

**EDUCATIONAL MULTINDI: AN INTEGRATIVE AND  
COMPETITIVE DEVELOPMENT OF SCIENTIFIC THINKING  
AMONG NIGERIAN SECONDARY SCHOOL STUDENTS**

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**Abstract**

*Either by adaptive maintenance or genetic actualization, the Nigerian students multicultural as well as unique in his/her learning behaviours. It is understood that the components of human knowing constitute from formal and informal learning; therefore, it can be argued that every society is composed of students who are collective (emanating from formal training) and individualistic (emanating from informal training) at the same time. In other words, no student can be described as totally individualistic or totally multicultural in his/her thinking, problem solving and relational behaviours. This paper argues that Nigerian students, due to the country's composition are wired with a template that facilitates their development into multicultural and individualistic (multindi) persons. Even in his/her ethno (rural) or metro (urban) cultural context of families and schools, the Nigerian child is not raised in a socio-cultural contextual isolation. He/ She interprets experiences and understands information multicultural and uniquely at the same time. This study proposes that though same modes are used in understanding and interpreting the environment, the interactions between the modes for the Nigerian students make for the multicultural-individualism in their understanding and interpretation. These modes are termed selves. They are environmental, physio-biological, cognitive, affective, and spiritual selves. Collectively this is called the **epcas-self**. Developing the **epcas-self** for multindi education prepares the Nigerian student to naturally integrate all the aspects of the human power, energy and force, the characteristics of which help in the development of scientific thinking as he/she trains to participate in the labour market. The researchers present an official proposal of how multindi development works for Nigerian secondary school students.*

**Introduction**

The major aims of any worthwhile helping service, such as schooling is presumably to support learners; to enable them review any *positive* or

negative assessment of themselves; to facilitate the understanding of their uniqueness and worth; and to help them identify hidden strengths for challenging and coping with both internal and external pressure of becoming their best self. (Portes,1996). This study proposes that there are possible modes within an individual whose interactive development shape and form the individual's response to what he or she is being exposed in thinking and problem solving. Formal or informal settings for learning, students are being prepared by parents and teachers to become adult thinkers and problem solvers in the society. The formal setting gears a student to collective learning and informal learning provides the individuation required to shape the child into the unique person he/she is trained to be.

Multicultural-individualism (Multindi) could be described as a typology but more so a preferential mode of understanding learners as they try to understand or explain environments and others with whom they share the environmental self. A formal operational student has five basic components the interactive nature of which informs the way such student thinks and problem-solves (Udoye, 2005). These include environmental-self, physio biological-self, cognitive-self, affective-self and spiritual-self (source-self) – EPCAS-self.

*Environmental self:* The learner's environment (**E**) includes all that is *other* than the learner which can be observed or felt in the senses directly or otherwise. This self can be described as overt and tech-vert. E-self provides the matter and the form which the students use when they begin their multindi development. It is housed in their environmental realities. The environmental-self learns to relate to realities which may include animate and inanimate objects as he/she (patient/family) develops the inter-relational preferred mode.

Learning to relate to the environmental-self involves learning for adaptation, shaping and selecting from the environment (Sternberg, 2000). This level is of primal importance in the development of EPCAS-self. Environmental model of self could be called the *inherited self*. It is *multicultural* in nature and operation. It is parsimonious due to its predictability. It is an unquestioned self that could be equally sophisticated in essence, depending on its context. Every part of self here is testable, it can be said to be observable and measurable. A positive and robust development of the environmental-self at the early stage of a student's learning is assumed to be of significance to the development of the other selves. In the log, items used to assess the students include, chores, community, club, family, farming, cleaning, groups, work and *other*.

*Physio-biological self:* The physio-biological (**P**) includes the biological and the physiological aspects of the individual entity as he/she lives

and/or engages in human behaviours. It incorporates the behaviours and the chemical responses of the senses and the neurons. It is housed in the corpus, and can be either or both overt and/or tech-vert. This could be called sensational knowing. The statement of one with a developing multindi of this aspect is, “*If I see it, hear it or sense it anyhow, I will know it; and therefore, I will be able to solve this problem*”. Students develop p-self as children and/or adolescents from the mentorship of significant other or expert during intense synaptogenetic and growing up periods. The P-self includes the sensed-self, the chemical (auto) self and the biological self (genetic). In the log, items used to assess the students include drawing, dressing, drinking, eating, exercises, self-care, talking and writing. P-self is the capsulizing of the individual-self as he/she interacts with the multicultural context of the e-self.

