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IDENTIFICATION AND ANALYSIS OF CONCEPTS PERCEIVED AS DIFFICULT TO TEACH BY SCIENCE TEACHERS

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ABSTRACT

This paper focused on the identification and analysis of concepts perceived by Basic science teachers as difficult to teach. The study adopted survey design. The population of this study comprised all the junior school (JS) teachers in all the 78 universal Basic Education (UBE) schools in Dekina Local Government Area of Kogi state. The subjects included 118 JS teachers that teach Basic science from 60 schools in Dekina Local Area of Kogi state. The instrument used for data collection was a questionnaire prepared by the researcher. The data were interpreted and analyzed using mean(X), standard deviation (SD) and correlation. The result of the study showed that Basic Science teachers found physical science concepts difficult to teach while most of the biological and health science concepts were easy to teach. Some of the reasons given for the difficulty include inability of the teachers to understand the curriculum, inadequate instructional materials and teachers' course of studies or qualifications. Recommendations made included employment of competent and qualified teachers and regular training and retraining of Basic science teachers.

Keywords: Identification, Analysis and Basic Science Curriculum.

INTRODUCTION

Basic Science in Nigerian schools is one of the core subjects taught at junior secondary school (JS) or (upper Basic) level of education. The subject is taught to every student that enrolls in school at this level. Basic Science is a foundation to all science and science related subjects at senior secondary (SS) level and tertiary institutions. Also the contents are considered very important by Federal Ministry of Education and Science Educators for the attainment of the general objectives of Junior Secondary (JS) Education in Nigeria (FRN, 2007). The broad objectives of Junior Secondary (JS) level as contained in National Policy on Education

(FRN, 2005:8) are to prepare the individual learner for: "useful living within the society; and Higher Education".

The general objectives of Basic Science are incorporated into the general objectives of Junior Secondary (JS) education. These objectives which are enshrined in the curriculum document include, to:

- Observe and explore the Environment
- Develop basic science process skill
- Develop functional knowledge of science concept and principles
- Explain basic natural phenomena
- Develop scientific attitudes
- Apply scientific skills and knowledge to solve every day problems they come across within their environment.

Based on the objectives of Basic Science and curriculum contents, the core curriculum provides for the application of Basics Science to understanding, explaining natural phenomena and solving challenges posed by environment such as health, communication, food and shelter. Also the curriculum emphasizes the production of crafts and developing students' ability to manipulate their environment to their advantage. Therefore, Basic Science in Nigeria has some rudiments of technology as the subject introduces Students to application of scientific knowledge and approaches to solving environmental problems, and production of local crafts using available materials in the environment.

However, Basic Science teachers at Junior Secondary School level just like their counterparts that teach Basic Science and Technology at lower Basic (primary school) level are mostly specialists in other science subjects such as Biology, Chemistry, physics etc. They found it difficult to complete each term's scheme of work (Okezie, 1994). Reasons such as overloading of curriculum, lack of competence to handle some of the topics on the part of the teachers, lack of appropriate teaching resources and poor motivation were advanced for gross under-teaching of the contents of Basic Science curriculum (Njoku, 2005).

One of the consequences of the gross under- teaching of Basic Science in Nigerian Secondary school is failure to attain or realize the full objectives of the subject this by implication leads to graduating "half baked" Basic

Science graduates .There is general dissatisfaction parents and public about the quality of knowledge and skills acquired by Basic Science graduates and their academic performance in public examination: and by extension science students' low performance at both Junior School Certificate Examination (JSCE) and Senior School Certificate Examination (SSCE) (Njoku, 2001), Atadoga, (2007) and WAEC Chief Examiners Report (2008).

For Basic Science to achieve it's purpose there is the need to improve the teaching approaches, explore the students' immediate environment and make teaching student – centered. The teacher must also have good mastery of the subject matter and provide conducive classroom environment that will encourage every student to learn the subject with interest. Based on the given background, the problem of this study is to identify Basic Science concepts which the subject teachers perceive to be difficult to teach, and the reason why they find them difficult.

