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Probing the Dynamics of Primary Science Classrooms in Nigeria in Relation to Pupils' Interest in Science

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The thrust of this study was to investigate the discourse in science classroom and determine its influence on pupils' interest in science. A combination of qualitative and quantitative approaches were employed, hence data were gathered from multiple sources (observation, interviews, and field notes). Using a case study of a school situated in Lagos, 22 pupils and a teacher were observed during science sessions. Data were analysed using pictorial, mapping technique and coding of interview transcripts. Findings revealed the dominance of teacher initiated talk and preponderance use of discussion and questioning at the expense of inquiry and experimental activities. The need to engage teachers in a continuous process of retraining most importantly in the direction of active learning was strongly advocated.

Keywords: [illegible]

Introduction

The quest for quality science instruction has been a perennial objective of science education (Akinoglu, 2008; Chun-Yen, Ting-Kuang, & James, 2010; Gregory, 2006; Heap, 2007; Mary, 2002; Tsai, 2003). Consequently, classroom practice has become an area of prolific research characterized by several parallel, but distinct lines of investigation. Research on classroom practice has been undergoing a revolution of its own in order to make science teaching and learning meaningful (Block, Gambrel, & Pressley, 2002; [illegible]; Mark, 2003; [illegible]). Current emphases centered around interactive, hands-on or inquiry learning. These pre-suppose an active science classroom where there is equitable question distribution and participation, an activity-driven environment that promotes various forms of interaction (student-teacher, student-student, student-material, teacher-material and student-teacher-material) (Isabel, Eduardo, Jonathan, Charalampos, Maria, & Jimenez, 2002; Madelon, Pedro, & Dan, 2003).

Research on classroom interaction is desirable in order to establish baseline data relating to teachers and pupils activities in science classroom. Such data assist to indicate how current concerns are met through classroom practice (Crosswell, 2009; Habsah, 2006). This may be used as a way of measuring changes introduced by new initiatives designed to improve the quality of future teaching and learning. It is necessary to monitor classroom processes and interactions for appropriate feedback towards professional growth and

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development of teachers as well as in-service development and training (Dukmak, 2009).

A plethora of studies (Aminu, 1979; [illegible]; Okebukola, 1986; Ogunleye, 1999; Owolabi, 2006) has shown that the climate which pervaded science classrooms in Nigeria, included teacher dominance, individualistic students work, low peer support and lack of opportunities for practical work. A science classroom environment such as this only promotes teacher talk activities, student read activities, teacher dominated lesson, didactic, textbook bound and examination-oriented teaching. This contradicts the advocated strategy in the curriculum which is guided discovery (Oloyede & Adeoye, 2009; Wood-Robinson, 1991). This strategy ensures that learning as an activity takes place while the students' mind is actively engaged through a series of well structured experiences typified by experimentation, questioning, and discussion. The major elements in the method are students' activities through experimentation, inquiry through assignment and discussions and genuine interaction among students, teacher and resource materials (Anders, Christina, Bruno, & Lena, 2003).

Cognitive abilities of students and their classroom interactions are important predictors of achievement, in recent years, affective variables have emerged as salient factors affecting success and persistence in science. Critical among these affective variables is students' interest in science (Andreas & Manfred, 2011; Ayelet & Yarden, 2009; Hulleman & Harackiewicz, 2009). One of the more important goals of education is developing the love of learning (FRN (Federal Republic of Nigeria), 2004). There is reciprocal relationship between interest and learning achievements as each reinforces the other ([illegible]). More importantly, there occurs enduring swing away from science in many countries ([illegible]). The quantitative decline in enrolments in science subjects (Crawley & Black, 2012) is an indicator of dwindling interests of students in science. Decline enrolments in the sciences are associated with the perception that science study is too difficult compared to other subjects (Crawley & Black, 2012). Also, science subjects were said to be too demanding and requires special motivation from teachers for the sagging interest ([illegible]). It requires an inspiring teacher to foster students' interest in such a situation.

The falling numbers choosing to pursue the study of science has become a matter of considerable societal concern and debate. It is of critical importance to investigate the discourse that occurs in science classrooms, and determine whether distinct and informative interest profiles would emerge from pupils' perception of learning variables that ginger their interest in science. To achieve these, the following research questions were addressed:

(1) What is the pattern of interaction in science classes observed?

(2) To what extent are teachers able to use inquiry method in science classes?

(3) To what extent are teachers and students involved in experimental work?

(4) How often do pupils initiate talk during primary science lesson?

(5) What learning variables influence interest of pupils in science?

