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INDIGENOUS SCIENCE PRACTICES FOR APPROPRIATE TECHNOLOGY DEVELOPMENT AMONG WOMEN IN BORNO STATE: IMPLICATIONS FOR CLASSROOM LEARNING.

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ABSTRACT
The justification for traditional science practices is that people construct a safer science able to solve African problems and other nagging world problems. In the process of industrialization, local knowledge is often developed relative to the modern knowledge and technologies that develop to serve the needs of the new commodity generating economy in developing countries like Nigeria. It is often the case that women , ethnic minorities and others remaining more on the margins of the new economy, and this allows them to retain indigenous knowledge long and the sudden commercial interest in indigenous practices often target women and themselves as potential sources of this local knowledge for industrialization. This paper examines the African indigenous practices and knowledge acquired among women and how these practices are blinded with the related science concepts. It shows that African traditional practices are thought system that can have equivalent value with the scientific practices in the western paradigm system though it is not itself paradigmal. The indigenous practices and knowledge acquired among women must convince others that these practices are tools to help them as well as translating what they practice and relate it's to science classroom. Two research questions guided the study. Samples of sixty (60) participants consisting of skilled and unskilled women in confined internally displaced area (IDA) of the community or camp (in Maiduguri) were targeted, and science teachers teaching science subjects were randomly selected from the post primary schools in the IDA camps in Maiduguri metropolitan council. The instrument used to collect the data were

check list, oral interview and simple percentage and frequency counts were used to express the data. It was found that most of the women do practice the indigenous practices and few do not practiced it and that ll the identified indigenous practices are embedded with science concepts, ideas and principle

Keywords: *Science Practices, Indigenous practices, Indigenous knowledge, Indigenous women and Classroom learning.*

INTRODUCTION:

Indigenous knowledge comprises knowledge developed within indigenous societies, independent of, and prior to, the advent of the modern scientific knowledge system. According to Odora, (2005) indigenous knowledge is the sum total of knowledge and skills which people in a particular geographical area possess and which enables them to do the most out their environment. Africans are well known for that. Indigenous knowledge can be broadly defined as the knowledge that an indigenous (local) community accumulates over generation of living in a particular environment.(Ryser,2001).This knowledge is not limited to technical know-how, skills innovations, practices, processes learning and teaching, but also includes knowledge that associated with biodiversity, traditional life style and natural resources. (WIPO, 2012). Science is the per-suit of knowledge. Approaches to gather that knowledge could be culturally relative. Indigenous science incorporate traditional knowledge and indigenous perspective, which non-indigenous scientific approaches are commonly recognized as western education or science together they contribute substantially to modern science. Knowledge and practices covers diverse areas of importance for society, spanning issues concerned with the quality of life-from agriculture, water to health technologies. The goal of this paper is to establish a heuristic whereby indigenous knowledge and practices can be reviewed and evaluated within the contexts to determine if indigenous knowledge and practices can lead to the development of appropriate technology to address the need of the society for sustainable development.

Many indigenous practices reveal that it can be classified as “appropriate” focused on basic needs of water, sanitation, shelter, clothing and agriculture. There are various practices which are carried out in the homes and at the

community at large where people live. Many of such practices which are been carried out by women have some scientific and technological concepts, ideas and principles, and are of peculiar importance for women. Problem solving is a primary characteristic of science and the learner does not just read about science but to do science. Science has become an interdisciplinary, aiming at achieving scientific literacy among communities.

The immediate challenge for us as science educators was to appraise the home and indigenous science practices among African women and explore how they can be integrated with the class room learning.

Women are the nation builders. And historically, culturally and biologically they are link to live to life and nature. Women demonstrate informed science in diverse ways in the natural world. These activities are hidden in some women or unorganized but they can be brought out for probable integration with the formal science. That is process of learning normal school science in order to enrich classroom learning activities.

Science concepts accepts every attempt of humans to explore, integrate and manage the natural world in all its ramifications. The natural world is the dynamic and it is essentially concerned with the search and findings and give explanations of both regularities in nature. The purpose of science is to transform the environment towards improving the general quality of life, thus making the world a better place in which to live. Samuel (1996) asserted that science is primarily concerned with the intellectualization of facts and values in an unbiased manner.

Every traditional society of the world possess a form of science and technology which is employed as indigenous practices and knowledge geared towards the satisfaction of basic needs of that society. These informal science practices according to Ogunniyi, (1986) and Samuel, (1996) may be useful even in the face of modern science. Those practices should not therefore be rendered as obsolete in such societies, but rather, they can be refined and integrated in the knowledge of and techniques of formal science, since they constitutes direct experience with the immediate environment and with the natural world and may be useful to both teachers and learners in enriching classroom science experiences and thereby enhancing teaching and learning science.