STATEMENT OF THE PROBLEM

Basic Science is perceived as a foundation of career in science and science related courses (Njoku, 2001 and Atadoga, 2007). Performance in this subject has been observed by parents and educators as discouraging. Researches have blamed lower performance in the subject on students' attitudes, and classroom environment (Njoku, 2001 and Atadoga, 2007). Not much work is done on teachers perceptions of concepts in Basic Science and their correlation to effective teaching and learning of the subject. Also identification and analysis of reasons why teachers of Basic Science find some concepts difficult to teach, is a gap this study is out to fill.

PURPOSE OF THE STUDY

The purpose of the study is to identify concepts/themes in Basic Science that teachers of the subject perceived difficult to teach and reasons why they find so.

RESEARCH QUESTIONS

In an attempt to address the problem of this study, efforts are made to answer the following three questions.

1. Which concepts do teachers of Basics Science find difficult to teach?
2. What is the level of difficulty teachers of Basic Science encounter in attempt to teach each concept?
3. What are the factors responsible for teachers'

difficulty in teaching some Basic Science concepts?

METHODOLOGY

Design of the study: The design of study is survey.

POPULATION

The population of the study consists of all Basic Science teachers in Dekina Local government Area (LGA) of Kogi State. They are 150 in number in 78 secondary schools.

SAMPLE AND SAMPLING TECHNIQUE

A sample of 60 Junior Secondary Schools was randomly selected from 78 secondary schools using stratified sampling techniques. A total of 118 Basic Science teachers participated in the study respondents. They were all those that teach the subject in the schools selected to the study.

INSTRUMENTATION

One questionnaire tagged Teachers' Perceived Difficult Concepts in Basic Science Curriculum (TPDCBSC) was used for data collection. The instrument consists of two sections A and B. Section A deals with personal data while section B consists of 44 concepts from Basic Science curriculum of a 4-point scale rating. The teachers were required to rate the concepts (i) very difficult (VD), (ii) Difficult (D) (iii) Easy (E) and (iv) Very Easy (VE).

The other section of the questionnaire consists of 15 items, with 4-point rating scale adapted from Njoku (2005). The items are suggested possible reasons why teachers of Basic Science find the concepts difficult to teach. Their responses show and rate their levels of agreement or disagreement.

VALIDITY OF THE INSTRUMENT

The questionnaire was validated by four seasoned Basic Science lecturers in Federal College of Education, Zaria and also two measurement and evaluation experts in the School of Education, Federal College of Education, Zaria. A total of 50 items were submitted for validation. They disagreed with 6 items as invalid but unanimously certified 44 items to have face and content validity. The data collected on single administration of the instrument was correlated using Split-half reliability formula. The reliability calculated for instrument was 0.84.

PROCEDURE FOR DATA COLLECTION

The questionnaires were administered personally by the researcher. Personal visits were made to all the sampled schools used in this study in Dekina Local Government Area (DLGA). The questionnaires were distributed to the respondents and later retrieved from them on completion on the same day by the researcher. It took the researcher four weeks to go round the sampled schools.

DATA ANALYSIS

The data collected were analyzed using means(X), Standard deviation (SD) and rank order. These were done to each item (i.e. Concept). A 4 – point scale was used as the instrument with 2.50 as mean scale point. Interpretation of means scores for each item was based on the following criteria.

Criteria:

Means Score	Interpretation
1.50 – 1.99	Very easy (VE)
2.00 - 49	Easy (E)
2.50 – 2.99	Difficulty (D)
3.00 – 3.49	Very difficult (VD)

RESULTS

Answering research question one and two: the questions state that:

(1) Which concepts do teachers of Basic Science find difficult to teach?

(2) What is the level of difficulty teachers of Basic Science encounter in an attempt to teach each concept?