Theoretical Framework

Modern day teaching entails the teacher engaging the student in an interactive and reflexive process and maintaining a classroom culture rather than the transmission, introduction or even rediscovery of pre-given and objectively codified knowledge (Crawford, 1996). In congruence to this statement, this study is pivoted on Vygotsky (1962) social development theory and [illegible] situational analysis. Vygotsky (1962) argues that social interaction precedes development, consciousness and cognition are the product of socialization and social behaviour. He stressed that every function in the child's cultural development appears twice: first on the social level, and later, on the individual level. That is between people (interpsychological) and then inside the child (intrapsychological). Vygotsky (1962) theory promotes learning contexts in which students play an active role in learning. Learning therefore becomes a reciprocal experience for the students and teacher. In other words, the nature of the learning process is affected by the nature of the social interaction. Teacher and students interactively constitute the culture of the classroom, with negotiation and collaboration as the hallmark.

Interest is a phenomenon that emerges from individuals interaction with their environment and is generally aroused by specific features of an activity or task ([illegible]). Interaction between an individual and the environment, which comprises objects, activities and other people, is a central feature of interest as defined by Mitchell (1993), through meaningful participation in that environment. Theories of situational analysis (Mitchell, 1993) argued that interest is an external locus. Genuine interest is the accompaniment of the identification, through action, of the self with some object or idea, because of the necessity of that object or idea for the maintenance of a self-initiated activity.

The Primary Science Curriculum

The present primary science curriculum was introduced in 2009 and referred to as basic science and technology curriculum. It combines the content of two subjects (primary science and basic technology) using an integrated approach. The curriculum reflects depth, appropriateness, and inter-relatedness of the curricula contents. The aims as stated in the curriculum (FME, 2009) are to: (1) lay a solid foundation in science at the primary school level by introducing the basic process of science to the Nigerian child; (2) enable the Nigerian child to develop spatial (three dimensional) perspectives in the course of his or her intellectual development; (3) provide opportunities for the Nigerian child to develop manipulative and psychomotor skills through concrete experience; and (4) develop and sustain the interest of the Nigerian child in science through appreciation of orderliness and beauty in nature.

The curriculum was designed such as to promote active doing and participatory learning. It encourages hands-on activity and draws examples from immediate environment of learners. Hence, guided discovery method of teaching was recommended. The central theme chosen is science for living. Some practical application of major ideas in topics like housing and clothing and relevant technology have been added to the curriculum. To make learning easy and interesting, topics, themes and concepts are spirally arranged. This will enhance retention and retrieval of knowledge, promote interest and curiosity in the subject and also provide opportunities for creativity.

Methods

Study Design and Participants

This study employed a combination of quantitative and qualitative approaches to unravel the pattern of interactions in primary science classroom. This study took place in a school situated in Lagos, south western Nigeria. Lagos was a former capital city of Nigeria and has continued to be the commercial nerve centre of Nigeria. The school where the study was conducted was owned and managed by a private body. It is a grade A school with specialist teachers unlike many other schools (public and private) with generalist teachers. While a specialist teacher is employed to teach a subject he specialises in, a generalist teacher teaches all subjects irrespective of area of specialisation. The school has an enrolment of about 450 pupils and 55 staff, hence a sizeable pupil-teacher ratio. It has a functional laboratory which is not well equipped. The laboratory facilities are not enough to go round the pupils at the same time.

An intact class (basic 3) of 23 pupils (7 males and 16 females) and a teacher was involved in the study. Basic 3 is strategic for the fact that it is the confluence between the change in the use of mother tongue as medium of instruction and English language on one hand and the terminal year for lower basic on the other hand. Pupils at this level would have been used to the school activities and practices and should demonstrate high level of comportment which is an important condiment for interaction.

Instruments

A self-developed observation protocol titled PSOS (Primary Science Observation Schedule) was used to gather data on classroom interaction. Observation studies although not making claims to the truth of what goes on in classroom provides important dimension to describing and understanding classroom practices. PSOS is divided into three components: teaching initiated by the teacher, teaching initiated by students and teacher and students involvement in experimental work. Each component is sub-divided into questioning, inquiry, discussion, and activities. Against these components is arranged 30 time-sampling unit, duration for a science class. A training session was organised among the researchers to ensure high inter-rater scoring and high reliability of data. Comparisons were drawn after every topic and discrepancies in scoring were pointed out and corrected. High inter scorer reliability was obtained after the third session. The researchers thereafter proceeded to the classroom to observe the lesson together. This was achieved by conducting an observational session with primary three pupils of a school which shared many common attributes with the school choosen for the study. Consent of the school was sought and granted to allow the science teacher teach throughout the week the observation was carried out. This enables the researchers to observe same teacher in turn. The lesson was also video recorded. The observation was conducted from a distinct but pole position (unobtrusive) to avoid any distraction of pupils' attention. Researchers intent and presence although known to the teacher has no interactive effect on classroom performance (attention and participation) as the teachers were well briefed and assured of the confidentiality of their identity and the report. Teacher-student interactions were recorded by observers by placing a tick at the appropriate cell to indicate an occurrence of a behaviour. No behaviour is recorded more than once within a minute.