Literature:

African contributions to science

Every traditional society of the world possesses a form of science and technology which is employed as indigenous practices geared towards the satisfaction of the basic needs if that society. These informal science practice according Ogunniyi (1986) & Samuel (1996) may be useful even in the face of modern science and technology advancements. Those practices should not therefore be rendered as obsolete in such society but rather, they can be refined and integrated in the knowledge and techniques of formal science, since they constitute direct experiences with immediate environment and with the natural world and may be useful to both teachers and learners in enriching classroom science experiences and thereby enhancing teaching and learning of science. However, formal and informal sciences interact with one another, though both are practiced in different contexts and their linkage is advocated.

Great achievements in science and technology in ancient African countries that includes the Egyptian charted the movement of the sun and constellations of and the cycle of the moon. They divided the year into twelve parts and develop a yearlong calendar system containing 365.25 days. Clock were made with moving water and sundial like clocks were used. Woods (1988) and Brooks (1971). In metal and tools making, which includes steam engine, metal chisels and saws, copper and iron tools and weapons, nails, glue and carbon steel and bronze weapon and art(Van-Sertima,(1983). Other practices were the use of plants with salicylic acid for pain relieve as in aspirin, kaolin for diarrhea as in kaopeetate and extracts that were confirmed to kill Gram positive bacteria (Van-sertima, 1983). Other plants used had anticancer properties and treated malaria have been shown to be as effective as modern day western treatments. Consider Roots as food plants and medial, indigenous people lives for centuries depend on their knowledge about environment. Many species of plants are cultivated and enjoyed across the globe were domesticated by indigenous people for food and medicine. Cotton was grown and made into textiles in the western Sudan and in the interior of the Bight of Benin for centuries before being introduced to the Americas, along with weaving, indigo dyeing and the decorative arts associated with textiles (Paul E.L, 1980). Indigenous knowledge about medicinal properties of plants has been instrumental in pharmaceutical

development. In the field of medicine, indigenous knowledge of healing such as traditional bone setting, has proven to be highly efficacious with life supernatural content. It attract patronage from Africans cutting across social and religious boundaries.

Thus, the application of formal scientific knowledge in solving societal problems is enamors particularly the economic value for women. Women particularly those in the rural areas carry out a number of indigenous science practices often without them understanding it as they aim at making life challenges and satisfying basic needs. They are involved in these activities because of their peculiar roles and contribution to life sustenance. In traditional society like ours these activities are environment indispensable and are numerous. Azikwe, (1999) contented that women are directly responsible for the consumed by the family, for the health, nutrition and educational needs of the family members.

An examination of African traditional contributions to science and technology is hampered by the problem arising from racialized views of history and relegation of Africa to an "undeveloped" or "undeveloped" stereotype.

Objectives of the study. The objectives of the study are to:

- Determine the prevalence of indigenous science practices among women in Gwoza local government of Borno State.
- Ascertain science concepts that are embedded in the identified indigenous science practices as opined by science teachers.

Research Questions.

Two research questions guided the study

✓ What are and how often are the indigenous science practices and indigenous knowledge that exist among women in Gwoza local government area?

✓ With what school science related concepts do these practices got blended?

Methodology of the study

The design of the study was a descriptive survey design on the indigenous science practices which are science in nature among sixty (60) skilled and

unskilled women in Gwoza local government area of Borno state by the use of questionnaire/check list technique based on convenient sampling. Two structured questionnaires were developed by the researchers titled:

vi) Women indigenous science practices questionnaire (WISPO).

This instrument was a check list of women's indigenous science practices generated from oral interview and direct interaction with women in the internally displaced camps called (IDP) who were part of sample and some were illiterate who could not even read and write, some were even averaged in reading a text.

Eighteen (18) item science practices were listed and responded to by the respondents to indicate the prevalence of these practices on a rating scale of: **Most common, occasionally, and rarely,** which was expressed in frequencies distribution, percentages and scored to an empirically determined key assigned to a weighted set responses as: **most common (3), occasionally (2) and rarely (1)** to capture their responses. An arithmetic mean and standard deviation was used to test the research question one (1), variable values below 2.5 were adopted as negative (rarely) while all variable values above were adopted as positive (most common). The second one was titled: "School science concepts embedded in indigenous practices" (SSCWP). School science teachers were asked to fill in school science related concepts that blended with the eighteen indigenous practices. Researchers then after careful analysis of the prevalence of the practices, they assigned the school related concepts that blended with eighteen indigenous science practices after it was filled in by the school science teachers.

