

## Strategies for Developing Learning Skills in Primary Science in Nigeria Schools

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### Abstract

*This paper examined the 21st century learners characteristic, the learning skills and the importance of developing learning skills in Primary Science teaching. The use of conventional methods of teaching was discouraged as it merely reproduced learners without thought processes who focus on mere regurgitation of facts without necessarily utilizing the left brain and the right brain activities in learning science. The paper also identified some of the strategies for developing learning skills among learners of primary science and the educational implications involved, were discussion.*

**Keywords:** *21st Century Learners Characteristics, Learning skills, Teaching skills, Learning Styles, Constructivism*

### Introduction

The reformation in science curricular led to innovations in the teaching and learning of Primary Science and also in of professional development teacher, where teachers are re-trained for effective challenges of the 21st century Primary Science education. In Nigeria, the Millennium Development Goals Project (MDG) in collaboration with National Teachers' Institute (NTI), organized a workshop in 2006 for retaining of Primary School teachers and among the subject teachers involved were primary science teachers. According to the NTI manual (2006), the general objectives of primary science education is to enable children observe and explore the environment using their senses. In pursuance of these objectives, the primary science curriculum content were centered on Physics, Chemistry, Biology, Health, Agricultural science and presented in an integrated manner.

These themes would expose the learners to acquire knowledge that would help to lay strong and sound foundation needed for further studies in science and also for scientific and technological advancement in future. Unfortunately, the teaching methods in the primary schools have been proved to be naïve, unproductive and passive thereby leaving the primary science learners to be ill-equipped for further pursuance of science and science related studies at higher level. Ogunleye in Uzoechi (2006), identified among others, lack of qualified science teachers, poor teaching methods, lack of adequate instructional materials, gender problems, poor learning environment as the problems of the rudiments of nature study into the curriculum that was introduced ever before independence.

Studies even after independence and even recently, identified the same problems. Ifegbo (2005) found out that both human and material resources in the teaching of science were neither available nor adequate in primary school in Imo state. Leghara and Okafor (2006) observed that many of our primary school lacked adequate number of science teachers and even where they were present, materials were lacking.

To Uzoечи (2004,2006), Teaching and learning of science were predominantly by memorization and regurgitation of facts with inappropriate teacher/ pupils ratio. These were in line with former findings by Okpalla (1981) and Okebukola (1996) cited by Ezeliora (2005), Okalla posited that teacher clung to verbal symbolism while Okebukola indicated that teachers read from the science textbook, interspersed with a few explanation. While pupils copy as the teacher dubs textbook or an old note. Maduabum in Ifegbo (2009) maintained that due to poor teaching methods exhibited by teachers, pupils failed to have interest in learning and doing science instead, most of them left the primary schools into the secondary with misconceived ideas about concepts and process skills of science. In affirmative, Ezeliora pointed out that in secondary schools, science teachers faced challenging tasks in an attempt to bring these pupils to the expected standard for onward move towards achieving functional science education of the required scientific skills and attitudes due to lack of pupil-pupil interaction, pupil-teacher interaction and pupil-learning material interaction during the teaching and learning process in their primary schools.

Obiefuna (2000) postulated that primary science teachers shied among from activity oriented teaching methods which are effective and relied on teaching methods which are easy but most times inadequate and inappropriate.

Obioha (1987) Njoku (1993) cited in Ifegbo (2009) opined that such inappropriate and ineffective methods of teaching primary science have affected performance of pupils in primary science. Virtually, Ifegbo argues that teaching was the focus before the 21st century and agitates for 'learning' as the focus and the need for a paradigm shift in the teaching learning methods employ by teachers of primary science for purposeful and meaningful learning to take place in the 21st century.

### **The 21st Century Learner and the Nigerian Classroom**

Virtually the discourse from the introduction depicted a 'gap' between 'what is' and 'what is expected' in the teaching learning process in the Nigerian primary school classrooms. Learner – centeredness approaches to teaching and learning have been introduced into the system though, yet to be fully implemented. Lecturing / talk- chalk teacher dominated discussion methods, verbalism and whole class teaching are yet in practice.