TABLE 1: Means difficulty score, standard deviation and rank (correlation) of Basic Science Concepts as perceived by Basic Science teachers difficult to teach and their level of difficulties (n=118)

S/N	TOPIC	$\bar{X}$	SD	Rank	Remark
1.	Family Health (Cleanliness and Nutrition	2.12	0.84	31	E
2.	Environmental Conservation and safety I (Maintaining Balance)	1.56	0.82	36	VE
3.	Environmental Conservation and Safety II (Sanitation)	2.01	0.83	15	E
4.	Disease Vectors	1.60	0.83	37	VE
5.	Disease Prevention	1.78	0.83	39	VE
6.	Prevention of STIC. HIV/AIDS	1.24	0.81	38	VE
7.	Drug Abuse	1.89	0.83	40	VE
8.	The Earth in space	2.13	0.84	212	E
9.	Matter	2.12	0.84	23	E
10.	Living Thing	1.61	0.82	40	VE
11.	Activities of Living things	1.51	0.80	42	VE
12.	Non-living things	1.42	0.79	43	VE
13.	Gravitation and Weightlessness	2.02	0.84	18	E
14.	Space Travel	2.15	0.84	19	E
15.	Renewable and Non-Renewable Energy	2.02	0.84	19	E
16.	Forces	2.99	0.84	1	D
17.	Family Health (Diseases)	2.50	1.04	3	D
18.	Environmental Pollution	2.07	096	22	E

19.	Living things (Habitat and Uniqueness of Man)	1.83	0.83	44	VE
20.	Changes in matter	2.45	1.00	23	E
21.	Changes in Living Things	2.02	0.84	23	E
22.	Changes in Non Living things	240	1.00	35	E
23.	The human body	2.05	0.86	34	E
24.	Information and Communication Technology (ICT)	2.66	0.99	7	D
25	Crude Oil and Petrochemical	2.22	0.96	24	E
26.	Work, Energy and Power	2.11	0.84	29	E
27.	Simple Machines (Wheel and Axle)	2.32	1.03	33	E
28.	Simple Machine(screw Thread)	2.64	1.05	10	D
29.	Simple Machines (gears)	2.16	0.89	24	E
30.	Kinetic Energy	2.55	1.06	3	D
31.	Thermal Energy	265	1.08	1	D
32.	Family traits (Genetics)	2.75	1.06	11	D
33.	Environmental (Hazards)	2.81	0.85	4	D
34.	Metabolism in Human Body	2.00	0.82	27	E
35.	Sense Organs	2.85	0.97	30	D
36.	Reproductive Health	2.75	1.06	6	D
37.	Resources from Non-Living things	2.45	1.00	27	E
38.	Skills acquisition	2.25	0.95	29	E
39.	Ethical Issues In science and Development	2.44	0.97	30	E
40	Light Energy	2.66	1.08	12	D

41.	Sound Energy	2.55	0.80	11	D
42.	Magnetism	2.89	0.81	1	D
43.	Electrical Energy	2.01	083	32	E
44.	Radioactivity	272	1.01	8	D

For clarity sake, the topics identified by the Basic Science teachers as difficult (D) are shown in Table 2 according to ranking scale.

Table 2: Difficult concepts Identified from the Basic Science Curriculum

TOPIC	DIFFICULTY RANK
Forces	1
Thermal Energy	1
Magnetism	1
Kinetic Energy	4
Family Health (Diseases)	4
Environmental Hazards	6
Reproductive Health	7
Information and Communication Technology(ICT)	8
Radioactivity	9
Simple machines (Screw Thread)	10
Machines (Screw Thread)	11
Family traits (Genetics)	12
Sound Energy	13
Light Energy	14

Based on the results in Table 1, out of the 44 perceived difficult concepts in Basic Science difficulty levels, 9 topics were assessed Very Easy (VE) to teach, (rank 36 – 44). Similarly, 21 concepts were found Easy (E) to teach, (rank 15 – 43) while 14 were found difficult (D) to teach, (rank 1-14). Also from Table 1, no concept in Basic Science was found Very Difficult (VD) to teach by the subject teachers used for this study.

The concept identified by the Basic Science teachers to be Very Easy (VE) or Easy (E) to teach as shown in Table 1 are basically biological and health science related, e.g. environmental conservation, disease vectors, disease prevention, prevention of STIS, HIV/AIDS, drug abuse, the earth in space, matter, living things, non-living things, activities of living things, the human body, metabolism in human body and environmental pollution. Those concepts that are physical sciences related that the teachers found easy to teach are few compared to the ones that are biological and health sciences related. Examples are simple machines (gears), gravitation and weightlessness, space travel, renewable and non-renewable energy, work, energy and power. The 14 concepts rated by the Basic Science teachers as difficult (D) to teach are mostly physical sciences based. This implies that Basic Science teachers find physical sciences concepts in the Basic Science curriculum more difficult to teach than biological and health science topics. By implication the teachers might skip concepts and where they attempt to teach them to the students they would lack competency and confidence.