Validation of the instrument

The first draft of the questionnaire (WISPQ) was given to some science educator's specialist at Kashim Ibrahim College of Education level for corrections.

Population and sample

The participants in the study consisted of sixty (60) women (skilled and unskilled) who could read and write and some who could not and some science teachers. The stratified random sampling technique was used to select the total

number of sixty (60) skilled and unskilled women. The unskilled women were mostly farmers and pity-traders. While the skilled women were middle class from different organizations.

Science teachers were selected by purposive sampling from six (6) selected schools in the (IDP) area of the study and they all indicated that they understood the listed indigenous activities. Of all the teachers involved for the study. Thirty (30) were female teachers of Biology. Chemistry, Physics, Home economics and Agricultural science and the remaining were the unskilled women who could not read and write.

Procedure for data collection

The researchers administered the instrument in collaboration with the teachers and the laboratory assistant to the respondents.

TABLE 1: Responses of Women on the prevalence of indigenous science practices generated through questionnaire/check list/oral interview

S/N	Indigenous science Practices	Most commo F (%)	Occasionally F (%)	Rarely F (%)
1	Use of glass mirrors	60(100%)	0(0.00%)	0(0.00%)
2	Washing plates, washing clothes, toilets, hand	60(100%)	0(0.00%)	0(0.00%)
3	Cutting soup-leaves, splitting firewood, sweeping with brooms	56(92.32%)	04(7.8%)	0(0.00%)
4	Local child delivery practices to pregnant wom consent of labor during delivery and early pre period.	16(26.67%)	44(77.33%)	0(0.00%)
5	Local treatment of fracture, broken bone, and Wounds	26(43.33%)	34(56.67%)	0(0.00%)
6	Treating fever convulsion, diarrhea, cough and other diseases by steaming of leaves, cooking and other herbs	38(63.33%)	22(36.67%)	0(0.00%)
7	Treatments of measles, chicken pox and other Infectious diseases by the use of concussion.	23(38.33%)	36(60%)	01(1.70%)
8	Food production against diseases and pest by	53(88.33%)	07(11.67%)	0(0.00%)

	the use of natural products like ashes, grinded pepper and animal dung			
9	Food preservation by adding salts ashes and Smoking of food stock like fish and meat	49(81.67%)	11(18.33%)	0(.00%)
10	Cotton rolling and molding into thread for Woven and cap, niching by the use of needle	09(15%)	41(69.70	10(17.70%)
11	Tie and die of clothes and reining process	11(18.33%)	35(58.34%)	14(23.33%)
12	Local soap, oil and local face powdered Production.	18(44.99%)	32(52.33%)	10(16.70%)
13	Using organic manure in raising plants and forest conservation.	26(44.20%)	31(52.70%)	03(5.10%)
14	Production of local traditional drinking alcohol (gin)	22(37.40%)	36(60%)	02(3.4%)
15	Cooking of local soap, making tea and oral Dehydrations therapy.	25(41.67%)	35(58.84)	0(0.00%)
16	Porous pot and aluminum pot building by using Special clay type, fire-brick ting the pots by th Use of cow dungs or feaces	09(15.00%)	41(69.70%)	10(17.70%)
17	Grass cutting around house-hold	17(28.33%)	46(76.76%)	0(0.00%)
18	Hair weaving and platting	14(2333%)	46(76.76%)	0(0.00%)

Source: field work, 2019

Research Question 1: what are and how often are the indigenous science practices that exist among **women** in Gwoza local government area?

Table 1: Results of the check list/questionnaire of women indigenous science practices generated through oral interview and direct interactions with women in the IDP (camps) to indicate the prevalence of these practices. The results show that, the pattern of prevalence or commonness of indigenous practices among women differs in rating by their responses. Most of the practices were rated as occasionally representing 80% except local treatment of fracture, bones and woods. Tie and dyeing of clothes and reining and local soup production, oil and colored face powder production represent only 20%. These practices

generally can be classified as medical agricultural and technological in the modern perspective and some are home chores especially the urban areas like the tie and dyeing and hair weaving. The issue of traditional versus orthodox medical practices in the past has generated controversy among society members. Consider the issue of modes of operation with orthodox medicine, the traditional delivery practices in the bid to align their modes to orthodox medicine and gynecology particularly in the rural areas where such orthodox facilities have not been provided by government.

