

Investigating Difficult Concepts in Basic Science and Technology Curriculum for Solving Energy and Power Problems for Sustainable National Developments

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ABSTRACT

This study investigated difficult concepts in junior secondary school basic science and technology curriculum with the implication for solving energy and power problems for community development in Ikot Abasi Local Government Area of Akwa Ibom State. The study adopted a survey research design, using simple random sampling technique. Four hundred and twenty four (424) JSS 3 students from seven (7) randomly selected junior secondary schools were involved in the study. One instrument used was; perceived difficult concepts questionnaire (PDCQ) ($r=0.89$). One hypothesis was formulated and tested at 0.05 level of significance and two research questions constructed to guide the study. Data were analyzed using weighted mean, percentage scores and t-test statistics. The results showed that the level of difficult concepts perceived by students was high in most concepts investigated including energy and power concepts. Also, there was no significant difference between male and female students' perceived difficult concepts in Basic science and Technology ($t = -0.876$; $df = 422$; $P > 0.05$). Finally, conclusion and recommendations were made based on the findings.

Keywords: *Difficult concepts, junior secondary school curriculum, Basic science and technology, gender.*

INTRODUCTION

The attention of children in their early lives hinges much on interacting with objects in their immediate environment. From this interaction, they engage in various activities that are of no value and interest to adult individuals. But, children are well-pleased with such activities and are excited each time they do them not being mindful whether the activities are injurious to them or not. Using previous exposure of children to activities which can be foundational to the classroom learning experience, the national curriculum therefore, stipulates child-centred and activity-based approach to the teaching and learning of basic science and technology. However, probably because of lack of right human and relevant non-human resources, learners are faced with difficulties in understanding some basic scientific concepts imperative for the realisation of national objectives in energy and power sector. The child, which is at the centre of a well planned curriculum, is observed to have an exposure to learning experiences and classroom environment that do not bring about his all round developments and national attainments. Currently, the nation, Nigeria is faced with unstable energy and power supply which has paralysed virtually all the sectors and makes social and economy life difficult for the citizens. Many viable businesses crumble every day. The Realisation of government's plans and policies to solve the problem over time becomes very difficult. The current problems with energy and power generation in Nigeria could be termed man-made problems. The way

the preliminary science is taught (that is, Basic Science and Technology at the primary axis and Basic Science at Junior Secondary level) should be the concern of government, scholars and stakeholders in the society. The expectation of any given community is to benefit from science curriculum as the overall dividend of sending their children to school for functional education. The way the school environment handles the curriculum and what the curriculum intends to achieve determine to a large extent the overall effects on the community of running such a programme. The community is undergoing a very serious economic downturn. One of the prominent reasons in Nigeria is a long time problem in energy and power sector despite huge amount of money invested in the sector. Ayanruoh (2013) lamented that Nigerian has one of the most problematic electricity sectors in the world. Nasamu (2015) identified some of the challenges which included under-utilization of generating plants partly due to insufficient gas availability occasioned by frequent vandalism of gas distribution assets, inadequate transmission infrastructure and very high distribution losses coupled with liquidity and viability issues affecting most of the successor distribution companies. One of the solutions to this problem/challenge is teaching the child/learner basic science and technology concepts for conceptual understanding.

Education is a product of interaction among elements he is exposed to from conception through birth, childhood to adolescence, adolescence to adulthood, from adulthood to infirmity and infirmity to death. His experiences and engagements throughout all these stages determine to a large extent what his end is likely to be. These elements exist in form of human and non-human to make a child. What a child brings to the world through the parents such as any form of genetic display and the touch of the environment where he grows up have a lot to contribute to his classroom experience and his education in general. The initial education received at home in informal setting through parents builds foundation for his moral upbringing and intellectual soundness. At home, children are taught culture, values and norms of his community. They are taught home science of different kinds, home/traditional ways of sum, division, subtraction and multiplication of numbers, money, in general, numbers and numeration (that is, home mathematics). Language is also taught to children. This is why native language could have a very strong effect on child's learning because it is the first language he learns. Child's instructor continues to build on child's home background. As the instructor, his expertise in training the child is highly imperative if the child will be fulfilled in life. The instructor then, at this stage, becomes child's next parent, everything to the child outside home setting. He is the counselor, guardian, sociologist, psychologist, model, mentor and maker, almost child's life designer. The environment the teacher operates to produce a child of his desired goal is also paramount. The environment should be such that promotes child's learning and supports teacher's effort to bring about the learning. The availability or non-availability of adequate and relevant learning materials have the potentials to either promote or inhibit child's tendency to learn. Availability of adequate and relevant materials promotes child's tendency to learn while non-availability of teaching/learning resources increases the tendencies to make learning difficult. This could be one of the reasons for the difficulty experienced in energy and power concepts as revealed in this paper. This paper

therefore addresses difficult concepts in basic science and technology curriculum for solving energy and power problems for sustainable national developments

Research Questions

1. What is the level of concept difficulty perceived by students in junior secondary school Basic Science and Technology curriculum?
2. Which concepts do Jss3 students perceived difficult to learn?
3. Will there be difference in the concepts perceived difficult by male and female Basic Science and Technology students?

