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A BRIEF ON DEVELOPING OF INDIGENOUS INSTRUCTIONAL STRATEGIES FOR EFFECTIVE SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION

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Abstract

This paper highlights the potential advantages of an educational initiative, including the enhancement and engagement of critical thinking, and problem-solving skills. It also emphasizes the importance of involving Indigenous communities, educators, and knowledge keepers in the development and implementation of these strategies. Ultimately, the abstract underscores the transformative potential of Indigenous instructional strategies in STEM education, offering a path toward a more holistic, culturally sensitive, and effective approach to teaching and learning in science, technology, and mathematics.

Preamble

Teaching and instruction are as old as man and as such their strategies develop and improve from time to time especially because of the development in science and technology.

Brainstorming/discussion on education in Africa will be incomplete without adequate knowledge of indigenous educational system, because whether simple or complex, as posited by Fafunwa (2004), every society has its own system for training and educating its youth. Indigenous strategy is a contemporary strategy that uses indigenous materials, skills processes as well as indigenous rules or heuristics for the improvement of teaching and learning.

Just as events take their roots and components from history, orthodox instructional strategies have their roots generally in cultural practices, indigenous skills and informal education. All orthodox methods of instruction have indigenous antecedents. What we need to discuss therefore is more of discoveries and how applicable they are to specific concepts and topics.

Everyone here had out of school training and specifically we can recall how we were effectively taught how to produce pap from maize, guinea corn etc and what fermented products in such process could be used for.

Today one reads about disappointing assertions as Alio (1997) observed that traditional (orthodox) strategies for teaching problem solving in schools are not effective since students register a high percentage failure rate at SSCE level.

Indigenous Nature is Fundamental to Teaching and Learning

Effects of colonialism, faiths, formal education, and modern technology have not completely fundamentally altered the way we live (Obanya 2007). This can further be inferred from our dispositions and behavior in terms of:

- The misuse or use of mobile phones.
- Respect for elders.
- Cost consciousness.
- Respect for time
- Habit of sharing (fortunes, misfortunes, joy/sorrows)
- Worship styles.
- Domestication of English to pidgin English.

Psychological Theories and Constructs are pertinent.

a. Concept – learning requires examples and non-examples.
b. Thorndike's principle of Analogy or Assimilation states that "when an individual is faced with a new situation for which he has no natural or learned response, the response he makes will resemble an earlier response to a similar situation". (Chauhan, 2003). i.e. To teach from known to unknown, provide identity between historical events and present day-to-day events.
c. Thorndike's principle of associative shifting states that any response of which a learner is capable, may be attached to any stimulation to which he is sensitive.
d. Perception- is known to be cultural, relative, selective, organized, and influenced by sets and expectations.

Relevant Experiences

Mathematics and culture have strong link as Shirley (1997) observed that Mathematics Education needs to use ethnomathmatical thinking to broaden the definition of Mathematics. This is applicable to all fields.

Between April and May 2003, Kano State Primary Schools Management Board organized a workshop for Primary School Mathematics Teachers through Competency Systems Consultants.

The aim of the workshop was to systematically develop Mathematics Teachers Skills which is required of them to tackle pupils' high level of apathy or fear for, and poor achievement in Mathematics.

Five resource persons participated in the training (Dr. I. U. Jahun (Late), Prof. A. Sagir, Prof. (Mrs.) T. Eniayeju (Late), Dr. Okegbile, A. S. and Mal. Dayyabu). The resource persons used different approaches to teach each of the 'difficult' concepts. Notably were 'Ethno Mathematical' approach used by Prof. Sagir and cooperative approach used by Ass. Prof. (Mrs) Eniayeju. Mal. Dayyabu emphasized the example and non-example approach to reorient teachers of Mathematics. These three approaches are worthy strategies and specifically ethno mathematical approach is completely indigenous.

There was a validated 20 – item pre and post test for a sample of 46 participants. Using the t-test for correlated group, t-observed was 7.306 (df = 45, & = 0.05) hence it was observed that there is a significant difference in the mean performance of participants in the two tests and that mean performance in the post test was significantly greater than the mean performance in the pre-test. (System approach for teaching Mathematics, 2003).

Also, having identified peer learning as what is practiced in Africa generally and the distrust bedeviling teacher's marks, peer rating techniques was observed to be a likely accompaniment of indigenous strategies when it was the turn of evaluation of the strategies and effects.

Obanya (2007) observed that, students form study groups in which they pull intellectual and social resources together to prepare for examinations. In such groups, the goal has never been competition, instead, it has been corporate success. So far, teachers, parents and stakeholders are not satisfied with students' achievement in the school. Students who write well administered and well rated tests complain that their scores fall short of their expectation. That is, there is lack of trust for teachers mark.

Nevertheless, on the teaching of science, technical and mathematical subjects, assessment of students has been a one – way affair. Teachers do all the assessment. This is unlike our heritage. We might need other approaches.

Peer rating is a technique in peer appraisal whereby pupils rate their peer (fellow-student) on the same rating device allowable by the teacher. Students brought up under such atmosphere or strategies are likely to think more critically, confidently, objectively and autonomously.

Some colleagues might want to think the way and manners others have argued that –

a) Can students really rate their peers objectively?
b) Can students rate superior colleagues?
c) What will be the relationship between peer rating and teachers rating?
d) What is the standard procedure?

Nash (1973) discovered that pupils at eight years were able to say which children in the class were better than them at reading, writing and numbers. Ramsey, Wenrich, Carline, Inui, Larson, Logerto (1993) confirmed that in medical education, peer rating is feasible to obtain assessment from professional associates of practicing physicians in areas such as clinical skills, humanistic qualities and communication skills.

Eight undergraduate students and a teacher were involved in a peer rating study of tests in two courses; Statistics for Behavioural Sciences (SBS) and Human Learning and Motivation (HLM) using Kendall's Tau correlation, all coefficients on the correlation matrix for SBS and all except in two cases for HLM were significant at 5% level of significance. All coefficients were positive. Objectives of students in the course of rating procedures revealed that the idea of rating colleagues seems novel, interesting and educative (Okegbile, 2008).

In Federal College of Education (Technical) Bichi, Professional Diploma in Education students of 2011/2012 were just being introduced to peer rating and so far in the preliminary attempt (without prior briefing) there was a significant relationship between their rating and that of the lecturer.

Task Ahead Of Policy Implementers

1. Developing indigenous method requires;
   - Knowledge of culture and its diversity.
   - Research efforts.
   - Commitment of teachers.
   - Fund.
2. Authors would like to revise or edit their books by inserting or applying necessary indigenous strategies arising from a workshop of this nature and results of meta analytical studies.

Caution/Limitation

Special consideration must be given to the nature of Nigeria, its cultural diversity and plurality before recommending any indigenous strategy for use. Generalizing of any indigenous approach depends on limitations. There are indigenous practices that promote and those that do not promote science teaching (eg proper disposal of waste, taboos, carcass). Teachers therefore will need to be cautious at the use of indigenous practices in teaching

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