*Cognitive self:* The researchers speak of the cognitive self (C) when humans address that aspect of the individuality that employs the processes of the human mind and mental resources in thinking, reasoning, judgment and decision-making. This self is supposed to be housed in the human mind and intellect. Prior to the advent of computers and understanding of information processing in the 1920s this component self was believed to be completely covert. Technology and psychology studies have enabled this self to be interpreted overtly and tech-vertly. The development of scientific thinking at this level is called *informed knowing*. It is socio-culturally constructed (Vygotsky, 1978). Another name for this is *the equatorial-self* dividing the upper and the lower hemispheres of the epcas-self. This self asks questions in order to understand both upper and lower hemispheres. It is sometimes the *control panel* in the development of the multicultural-individualistic (multindistic) self for scientific thinking. In the log, items used to assess the students include use of computer in thinking and programming, listening, brainstorming, learning, mental exercises, attending to media news, prioritizing, problem-solving, reading, think-talk and writing.

*Affective self:* The affective (A) individuality involves the responses and the interactive behaviours that students adapt as expected media for the expressions of feelings, emotions and every other affective behaviour which may be unique to a given student and/or culture. This self-development moves from an individualistic standpoint out to the multicultural peripheries. It is called *experiential learning*. It is learning that is felt and internalized from experiences. This is the learning used to understand or feel others’ or individual position. The affective-self is believed to be housed in the heart, although the responsive or reactive effects could be known or felt at the neurological arenas. Formation of attitudes originates from this self. In the log,

items used to assess the students include laughter, recreation, relaxation, rest, services, sharing, stressless and visits.

*Spiritual self*: The spiritual self (**S**) is the other end of the mode which includes all the individual uniqueness and inexplicability. At this core lies the actualization of internalized self. If the environmental-self includes all the direct and indirect observable and known realities learned in the senses, the spiritual-self (which sometimes is referred to as the *source*) includes the realities learned in the extrasensory and metaphysical regions. It is simply known (Hofer, 2004). Its force (**F**) has been directly or indirectly, but indisputably though not scientifically, accepted by different fields and disciplines. This self is believed to be housed in the soul. Whereas the e-self is multicultural, the s-self is individualistic. Although personal and unique, knowing here is termed *universal*, incorporating the fundamental human values in its expression, namely life and love. Knowing here transcends boundaries of cultures, religions and groups. It is wholistic and can be described as uncontextual. Unlike the environmental-self, the spiritual self is sophisticated in its expression and explanation. Learning and knowing could be mostly unobservable and underscores a sophisticated understanding. In the log, items used to assess the students include Wholy Other-talk, aloneness, meditation, praying, presence, reflection, silence, Otherness and spiritual reading.

### **EPCAS-Modes for Integrative and Competitive Development in Thinking**

Scientific thinking is characterized by its *multicultural* connectedness to all other individuals. Thinking is scientific when it incorporates the following aspects of knowing.

- Systematic method of incorporating adaptive measures in unfamiliar contexts
- Inbuilt principles for spotting opportunities and problems in thinking and economics.
- Educational training that provides theoretical knowledge of content area from where learning adaptation is made feasible.
- Self-knowledge in light of an adequate understanding of cultural background.
- Willingness and skills to engage in a meaningful exploration and learning of new things about self, other and environment without teacher losing control.
- Ability to listen without biases and stereotype.
- Providing a learning-teaching that scores self-analytical thinking and creative problem-solving.

These are challenges and they contribute in part to the reason for this study. No matter the subjects of choice in secondary schools, the Nigerian child can be trained to imbibe these aspects of thinking. The researchers argue that these attributes could be developed by training the students in the use of their *epcas* modes.

**E-mode.** Students who solve their problems of thinking and experiences in or with their *environmental self* are the **competitive** type. Their learning is more of outward focus. They tend to solve problems and answer questions that win them approval and acknowledgment. Their knowledge expression is overt, meaning that what they know in the E-self is observable and concrete. They are mostly scientific in explaining their thinking, or at the other end very primal. It is domain specific, particularly relying on their field expertise of primal knowledge base. Learning that is testable makes meaning to students who operate in this mode. Learning in this mode is heavily contextual as well as universal. *I am an achieving student. I am blessed with prosperous parents. I am happy, my family is here to support me. Just look at the moon. I like being in the laboratories during practical. I don't know what I could have done if I did not have expensive wardrobe.* This is referred to as holding environments (Hochschild, 1983).