However, other indigenous practices such as local treatment of chicken pox, measles and other infectious diseases and ailments in pediatrics as well as lever and other ailments in general orthodox medicine are very common in the rural areas by the traditional means.

For the enhancement of science teaching and learning, the prevalence of the various traditional practices was explored with respect to research question two (2) of the listed indigenous science practices. The response of the thirty (30) skilled and unskilled participants that responded to the school science concepts that blended with related to each of these practices was revealed as shown in table 2 below.

Out of the eighteen 18 listed indigenous practices observed in the study, most were found to have scientific meaning and understanding. Consider the use of glass mirror, which does not only reflects the concepts of light and its reflection, but illustrate the con concept of image formation in the mirror which is key to the teaching of images and mirror in physics or Basic science secondary schools. The practices of food protection against diseases and pest explain the concept of microorganisms, pressure increase by air tie ting, health and food hygiene and nutrition. Most of these were judged mostly by most common by the women as shown in table 1. Thus, to enrich science teaching and learning in schools these common practices poses sonic challenges to science teachers. In current best practices in science education, science is activity (Hudson, 1984, West Farmer and Wolf, 1991). Useful experience in informal science practices can be tapped to solve the problems faced science teaching and learning at all of education. The various science concepts observed in the study cut across all level of learning. It will therefore be of tremendous benefit to science education if the practices are well internalized and incorporated with classroom learning.

The effort will reduce the notion of science as abstract and principles to be memorized by the learners. It is against this notion that Maggule and Mazubiko, (2004) advocated the indigenization of formal school curriculum with efforts to Africanized curricular at all level of education. This is in order to bring the learners closer to their immediate environment. As Oguniniyi, (1986) opined that a great number of African myths and believes have scientific explanations which cannot be ignored. Hence, sensitization of the society on the educational, social and medical relevance of these myths and believes has implication on the acquisition of scientific literacy.

Table 2: concepts comparison of indigenous science practices with school science related concepts as opined teachers

S/N	Indigenous science Practices	School science related concep Practices
1	Use of glass mirrors	Understanding the concept of ligl light reflection and image forma mirror
2	Washing plates, washing clothes, toilets, hand washing	Safety precaution, health and hyg
3	Cutting soup-leaves, splitting firewood, sweeping with brooms	How to use simple machine
4	Local child delivery practices to pregnant women that is c labor during delivery and early prenuenium period.	Understanding living and nonlivin things characteristics and repro
5	Local treatment of fracture, broken bone, and Wounds	Understanding the concept of ske And supporting system
6	Treating fever convulsion, diarrhea, cough and other diseases by steaming of leaves, cooking of and other herbs	Plants and the uses of microorga and solvents towards better heal
7	Treatments of measles, chicken pox and other Infectious diseases by the use of concussion.	Understanding the concepts of organisms, immunization, mixture chemicals, reactions and solution
8	Food production against diseases and pest by	Understanding microorganisms a

	the use of natural products like ashes, grinded pepper and animal dung	health, food, hygiene, food preser and nutrition.
9	Food preservation by adding salts ashes and Smoking of food stock like fish and meat	Food and nutrition, food preserv Fermentation, microorganisms ar Evaporation
10	Cotton rolling and molding into thread for Woven and cap, niching by the use of needle	Design and use of simple machine Weave cloth by thread and needle Also it teaches the concept of thr Shuttle from hand to hand and the Spinning wheel to make thread by weaving machine called power loo Hence clothes are made from cot instance a cotton riga from Borno not look like a swollen suit from L
11	Tie and dyeing of clothes and reining process	Method of making designs of fabr Skin, printing, chemical combinati and solvents, color separation tec heat absorption, evaporation and reaction.
12	Local soap, oil and local face powdered Production.	Soap, hard and soft water specifi evaporation extraction and distill
13	Using organic manure in raising plants and forest conservation.	Soil and soil management, soil fer Conservation of natural resource
14	Production of local traditional drinking alcohol (gin)	Hydrocarbons, alcohols brewing, Fractional distillation and ferment
15	Cooking of local soap, making tea and oral Dehydrations therapy.	Food and nutrition, solvents towa better health and chemical reacti
16	Porous pot and aluminum pot building by using Special clay type, fire-brick ting the pots by the Use of cow dungs or feaces	Methods of making artificial refrigerator extraction process o system, heating process and cool system
17	Grass cutting around house-hold	Safety precaution, health and hyg

18	Hair weaving and platting	Health, hygiene and manipulative development.

Source: field work, 2019

Research Question 2: With what school science related concepts do these practices blended?