The 21st century requires competency from both the teacher and the learner and this could be achieved through pedagogic and andragogic effectiveness where the teacher and the learners are actively involved in all that concerns human learning. "What is" in the school system includes the following: Teacher dominated learning environment, the teacher reads and dictates notes to the learner, the teacher reads the textbooks to the learners, the teacher writes voluminous notes on the chalkboard for the learners to copy. Use of teaching aids rather than instructional materials. Teacher is still regarded as the custodian of knowledge and information flows from the teacher. Frontal teaching that exposes the learner to rote learning, memorization and regurgitation of facts are practiced.

Further more the learning environment is not stimulating enough to develop learning skills. Whole classroom teaching is practiced to the fullest in the Nigerian primary schools and teaching is the focus other than learning. Teachers due to proactive inhibition and technophobia still embark on the conventional teaching methods and the environment is devoid of technology – driven. Assessment is one way and the learner most times, hardly realizes why he/she failed in a particular subject Emphasis is placed on objectivist theory of learning where the learner is forced to learn from what the teacher's interests are.

Admittedly, scientific and technological development has influenced the instructional system components of the 21st century and the learning theory has shifted from objectivism into another branch of cognitive learning theory – constructivism. Obanya (2002) supports that something drastic has to be done urgently to remedy the situation the Nigerian educational system found itself at the beginning of the 21st century. The constructivist according to Senapathy (2009) functions under four major assumptions.

- Knowledge depends on past construction and the world is made known to learners through mental framework and new information is transformed or interpreted through this mental framework.
- Assimilation and accommodation aid constructions in the existing mental framework.
- Learning is not mechanical rather, it is an organic process of invention where learning happens in a natural way without anyone forcing such an occurrence to take place.
- Meaningful learning occurs through reflection and scaffolding of new knowledge.

In a nutshell, the constructivists believe that learning is an individual event where the learner constructs knowledge through the organic process of invention utilizing the mental framework, information is accepted and processed to fit the personal framework and based on the prior knowledge, new knowledge is formed and understood. The 21st century learner requires to be equipped fully and involved actively for the information processing to be positively influenced. This takes place through effective interaction with the environment that is enriching and stimulating. The 21st century teaching learning process requires a paradigm shift from 'what is' to 'what is expected'. 'What is expected' includes.

- Learner –centered /dominated approaches.
- Facilitative teaching /learner.
- Knowledge construction by the learner, as the teacher coaches, guides and facilitates.
- Active learner and use of activity oriented instructions.
- Learner exposures to critical and analytic thinking through the use of real-life experiences / environment and Hands –on /minds – on experiences.
- Learner controlled instructional system.
- Collaborative learning.
- Technology –driven learning environment.
- Use of learner – friendly instructional strategies.
- Learning environment full of instructional materials and learners effective interaction with materials, fellow learners and teachers.
- Flexible sitting arrangement.
- Two way assessment technique.
- Assessment dominated learning process; at the beginning of instruction, during lesson delivery.
- Instructional system with practical oriented instruction and examination.
- Linking and matching theory with practice during teaching / learning.
- Use of ICT technologies and ICT complaint teachers.
- Learning with, about and especially from technologies.
- Above all emphasizing on process of learning rather than product of learning through effective implementation of constructivists learning theory and principles.

It is a truism that there are gaps and the gaps affect learning especially, in science and technology subjects. There is need therefore to expose both the teachers and the learners especially in primary science to acquire appropriate teaching and learning skills for the learners of the 21st

century to face the challenges of the 21st century science and technology and for sustainable development

### **Concept of Learning Skills and the 21st Century Learning Skills**

Ifegbo, (2012) defines teaching skills as those teacher behaviours the teacher employs during teaching and learning process for the teaching and learning to be active, effective, purposeful and meaningful. Ifegbo further explains that teaching skill are different from teaching methods, the teacher exhibit teaching skill for the effective use of the teaching method and for a worth while learning overcome to be achieved. Learning styles and learning skills in the same vein differ. Learning styles according to Keefe in Ezekoka (2005) are characteristic cognitive, affective and physiological behaviours that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. Ezekoka posits that understanding brain functioning is an important factor in understanding the concept, learning style. The left-brain users learn in a step-by-step approach while the right-brain users learn holistically, generalizing concepts before going into specifics. Left brain is specifically for critical thinking while left brain for creative thinking. In learning styles, learning skills are exhibited. Learning skills are knowledge, abilities and experiences a learner exhibits in utilizing a particular learning style.