From Table 2, the rank order of the difficult concepts reveals the level of difficult experienced by the Basic Science teachers in teaching the concepts in the subject curriculum. Most of the concepts as indicated are physical sciences related with just 3 topics that are biological and one health sciences. The difficult concepts are indicators of the teachers' weaknesses and low skills in handling the concepts that are physical sciences in the curriculum. By the difficult ranking as Shown in Table 2, the most difficult concepts are "forces" "thermal energy and magnetism", followed by "kinetic energy" and the last difficult is "sense organ".

Answering research question three: The question states that: What are the factors responsible for teachers of Basic science finding some Basic Science concepts difficult to teach?

TABLE 3: Mean score, standard deviation and rank (correlation) of factors which teachers perceived to account for the difficulty they experience in teaching some of the basic science concepts.

S/N	Topic	$\bar{X}$	SD	Rank	Remark
1.	The basic science laboratories are inadequately equipped	2.63	1.01	9	Agree
2.	No of basic science laboratories exist at all in schools	3.12	0.91	11	Agree
3	Most of the basic science teachers are single science or course based	3.24	0.99	1	Agree
4	Basic science teachers are not willing to improvise teaching/learning resources	2.89	0.94	10	Agree
5	Most basic science teachers have negative attitudes towards teaching	3.03	0.90	15	Agree
6	Basic science teachers are not resourceful	2.57	0.98	12	Agree
7	There are no practical manuals for basic science	3.06	0.92	8	Agree
8	Most basic science teachers do not understand the basic science curriculum content	2.94	0.97	2	Agree
9	No adequate provision for training for basic science teachers	2.76	0.89	3	Agree
10	There is no single text book that covers well all the concepts in the curriculum	2.91	0.90	5	Agree
11	Inadequate provision time allocated to basic science on the school time Table makes it difficult to effectively cover all the topics in the curriculum	3.14	0.95	4	Agree
12	Learners background makes the	2.75	0.89	7	Agree

	basic science concepts difficult to teach				
13	Inadequate preparation of basic science teachers before teaching	2.99	0.95	6	Agree
14	Large class size	2.56	0.85	13	Agree
15	Teaching methods make science concepts difficult to teach	3.04	0.93	14	Agree

Results in Table 3 show respondents' rating of factors responsible for the teachers of Basic Science finding concepts in the subject difficult to teach. The results reveal higher means rating scores above the criterion mean of 2.50.

By their ranking order as reflected in Table 3, the reasons ranked 1, 2 & 3 have to do with teachers' discipline (i.e. specialty or field of study), mastery of subject matter and adequacy of training and retraining programmes. The reasons ranked 4, 5 and 6, time allocated on school general time-table for the teaching of Basic Science per week, inadequate Basic science text-book to cover all the concepts in the curriculum and lack of preparedness of teachers before teaching the concept. The reasons ranked 7,8 and 9 are connected to students' background, lack of practical manuals for Basic Science and inadequate Basic Science laboratory facilities in schools. Also, reasons ranked 10, 11 & 12 have to do with teachers' unwillingness to improvise, non existence of Basic Science laboratories in some schools and non-resourcefulness of teachers. Furthermore, reasons ranked 13, 14 & 15 deal with large class size, teaching methods and Basic Science teachers' negative attitudes towards teaching.