Scope of the Study

This research is a survey study which was limited in scope to the perceived difficult concepts in junior secondary school curriculum. The study was limited to the junior secondary school three (JSS III) curriculum and JSS III students. The study covered five clans in Ikot Abasi Local Government Area in Akwa Ibom State. The study involves both public and private secondary schools in Akwa Ibom State. Seven (7) secondary schools were used for the study.

The study used twenty Basic science and technology concepts which are:

- Habitat and Adaptation of living things
- Uniqueness of man, Growth and Development
- Chemicals
- Work
- Energy
- Power
- Kinetic theory
- Heat flow
- Crude oil
- Evaporation
- Conduction
- Petrochemicals
- Boiling
- Convection
- Radiation
- Change and Development
- First Aids
- Rescue Operation and
- Security.

METHODOLOGY

Simple random sampling techniques were used for this research. Seven schools were randomly chosen from Ikot Abasi Urban. Intact class was used from each selected school giving the total sample to be four hundred and twenty four (424) students. In this sampling both male and female were represented.

Instruments for Data Collection

The instrument that was used in collecting data for this study was Perceived Difficult Concepts Questionnaire (PDCQ). The instrument (PDCQ) was made up of two sections (A and B) and the respondents were also requested to indicate their opinion using Very Difficult (VD), Difficult (D), Easy (E), Very Easy (VE), modeling it after liker type scale, on various difficulties in basic science and Technology.

Method of Data Analysis

The data collected were analysed using weighted mean and percentage scores. Very Difficult (VD) and Difficult (D) were classified as Difficult. Easy (E) and Very Easy (VE) were classified as Easy.

RESULTS

Research question 1: What is the level of difficulty students experience in the learning of each concept in junior secondary school Basic science and technology curriculum?

Table 1: Perceived Difficult Concepts in Basic Science and Technology

S/N	Statements	VD	D	E	VE	Mean	STD. D
1	Habitat and adaptations of living things	52 12.4%	51 12.1%	163 38.8%	154 36.7%	3.00	0.993
2	Uniqueness of man: reasoning, problem solving, observation and measurement and inference	123 29.2%	138 32.8%	104 24.7%	56 13.3%	2.22	1.012
3	Growth and development	44 10.5%	53 12.6%	173 41.1%	151 35.9%	3.02	0.951
4	Chemicals	115 27.8%	134 32.4%	117 28.3%	48 11.6%	2.24	0.985
5	Work	38 9.0%	73 17.4%	165 39.3%	144 34.3%	2.99	0.938
6	Energy	20 4.8%	45 10.7%	146 34.8%	208 49.6%	3.29	0.843
7	Power	66 15.9%	70 16.9%	153 37.0%	125 30.2%	2.81	1.038
8	Kinetic theory	151 36.3%	124 29.8%	94 22.6%	47 11.3%	2.09	1.018
9	Heat flow	101 24.2%	153 36.6%	109 26.1%	55 13.2%	2.28	0.975
10	Crude oil	84 20.1%	96 23.0%	138 33.1%	99 23.7%	2.60	1.058
11	Evaporation	58 13.9%	82 19.7%	144 34.5%	133 31.9%	2.84	1.025
12	First Aids	31	29	123	237	3.35	1.000

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		7.4%	6.9%	29.3%	56.4%		
13	Boiling	71 16.9%	88 20.9%	134 31.8%	128 30.4%	2.76	1.064
14	Petrochemicals	139 33.2%	118 28.25	90 21.5%	72 17.2%	2.23	1.089
15	Temperature	61 14.5%	86 20.4%	173 41.1%	101 24.0%	2.75	0.980
16	Rescue operation/Security	150 36.0%	125 30.0%	92 22.1%	50 12.0%	2.10	1.026
17	Conduction	105 24.9%	136 32.3%	119 28.3%	61 14.5%	2.32	1.005
18	Change and development	40 9.5%	73 17.4%	159 37.9%	147 35.1%	2.99	0.953
19	Convection	130 31.3%	134 32.3%	99 23.9%	52 12.5%	2.18	1.012
20	Radiation	118 28.05	128 30.3%	94 22.3%	82 19.4%	2.33	1.083
Weighted mean = 2.62							