Learners are categorized differently by different researchers. Ezekoka identifies these categories from different researchers. Thus: conservative focusers and gambling focusers, sharpeners and levelers, divergent and convergent producers, freedom oriented learners and control oriented learners, impulsive and reflective learners, field dependent and field independent, holists and serialists sensory or intuitive learners and visual or verbal learners, inductive or deductive learners ,activists, reflectors, theorist and pragmatists.

Admittedly, these categories emerged from learners behaviour during learning which according to Kolb (1999) is determined from the way a particular learner perceive information and how the information perceived is processed. An individual learner may either perceive information by concrete experience or through abstract conceptualization. In processing information also , a learner either does that by reflective observation or active experimentation (Ezekoka 2005:39). Boyatzis and Kolb (1995) identified four phases from the experiential learning theory thus: concrete experience, reflective observation, abstract conceptualization and active experimentation. Kolb (1999) from the above assumption identified four different learning styles of accommodator, diverger, assimilator and converger.

Ezekoka describes accommodator as a person who favours concrete experiencing and active experimentation learning dimensions. Information is perceived by feeling and the processing is by doing. Diverger favours concrete experiencing and reflective observation learning dimensions. Information from diverger are got through listening and watching. They engage more on paring and sharing where ideas are discussed in groups. Convergents learn through conceptualization and active experimentation dimensions. Information is perceived by critical thinking and learning by doing they process information by involving objects or materials rather than people. Assimilators are abstract conceptualizers and reflective observers learners. They perceive information through thinking, watching and listening and process information preferably, alone though very cautious and always exhibit thoroughness in understanding concepts before they can act.

Virtually as the learners employ the learning styles discussed above, learning skills are exhibited. Partnership for the 21st century skills observed that a profound gap exist between the knowledge and skills students learn in school and the knowledge and skills they need in typical 21st century communities and workplaces. This emerged what is referred to as the 21st century learning

skills (4c's) Thus: critical thinking and problem solving, creative thinking and innovations, communication and collaborating. Learning skills according Bayatzis and Kolb is defined as a generic heuristic that enables mastery of a specific domain. They further identify the two components of a skills to be a domain –specific and knowledge rich ; A skill describes an integrated transaction between the person and environment and finally, skills are developed by practice. Tracing, back to the 'what is' in the Nigerian school system especially in the primary school, learning skills are absolutely missing and the need of the hour is to close the gap so as to help learners meet up with the challenges in the community and work place in this 21st century.

### **The 21st Century Learning Skills and the Strategies for Developing the Skills in the Primary Science Classroom**

Ani (2004) posits that 'Reasoning' is the missing 'R' in the 3R's of reading, writing and arithmetic that formed the basics for teaching and learning process. Ani opines that pedagogical method of teaching and andragogical method of facilitating learning are two dominant methods of leading learners through the winding road of learning. Andragogy according to Ani, is the learning approach that uses systematic and synergic thinking approaches to learning and in this systems thinking, the facilitator leads the learner to be critical and creative in thought. This approach probably exposes the learners to the 21st century learning skills of critical thinking, creative thinking, communication and collaboration. The Nigerian classroom especially, the primary science classroom requires this type of learning environment to enable the learners meet up with the challenges in the scientific word because modern science according to Okeke (2005) depends on relative paradigms for its growth.