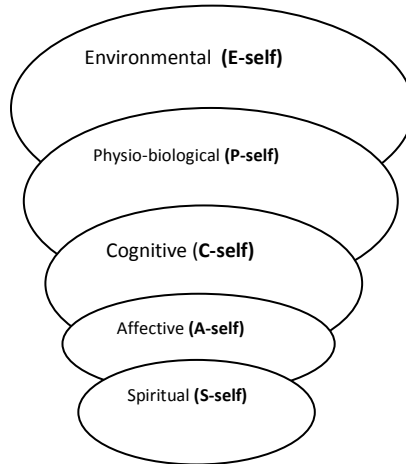
**P-mode.** Learning is constantly accumulating knowledge experiences from thought materials and/or matters with the physio-biological self. A student at this level believes that the more he/she knows about the bio-physiological behaviours, the better thinker or problem solver he/she will be in learning. Solving problems and answering questions in this mode can be **contextually sensorimotor** as well as personal. *I used to be very beautiful and strong. When I study Math, my blood pressure rises. I have lost all my hair and have no more colour because of all these hair cream. Have you ever looked at your body on the mirror and been tempted to curse the day you were born or break the mirror? I don't have quality life with my family again because my body has neither the strength nor the zest for any fun.*

**C-mode.** Piaget (1966) argues that by the time they are in secondary school, Nigerian students must have reached formal operational stage in their cognitive development. Learners in this mode want to develop an understanding that will eventually inform experiences. All the experiences accumulated at the P-mode are at this level remodeled for the purpose of internalizing them later. Hence, meaning-making is significant for the development of scientific thinking in problem-solving. Internalized balance starts to evolve at this learning mode. This is where learning or thinking is done for its sake. *I enjoy learning. When I read, I enjoy being informed. I feel powerful when I learn new ideas. I enjoy being in class during discussion.*

**A-mode.** Students whose preferential mode of thinking and problem solving involve use of affective-self are experiential. All the felt knowledge have been internalized so that –learning *expectancies* have been formed. Problems and questions of self and emotions are asked, solved and answered using prior felt experiences. They are motivated to feel passionately or not, because prior experiences provided them with ample templates. Their understanding of others’ knowledge (Supreme Being or Human beings) is enabled from the standpoint of their constructed and internalized emotive experiences. At this mode, extrapolation or inter-subjectivity is possible. This mode is the medium through which already internalized balance is either expressed or critically tested. *The teacher does not like me and he fails me. I fail Maths because I detest the subject. If there is God, why did He let my mother die when I was 10? (I feel it is either He does not exist or He has not the might we ascribe to Him) Why did God take my parent when I needed him/her most? (I feel it is either He is unjust or He must be a wicked one)*Experiences are explained with feelings in this mode. This student has internalized emotive expectancies of God’s might as related to ability to protect; and that of justice and care as “live and let live”.

**S-mode.** Students whose spiritual self has been developed exhibit a level of *competency* in asking critical questions/problems, realities and ideals. They may not necessarily answer them. They know the differences between mystery and solvable. Learning model is very personal but could fit into universal patterns; therefore students here employ universal values in their learning expressions and behaviours. It is at this level that students are authentically *connected* with the other whether in the e-mode or not. They are altruistic and patriotic. They are competent, given their ability to apply their universal human values in their answering of personal questions or solving the problems of life. At this level epcas actualization takes place. A fully developed epcas-self would reason as such: *If I put the most effort, I would achieve my best. I failed because I did not study. I am sick not because I have done anything, but because I am human. Human beings get sick at one point, and sometimes die. We are not made to live forever. We are mortals. Mortals are terminal. Love is eternal. I know God loves me – when I am well as much as when I am sick.*

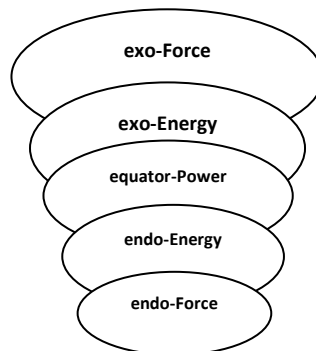
**Figure 1** Epcas-self Paradigm (Udoye, 2005)



**Multindi Education and Scientific Thinking**

The questions always asked are: ‘How is multicultural-individualism characterized?’ and ‘Who has it?’ There is a strong and positive interrelatedness and interwoven dependency between these five aspects of the human self in order for a student to maintain a high multicultural-individualism (Multindi) used in scientific thinking. Development of epcas-self is from the core moving outward and from the outside moving inward until the student arrives at the equatorial region of the self where the c-self helps the student to formally analyse and critically think in problem-solving situations. Though it starts at the formal operational stage, it is a lifelong process of development.