Table 1 shows the response of respondents to perceived difficult concepts in Basic science. The rating is as follows: First aids (3.35) was ranked highest by the mean score rating and was followed by Energy (3.29), Growth and development (3.02), Habitat and adaptations of living things (3.00), Work (2.99), Change and development (2.99), Evaporation (2.84), Power (2.81), Boiling (2.76), Temperature (2.75), Crude oil (2.60), Radiation (2.33), Conduction (2.32), Heat flow (2.28), Chemicals (2.24), Petrochemicals (2.23), Uniqueness of man: reasoning, problem solving, observation and measurement and inference (2.22), Convection (2.18), Rescue operation/Security (2.10) and lastly by Kinetic theory (2.09). Table 1 further revealed the weighted mean score of 2.62 out of the maximum 4.00, which is higher than the standard mean of 2.50. This implies that the students had high level of perceived difficult concepts in Basic science and Technology.

Research Question 2: Which concepts do JS III students find difficult to learn?

Table 1 indicates that First aids is the most concept students perceived difficult in junior secondary school three Basic science and Technology curriculum, while Energy, Growth and development, Habitat and adaptations of living things, power and Work were other most perceived difficult concepts respectively.

Research Question 3: Will there be difference between male and female students' perceived difficult concepts in Basic science and technology.

Table 2: Difference between Male and Female Students' Perceived Difficult Concepts in Basic Science and Technology

Gender	N	Mean	Std.Dev.	Df	t	P value	Remark
Male	191	51.29	8.922	422	-0.876	0.382	N.s

Female	233	52.10	10.010				
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Table 2 shows that there was no significant difference between male and female students perceived difficult concepts in Basic science and technology ($t = -0.876$; $df = 422$; $P > 0.05$). Thus, hypothesis 1 was not rejected. Table 5 further revealed that female students had the highest perceived difficult concepts in Basic science and technology mean score ($\bar{x} = 52.10$) while their male counterparts had the lowest perceived difficult concepts in Basic science and technology mean score ($\bar{x} = 51.29$), this difference in their mean score is not statistically significant.

DISCUSSION OF FINDINGS

The result of the finding revealed that, students had high level of perceived difficult concepts in basic science and technology, First Aids is the most concept students perceived difficult in junior secondary school three basic science and technology curriculum, while Energy, Growth and Development, Habitat and Adaptation of living things, Power, Temperature, Change and Development and Work were other most perceived difficult concepts respectively. Abimbola, Olorundare, Omosewo, Ahamed, Johnson and Yahaya (2011), point out that the performance rate is poor because of difficult topics in the subject, which are often ignored by students and even teachers. These researchers recommend that there should be a re-evaluation of the difficult concepts. Njoku (2005), Ncharam (2011) and Abimbola et al (2011) identified areas of difficulty in secondary school science curriculum as one of the reasons for low achievement in the subject. This implies that the much difficulty experienced by the learners in learning those difficult concepts especially energy and power may limit their thinking creatively to apply the knowledge and skills in solving human problems. The result also revealed that female students had the highest perceived difficult concepts in basic science and technology score ($x = 51.29$); while their male counterparts had the lowest perceived difficult concepts in basic science and technology ($x = 52.29$), this difference in their mean score is not statistically significant. The result is in line with Ncharam (2011) that examined the relationship between male and female students' learning difficulties and achievement in junior secondary school three (JSS3). The finding of the study revealed that there was no significant difference between male and female students' perceived difficult concepts in basic science and technology.

CONCLUSION AND RECOMMENDATIONS

The study seeks to investigate difficult concepts in basic science and technology curriculum for solving energy and power problems for sustainable national developments. Based on the finding, students had high level of perceived difficult concepts in basic science. Therefore, effort should be put in place by the individual teachers and stakeholders in education seeing the poor state of science teaching in schools to effect positive change in science classrooms. Education sectors should put more efforts in the area of training and retraining of teachers for knowledge updates. Teachers must be equipped with the corresponding strategies to deal with the students' perceived difficult concepts for improving students' learning. Due to the

inevitable importance of this research work, the researcher hereby considers it pertinent to make the following recommendations.

1. The government should always involve the educational administrators in policy formulation to proffer solutions to what makes learning difficult for students.
2. Politicians should not interfere with employment process. Appointment of basic science and technology teachers by qualification and specialisation should be based on merit.
3. In an attempt to solve the challenges in energy and power sector, attention should be focused more on providing better learning environment for basic science and technology teaching and learning at both primary and secondary schools.
4. Well-equipped basic science and technology laboratory should be built in both primary and secondary schools for early exposure of the learners to real science world.

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