Below Are The 21st Century Learning Skills And The Type Of Activities That Will Help Foster Such Skill In The Primary Science

Learning skills	Abilities	Strategies techniques
Critical thinking	Analyzing, arguing, classifying, comparing and contrasting, defining, describing, evaluating, explaining, problem solving, tracking causes and effects.	Brainstorming, graphics organizers, prediction, scaffolding concept-mapping, process-based learning, documented problem solving, coached problem solving.
Creative thinking	Brainstorming ideas, creating something, designing, entertaining, imaging improvising a solution, innovating, overturning, problem solving, active questioning	Experience based learning, case teaching method, simulations, The imagine elaborate predict and confirm strategy (IEPC).
Communicating	Analyzing, choosing a medium, evaluating messages, following conventions, listening actively, reading/decoding speaking, turn taking, using/ understanding technologies in communication, writing/encoding	Gallery walk activities, game-based learning interactive-learning, know-want-to-learn-learn (KWL)

Collaborating	Allocating resources and responsibilities, brainstorming ideas in group, decision making, delegating, goal setting, leading managing time, resolving conflicts, evaluating products processes of learning and teambuilding	Jigsaw, guided discovery, peer learning, reciprocal learning, cooperative learning just-in-time teaching, role-playing think pair-share. ETC.
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*Adapted from:*

Admittedly, a paradigm shift is required for the primary science learners to be equipped and empowered effectively and efficiently to face the scientific literacy and technological development of the 21st century. It is agreed that with the use of those activities/techniques, the “need” that is the gaps between the expected and the observed will be attended to, for science and technology related courses to be appreciated and learnt with interest and understanding at other levels outside the primary school and at the same time, develop lifelong learning and enable primary school learners to acquire learning skills and even integrate the skills into learning other subjects.

**Educational Implications of Developing Learning Skills in Primary Science Teaching and Learning**

Contemporary view of Nature of Science (NOS) accepts that science is conducted in a social context providing opportunities for personal bias and public adoption or rejection of ideas, unlike the traditional view that is so naïve about NOS, seeing science an objective enterprise. Teachers of science education in the 21st century should accept the contemporary view of NOS to ensure successful inculcation of the 21st century learning skills to the primary science learner and to enable them face the scientific and technological challenges for sustainable development.

Omifo (2006) carried out a study on the assessment of teachers views of the nature of science. It was found out that in general, teachers have mixed views of the NOS and less than 50% of the teachers studied have contemporary view. The implication of the findings showed that teachers communicate science in schools as a body of knowledge that is value-free and teachers are likely to teach science without reference to the ways in which science ideas were developed; they are not likely to teach an authentic view of science. Onu (2004) opines that teachers need to challenge children to think creatively, analyze, apply and evaluate information and not to end at developing the knowledge level of the cognitive domain only, as these skills are needed to achieve real success in life situation and in the world of work –(learning skills). The educational implications therefore are:

- That professional primary science teachers should be given appropriate training so as to exhibit the responsibility of the primary science teacher in teaching and developing the appropriate and meaningful learning skills among primary science learners which involves; critical and creative thinking, collaborative learning and effective communication.
- Teaching methods and the theory of learning should shift purely from teacher – centeredness to learner – centered and from objective theory to cognitive/ constructivism theory where learning should be seen as a process that is not mechanical in nature but rather as an organic process of invention where primary science teaching and learning happens in a natural way and science becomes a way of life and not just a body of knowledge that is emphasized upon accumulation of data, its classification and description and by an emphasis upon mechanistic mode of interpretation (Okeke 2005).

- Curriculum developers should go back to the drawing board and ensure effective curriculum planning, development, implementation and evaluation in primary science because primary science education is regarded as a foundation of science education at the post primary and tertiary institutions. Where the learning skills are developed based on the implemented curriculum, the primary science learners can withstand with ease science and other science related subjects in secondary and tertiary institutions. This will go a longer way to improve on the number of students that enter for science and science related courses and will in turn, lead to modernization and improvement of living standards of individuals and the society at large.

## Conclusion

The 21st century teaching and learning process has been revolutionized, learning is being emphasized rather than teaching and the 21st learning skills focus wholly on the constructivists learning theory whereby learning is seen as an organic process of invention and knowledge is constructed through the system of assimilation and accommodation into the existing mental frame work. The already existing framework of knowledge promotes transformation and interpretation of new information. The primary science learner should be trained and taught utilizing strategies/techniques that will equip and empower them to think critically and creatively work collaboratively and to communicate effectively for sustainable science and technology development in this country, Nigeria if this country is ready to realize scientific and technological breakthrough in future.

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