**Figure 2.** Epcas Paradigm: Regions from where the Epcas-self operates (Udoye, 2005)



The **force-energy-power-energy-force (FEPEF)** is the flow of the epcas person connecting the exo to the endo operations, vice versa. Cognitive self – *the equatorial self*, placed at the centre of multindi-person seems to represent the connecting power for the other selves. Equating this to Piaget’s model of cognitive development, this self reaches optimum development at formal operational stage at which age secondary school students are ready. The *equatorial c-self* contains the language attribute that initiates the divide between non-human animals and machines (e.g. computers). Ability to rationalize, interact with others, reason, create, and problem-solve are related to what, how, when and why of knowing and understanding, enhanced by the extent of development of equatorial c-self. Equatorial self is considered developed if the *power* of self here has been developed to hold our north (EP) and south (AS) “poles” with greater equilibration – balance (Piaget, 1969).

While the spiritual-self is the innermost core integrative aspect of the epcas model, the environmental-self is the remotest competitive self. Yet they all seem to be originating from and ending at the same source, **the source-self** (*see the EPCAS paradigm*). Attending to the reality of epcas existence makes for greater understanding and use of these selves. For instance, if something has not existed and students have not developed language for that in learning, no amount of equatorial-self maturation can conceptualize the something. On the other hand, if the something exists but students have not attended to it or imagined it, even the equatorial-self cannot know it. While one may not emphatically assume a position that these selves are age or stage-dependent in their developmental fashion; one could, however, hypothesize that to achieve the multindi education, a secondary age student has to grow from the **E** through **C** to **S** in the **epcas-self** development. It is worthwhile to note that epcas-self cannot be actualized in dichotomous reality. Actualizing epcas-self is the milestone, not necessarily achieving a stage or two. This is when we say a student has become multindistic in scientific thinking in the society.

Human societies are laden with needs, values, beliefs, epistemology, affectations, relationships and existential meanings with which matter and form are created, maintained, explained or destroyed. EPCAS model of study consists of the five interwoven and interdependent aspects of individual human existence, each of which anticipates a significant level of positive development for a given society to give its best to and benefit fully from its citizens. This is what the researchers call the **epcas** education for scientific thinking of students.

### **Conclusion**

The researchers believe that the multicultural nature of Nigeria with above 250 languages in its conglomeration influences learners in the classroom directly and indirectly. It is quite tempting to think that the Nigerian child born in the rural area that is homogenous has only one language out of these 250 languages to contend with in his/her internalization options. The researchers argue that every Nigerian learner, like an American child, is raised multiculturally even in his/her seemingly isolated rural area. Remove such a child and put him/her in the most sophisticated city of the world, and the quick adaptive process is always a proof that the multicultural nature of the country has significant influence.

When they start school, the unique training of the child starts. Not quite long in the multicultural setting of formal education, influenced by the micro and macro paradigms of being an educated person in Nigeria, the multicultural-individualism (multindi) sets in. Epcas modes of interaction help in the development of the multindi Nigerian students. Their scientific thinking grows or dims depending on their multindistic development. Paying authentic attention to the development of the epcas-self when we participate in the teaching/learning profession is the main target of every worthwhile education for the Nigerian secondary students.

### **Recommendations**

This study is at its very primary stage. There is need to develop the study with a scientific design model and usher it into an evidence based research.

Multicultural-individualism (multindi) and epcas models have not been fully explored. This study cannot be used for training except at the subjection of creativity or ingenuity of teachers. It is recommended that classroom teachers, irrespective of subject taught be attentive to epcas-self development of Nigerian secondary school students.

The researchers recommend that Nigerian secondary school students be exposed to a great deal of realities, even if through story-lines or folklores.

The researchers recommend further studies on this proposal in order to provide more testable frameworks, for teaching and learning activities.

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