In the table 2 above shows the relationship between the science concepts and the science teachers' generated science concepts, all the 18 indigenous science practices observed in the study were found to have scientific meaning by teachers which conversely were judge most common and occasionally by the women in questions as indicated on the table 1 except for few of the items which were rarely practiced but do have scientific concepts as opined by teachers. The school science teachers provided the rich insight into the existence of the links or relationship between these indigenous practices and the science related concepts as shown in the table 2. These common practices identified above and how they can be harmonized with classroom practice to enrich science teaching and learning in schools is of great concern to science teachers.

Results and Discussion

African science educators have the challenge of searching and providing scientific explanations for traditional African cultural practices, believes and superstitions. This useful information or experiences in informal science practices can be tapped to ameliorate the problems faced by science teaching and learning in schools. The different science concepts observed in the study cut across all categories of learning (cognitive, psychomotor and affective domain) and could be tied to their importance of eradication of illiteracy. Therefore, it will be tremendous benefit to science teachers if these practices are well and incorporated with classroom learning. This attempts made by the researchers will reduce the notion of science education has been abstract, difficult to learn and full of concepts which only the practioners knows it or as bundles of facts and principles to be memorized by the learners.

Classroom implications

Problem solving is a primary characteristics of science and the learner does not just read about science but "DO" science. Science has become an interdisciplinary, aiming at achieving scientific literacy among communities. There are increased emphases on laboratory activity and the learner is encouraged to find out more knowledge about the moving universe. Home/indigenous practices promote the learning of science and technology in the classroom

Teachers should harness these practices, and use it to promote the understanding and learning of science through proper organization of students into groups and each group being asked to think of the best way to perform a given task and to assist them if anything go wrong in their investigation and plan.

Students of modern science, in this regard have to acquire new roles. He/she must be a role player, a discoverer, a technician designing his/her own apparatus out of local materials, an experimenter who arrives at his/her own answer, and a scientist at heart. To ensure that these roles are maintained the learners are to be kept robust of: observing, describing, classifying, measuring, collecting data, interpreting data and formulating questions.

The major goal of learning in science is to develop reflective, independent learning in students that focusses on science as an inquiry that implies taking contemporary science education beyond teaching, just as the science of the 1960s and 70s. Inquiry is a step beyond science as process. In a complete science education, students learn relevant bodies of knowledge, ways to conduct scientific inquiry and the nature of scientific work. To accomplish this task, teachers must promote learning cognitive and social skills that make instruction more student centered. In addition to reflective thinking on the importance or task in learning science, student become aware of and acted on teacher goals for learning, responsibility, independence, self-reliance and problem solving.

However, students should attempts to bring some order of this disparity. The implication for the science teacher in the classroom therefore is that we must expose the students to problems that create contradictions in their prior knowledge so that through discovery they would reorganize their knowledge to arrive at agreeable one. The science curriculum should include activities which will challenge the students to observe measure infer etc.

Conclusions

For the past several decades, science educators have focused attention on minds, hands on and authentic learning experiences focusing on concept to be learned. Learning to do science is crucial for meaningful learning because learning continues throughout life, and individuals need to find, interpret, and judge evidences under different conditions they encounter. Therefore, it is essential for the students' future to be provided with skills at educational institutions. For example, if the related evidence is not collected, collected concepts will not help students to understand what takes place. (Tobin, Kable and fraser, 1990). For this reason the basic target in science classes should be teaching students how to attain knowledge rather than passing the convenient knowledge.

Recommendations

Science is neither magic nor bundies of abstract facts unrelated to out of school experiences (Mejeha), 1982 and Seweje, 200). It is therefore a great task which requires agent attention and all the stake holders in science education from policy makers to implementers including parents must have an input.

- Teachers therefore, have immensely relevant contributory roles and responsibilities, regular use and engagement of students with local materials in the learner's environment towards the achievement of educational goals and objectives. (Cwikla and Sini, 2004).

- There is the need by teachers to demonstrate high level of professionalism and use well designed innovative teaching strategies in order to achieve his/her lesson classroom objectives.
- Teachers are really faced with the challenge of exploring ways of using rich teaching strategies that will blend the informal and formal sciences for classroom teaching. Science teachers should therefore take further steps that will propels them as resources persons in selecting approaches that will integrate both indigenous practices and science concepts to enrich the learners in classroom experience.

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