the absence and the use of IKSP to further develop improvement;
- h. In depth comparative research on the problems encountered by teachers as well as students.
- i. DepEd supervisors as well as its research department can come up with a project study that will involve all principals together with their teachers and students. These can either be practiced in school, division, regional as well as national level. Making projects by school and having competitions where students can also be involved. Promoting service learning, where students from indigenous places would share and interact with students from the cities and municipalities which are away from indigenous practices.

REFERENCES:

- Alkenhead, G., & M. Ogawa. (2007). Indigenous knowledge and science revisited. **Cultural Studies of Science Education**. Springer.
- Armstrong, M., Kimmerer, R.W., & Vergun, J. (2007). **Education and research opportunities for traditional ecological knowledge**. Retrieved October 23, 2010, from <http://www.frontiersinecology.org/specialissue/articles/armstrong>.
- Arquiza, Y. (2005). **A Journey of hope, implementing the Indigenous Peoples' Rights Act of the Philippines: Cultural revival in a changing world**. Retrieved January 25, 2011, from <http://www.worldcat.org/title/-journey-of-hope-implementing-the-indigenous-peoples-rights-act-of-the-philippines/> oclc/173221761_
- Asian Development Bank. (2002). Country strategy and program of Indonesia in relation to development and culture. Retrieved February 13, 2011, from http://www.adb.org/documents/CSPs/INO/2002/csp_ino_2002.pdf.
- Ateneo de Iloilo. (2012). **Syllabus on science and technology I**. Retrieved March 12, 2012, from <http://www.isciencewithmamanne.blogspot.com>.
- Barnhardt, R., & Kawagley, A.O. (2005). Indigenous knowledge systems and Alaska native ways of knowing. **Anthropology and Education Quarterly**, **36(1)**, 8-23.
- Broesch, J., Fitzpatrick, I.C., Garcia, V.R., Giovanninni, P., Godoy, R., Huanca, T. et al. (2007). **Does modernization erode the secular trend of indigenous knowledge?** Retrieved April 27, 2011, from <http://www.tsimane.org/working%20papers/TAPS-WP-29.pdf>
- Boven, K. & Morohashi, J. (2002). **Best practices using indigenous knowledge**. Retrieved October 20, 2010, from <http://unesdoc.unesco.org/images/0014/001478/147859e.pdf>
- Corsiglia, J. & Snively, G. (2001), Discovering indigenous science: Implications for science education. **Science Education**. **85: 6–34**. doi: 10.1002/1098 237X(200101) 85:1<6::AID-SCE3>3.0.CO;2-R
- Department of Education Order 42. (2004). Permit to operate primary schools for indigenous peoples and cultural communities. Retrieved December 30, 2010, from http://www.deped.gov.ph/cpanel/uploads/issuancelmg/DO%2042_6-15-04_00001.pdf
- Department of Education Memorandum 346. (2010). Indigenous peoples month 2010. Retrieved December 30, 2010, from <http://www.deped.gov.ph/cpanel/uploads/issuancelmg/DM%20No.%20346%20s.%202010.pdf>.
- Donovan, D. & Puri, R. (2004). Learning from traditional knowledge of non-timber forest products: Penan Benalui and the autecology of *Aquilaria* in Indonesian Borneo. **Ecology and Society** **9(3)**: 3.
- Fleer, M. (1999). Children's alternative views: Alternative to what? **International Journal of Science Education**, **21(2)**, 119-135. Retrieved March 21, 2011, from <http://www.monash.edu.au/research/profiles/profile.html?sid=4131&pid=3565>
- Folke, C. (2004). Traditional knowledge in social–ecological systems. **Ecol Soc** **9**: 7.