DISCUSSION OF RESULT

Based on the results in Tables 1-3, the concepts that are considered very easy or easy to teach by Basic Science teachers are mostly concepts that are related to their immediate environment and every day happenings. These concepts are also mostly biological, health science, geographical and agricultural science. Biology or health science is the science that is offered at senior secondary certificate examination (SSCE) by all candidates be it science, arts or commercial candidates. Therefore, all teachers that teach Basic Science have background in biological sciences irrespective of

their level of pass at the SSCE. This background could be a contributory factor to their finding those identified concepts very easy or easy to teach by the teacher (Table 1). Also, the physical science concepts that are identified by the Basic Science teachers as easy ones are related to every day happenings and common materials found in homes\immediate environment (Table 1). The concepts are familiar to both the teachers and the students through their interaction with and in the environment. The teachers can get instructional materials on them. For example simple concepts like "simple machines" which is physical science have their instruments everywhere within both teachers' and students' immediate environments.

The Table 2 shows 14 concepts that are identified by Basic Science teachers as difficult concepts to teach. The rank order of these concepts indicates the relative level of difficulty which the Basic Science teachers experience in their attempts to teaching them. Therefore, the Basic Science teachers' difficult experience posses questions of 'WHY?'A careful look at the identified 14 difficult concepts by the teachers require just in-depth knowledge of the concepts if they are to effectively teach them. Also these 14 concepts require the Basic science teachers to be resourceful, committed and hardworking. These findings and observations agree with Njoku (2003) who opined that primary science teachers lack in-depth knowledge of primary science. Hence at both primary school and Junior Secondary level, most teachers lack in-depth knowledge of science subject.

From Table 3, another reason why teacher find some concepts in Basic Science difficult to teach is that some of the teachers are single science biased (e.g. either biology, chemistry, physics, physical and health education or agricultural science). Hence most of the Basic Science teachers have narrow and shallow knowledge of the subject. Lack of adequate provision for training and retraining programmes for Basic Science teachers was also identified as one of the reasons why the teachers find the concepts difficult to teach. Therefore, Basic Science teachers need a forum where they come together share ideas, rob minds together with their colleagues upgrade and update their knowledge. Also from Table 3, time allocated on the school general time –table makes the teaching of the subject difficult. It takes a committed and hardworking Basic Science teacher to organize extra lesson for the students outside the general school time-table so as to cover more concepts with deeper explanations.

The respondents also identified lack of single text books that covers well all the concepts in the curriculum as a reason why Basic Science teachers find the concepts in the curriculum difficult to teach. They need additional text books which will serve as reference texts since they have indicated that no single text givens in-depth treatment of all the concepts in the curriculum.

Furthermore, large class size, students' background and inadequate preparation of Basics Science teachers greatly contribute to reasons why teachers find topics in Basic Science difficult to teach as responded by the respondents. This agrees with Atadoga (2007) who found that large class size does not permit free rapport between the teachers and students hence results in low academic performance of students.

What the teachers can do to adequately handle the issue of poor background of the students is to introduce remedial class for them. This also requires commitment and dedication on the part of the teachers. The teachers need to take time a head to adequately prepare any concepts they want to teach the students. Large class requires more hands, group work and team teaching. The teachers need to group the students into manageable sizes for effective teaching and learning to take place.

There is no nation that has adequate laboratory facilities. Areas where teachers can improvise, they should be able to make use of local materials within their immediate environment. Students can equally be encouraged to participate in improvising some basic local materials which are relevant to some concepts in Basic Science. Some of these materials include nails, pieces of work, plants, fruits, flexible wires, pieces of magnet, etc. Therefore, inadequate laboratory materials as a reason why concepts in Basic Science are difficult to teach can be minimized and handled to an extent. The research respondents also identified lack of Basic Science laboratory as one of major reasons why Basic Science concepts are difficult to teach. In as much as Basic Science does not require elaborate laboratory, the government should try to provide schools with equipped Basic Science laboratories. However, while the schools are waiting for the government to build Basic science laboratories, certain portion of the classroom can be used as nature corner for storage and retrieval of Basic Science materials while practical activities can take place in groups in the classroom. All the teachers need are creativity, resourcefulness and hard work.

Also the teachers need to develop positive attitude towards the

subject and students. They need to be interested in their job and students.

SUMMARY OF FINDINGS

The followings are findings of this study:

1. The teachers of Basic Science find physical sciences concepts in the Basic Science curriculum more difficult than biological and health science concepts to teach.
2. In the 44 concepts identified in the Basic Science curriculum, their level of difficulties vary: fourteen (14) concepts were identified difficult (D), twenty one (21) concepts were easy (E) while nine (9) concepts were identified very easy(VE) to teach. No concept was found very difficult (VD) to teach by the teachers.
3. The factors responsible for the teachers of Basic Science finding some Basic Science concepts difficult to teach include inadequate laboratory equipments, incompetency of the teachers themselves due to single science subject biasness, large class size, lack of understanding of Basic Science curriculum, inadequate provision for training and retraining of the teachers and inadequate time allocation for the subject on the general school time-table

EDUCATIONAL IMPLICATION

Some educational implications from the findings of this study include the followings:

Basic Science teachers are mostly limited in knowledge as some of them are trained as biology, chemistry, physics, agricultural science or geography teachers (i.e. single subject teachers). In a situation as this, the teachers are incompetent in handling the subject effectively even as they do not understand the Basic Science curriculum content

There are no adequate provisions for training and retraining programmes for Basic Science teachers. This implies that most of the teachers do not have opportunities to interact with their colleagues so as to upgrade and update their knowledge and teaching skills. Therefore, the teachers would end up teaching the subject with obsolete methodologies.

In the absence of Basic Science laboratories and inadequate teaching and learning materials, the students would not be able to adequately learn the subjects with

both mind-on and hand-on. The students may end up graduating without acquiring sufficient manipulative skills and science is all about doing.

Adequate time is not allocated to Basic Science on the general school time-table and therefore teachers would not be able to cover enough ground within the official time. An attempt to rush to cover the syllabus would place the students on disadvantage as they might not be able to acquire deep the understanding of the subject.

Poor attitude of Basic science teachers as revealed by this study is an indication of among other things lack of interest in the job. This can be improved by improving teachers' welfare.

RECOMMENDATIONS

Based on the findings and educational implications, the following recommendations are made:

1. Those who are to be employed to teach Basic Science should have broad or deep knowledge of all the components of Basic Science curriculum as those who are single subject biased are not competent enough to effectively teach the subject.
2. There should be adequate provisions for regular training and re-training programmes for Basic Science teachers. Examples of such training and re-training programmes Include refresher courses, seminars, conferences and workshops. These afford them the opportunity to update and upgrade their knowledge and skills.
3. There should be establishment of well equipped Basic Science laboratories in all the schools. Also effort should be made by the Basic Science teachers and students to improvise some teaching basic learning materials (e.g. empty cans, nails, plastics materials, pieces of magnet, and pieces of wood).
4. Adequate time should be allocated to the Basic science on the school time-table so as to allow for practical activities.
5. Basic Science teachers should be given special allowance and in-service training as way of encouragement for positive change of attitude.
6. Authors should write more text books on concepts the Basic Science teachers find difficult, to teach. Those concepts should be simplified and illustrated.

CONCLUSION

The study focused on identification and analysis of concepts perceived by Basic Science teachers as difficult to teach. Based on the respondents' responses, out of the 44 main concepts in Basic Science, 9 concepts were perceived very easy (VE) to teach (rank36 – 44), 21 concepts easy (E) to teach (rank 15 – 43), and 14 concepts difficult (D) to teach (rank 1 – 14). No concepts perceived very difficult (VD) to teach by the teachers. Most of the concepts perceived very easy and easy to teach by the teachers are biological and health science based. The 14 concepts identified by the respondents as difficult to teach are mostly in the areas of physical sciences.

Therefore, it is imperative to note that most of the Basic Science teachers have no deep knowledge of physical sciences. Hence, they are not competent enough to handle most of the concepts are that physical science related. A total of 15 factors are induced to account for difficulties experienced in the teaching of some of the Basic Science concepts identified in this study by the teachers. These factors have to do with teaching and learning facilities, teachers' attitude, large class size, teachers' qualifications, training and re-training programmes for teachers and students background. Therefore, it is recommended that there should be provision for adequate regular training and retraining programmes for Basic Science teachers, establishment of well equipped Basic Science laboratories in all the schools and authors should write more and simplified materials on physical science concepts and other difficult concepts in Basic Science.

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