- Fraenkel, J. R., & Wallen, N. E. (2006). **How to design and evaluate research in education (6th ed.)**. Boston: McGraw-Hill.
- Gomez, R. (2003). Environmental management of the Ifugao rice terraces in Kiangan and Banaue, Philippines. Unpublished doctoral dissertation, UPLB, Laguna, Philippines.
- Indigenous (2010). **Merriam-Webster Dictionary**. Retrieved November 21, 2010, from <http://www.merriam-webster.com/dictionary/Indigenous>.
- Interactive Cordillera Group. (2008). **The Tapey = Igorot rice wine**. Retrieved January 12, 2012 at http://s4.Zetaboards.com/Igorot_Pride/topic/424119/1/.
- Kimmerer, R.W. (2002). Weaving traditional ecological knowledge into biological education: A call to action. **BioScience** 52:432-438.
- Kuhl, P., Tsao, F. & Liu, H.(2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning. **Proceedings of the National Academy of Sciences of the United States of America**.
- Ladiong, J.L. (1994). Indigenous Agricultural Practices and Beliefs of the Sagada People: Their effects to Scoico-Economic Development (Master's Thesis). Baguio Central University.
- Lawangen, A. (2010). Social System Dynamics of the Ibalois in Tublay, Benguet: Implications in Agrobiodiversity Conservation. A paper presented in the 1st National Higher Educational Institution Summit; Pasay City, December 10-11, 2011.
- Lawangen, A., Ayochock, A., Banwagen, J., Ngalatan, B. & Santos, M.(2006). Traditional Rice-based ecosystems of the Karaos in Bokod, Benguet: agrobiodiversity and Sustainability evaluation. Unpublished Thesis, Benguet State University, La Trinidad, Benguet.
- Litilit, M. B. (2005). Extent of performance of indigenous farming beliefs and practices in Tadian, Mountain Province. Unpublished masteral thesis, Benguet State University, La Trinidad, Benguet.
- Ludwig, D., Mangel, M., & Haddad, B. (2001). Ecology, conservation, and public policy. **Annu. Rev. Ecol. Syst.** 32: 481–51
- Matsui, K. (1998). Minor subsistence no sekai: Minzoku sekai ni okeru rodo, shizen,shintai (World of minor subsistence: Work, shizen, and body in folklore a world). In T. Shinohara (Ed.), **Minzoku no gijutsu (Techniques in folklore)** (pp. 247–268). Tokyo: Asakura Shoten.
- Maundu, P. M., & Omosa, E. (2008). Role of indigenous knowledge in promoting conservation of biodiversity; A kenyan case study: **Paper presented at the annual meeting of the International Congress for Conservation Biology; Convention Center, Chattanooga**. Retrieved, 2012, from, http://www.allacademic.com/meta/p243260_index.html.
- Morelli, G. A., Rogoff, B., Oppenheim, D. & Goldsmith, D. (1992). Cultural variations in infants' sleeping arrangements: Questions of independence. **Developmental Psychology**, 28, 604-613.

- Norgaard, R. (1988). The rice of global exchange economy and the loss of biological diversity. In E.O. Wilson (Ed.), **Biodiversity** (pp. 206-211). National Academy Press.
- Ogunniyi, M.B. (2007). Teachers' stances and practical arguments regarding a science-indigenous knowledge curriculum: **Part 1. International Journal of Science Education, 29**, 963-986.
- Ogunniyi, M.B., & Hewson, M.G. (2008). Effect of an argumentation- based course on teachers' disposition towards a science-indigenous knowledge curriculum. **International Journal of Environmental & Science Education, 3**, 159-177.
- Ogunniyi, M.B.& Mushayikwa, E. (2011). Modeling the Integration of IKS into the teaching and learning of science. **19th SAARMSTE Conference Proceedings**. Retrieved January 2, 2012, from <http://www.scribd.com/doc/47711384/Modelling-the-Integration-of-IKS-Into-the-Teaching-and-Learning-of-Science#archive>
- Orno, S. (1996). Sustainability analysis of upland farming system in Bagong Silang, Makiling Forest Reserved, Laguna, Philippines. Unpublished masteral thesis, UPLB, Laguna. Pp. 4-5.
- Semali, L. (1999). Community as classroom: Dilemmas of valuing African indigenous literacy in education. **International Review of Education 45** (3-4)
- The Indigenous Peoples in the Philippines. **The indigenous people of Islam in Mindanao**. Retrieved March 13, 2011, from <http://www.foodandwatersecurity.net/data/107/www.iwgia.org/sw16704.html>.
- The Indigenous Peoples Rights Act. (2002). **Republic Act Number 8371**. Retrieved October 20, 2010, from <http://www.chanrobles.com/republicacts/republicactno8371.html>.
- United Nations Educational, Scientific and Cultural Organization .(2002). **Universal Declaration on Cultural Diversity**. Retrieved December 30, 2010, from http://www.unesco.org/education/imld_2002/unversal_decla.shtml#1.
- United Nations.(1999). **Rio declaration on environment and development**. Retrieved December 2010, from <http://sedac.ciesin.org/entri/texts/rio.declaration.1992.html>.
- Valencia, M.D. (2008). Surfing the IKSP towards the establishment of the SMU school of living traditions. Doctoral Dissertation, Saint Louis University.
- Webster, B.J., & Fisher, D.L. (2000). Accounting for variation in science and mathematics achievement: A multilevel analysis of Australian data Third International Mathematics and Science Study (TIMSS). **School Effectiveness and School Improvement, 11**: 339-360.
- Zambrano, M. (2011). Stakeholders' assessment on the effectiveness of the leadership program activities in the schools of the Diocese of Baguio . Unpublished Masters Thesis, University of the Cordilleras, Baguio City.
- Zent, S. (2000). A genealogy of scientific perspectives of indigenous knowledge. New York: Berghahn Books.