It was considered important to complement observation by conducting interview with the teachers and pupils. An interview guide was developed by the researcher to further capture the transactions in the classroom. The interview for the pupils which was open-ended centred around the following questions: whether the pupil has interest/likeness in the school, what makes the pupil likes the school, whether pupil get homework, science book, reason for like/dislike in science and socio-cultural factors affecting the learning of science. The interview for the teachers centered around pupils interest and strategies of teaching. It took several practice sessions between the interviewers and another group of students from a different school to ensure a high degree of success of the procedure. After this and a pilot-trial, the interview proceeded. In a face-to-face interview sessions, four pupils were asked open-ended questions and pupils expected to give oral response.

Interest inventory of pupils in primary science is a self-developed instrument which sought information on ways to promote pupils' interest in the learning of primary science. It consisted of two sections: Section A sought biographic data on age, sex, parental literacy level, parental religion and language of communications at home and in school. In section B, issues bothering on ways of imparting scientific knowledge at primary school level were raised. These included teaching prompted by the following: teacher-talk, questioning, group work, field trip, process of science, simple experiments, project work, mother-tongue, cultural beliefs and story-telling. Pupils were asked to carefully study the various ways of teaching primary science and thereafter produce a ranking of their preferences.

The instrument was validated by subjecting it to peer review at first instance and later trial-testing among seven primary three pupils of another school which shares many commonalities with the school chosen for the study. This informed a change in structure from a questionnaire (3-point likert type) to an inventory. It was rather cumbersome for pupils to comprehend and respond appropriately to the 3-point likert type despite several attempts to explain how to respond to the various items. However, they easily comprehended when asked to assign position (rank) to reflect their preferences. The reliability of the instrument was established and a cronbach alpha value of 0.84 was obtained. Administration of the instrument was carried out by the researchers. Pupils experienced no difficulty to warrant any explanation from the team of researchers. All the instruments were recovered on the spot after 30 minutes.

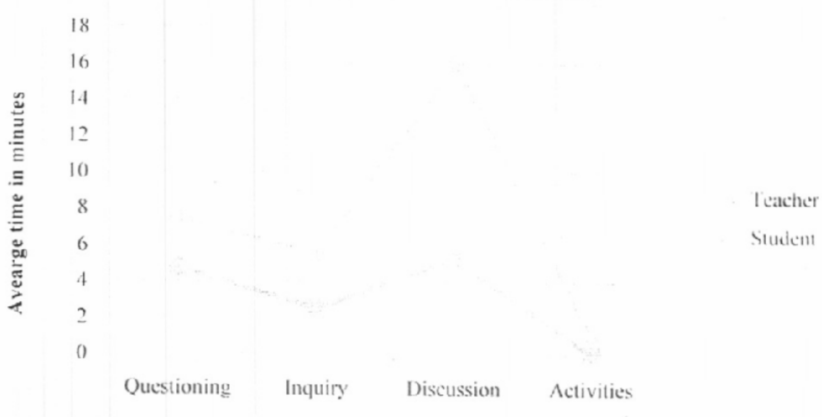
Data Analysis

Data from classroom observation sheet were analysed pictorially using line graph to describe the pattern of interaction in science classroom. Diagram of teacher-student interactions were developed to provide succinct description of classroom events. Student-teacher interaction was captured further using an open-ended narrative method. This involved an algorithm of the entire classroom processes. Hence, a detailed account of classroom interactions was captured. All researchers were involved in narrative at the same time. The manuscripts were harmonized to arrive at a concise report. Memos summarizing interactions were then written and shared among observers after observation. The interview was recorded and transcribed using axial approach.

Results

In this section, we present the findings from the study. They are grouped into the following major themes: pattern of interaction, teacher's use of inquiry, pupils' involvement in practical work, pupils initiated talk and pupils interest in science.

Pattern of Classroom Interaction



Data from the Primary Science Observation Schedule which shows the various happenings in the science classroom observed was used to obtain a graphical description of the classroom interaction pattern as shown in Figure 1.

Figure 1 shows the preponderance of use of discussion method. It reveals further the teacher use of questioning more often than inquiry. Figure1 also shows the complete lack of practical activities.

A mapping of the actual set up of the science class with the various transactions was obtained and presented in Figures 2 and 3.

Figures 2 and 3 show the sitting arrangement and the interaction between teacher and pupils during a science lesson. For clarity, pupils' participation in class was classified based on their activeness in class. These are represented as follow: FHCQ (female with high cognitive questioning), FLCQ (female with low cognitive questioning), HCQ (high cognitive questioning), LCQ (low cognitive questioning), HCA (high cognitive answer), and LCA (low cognitive answer).

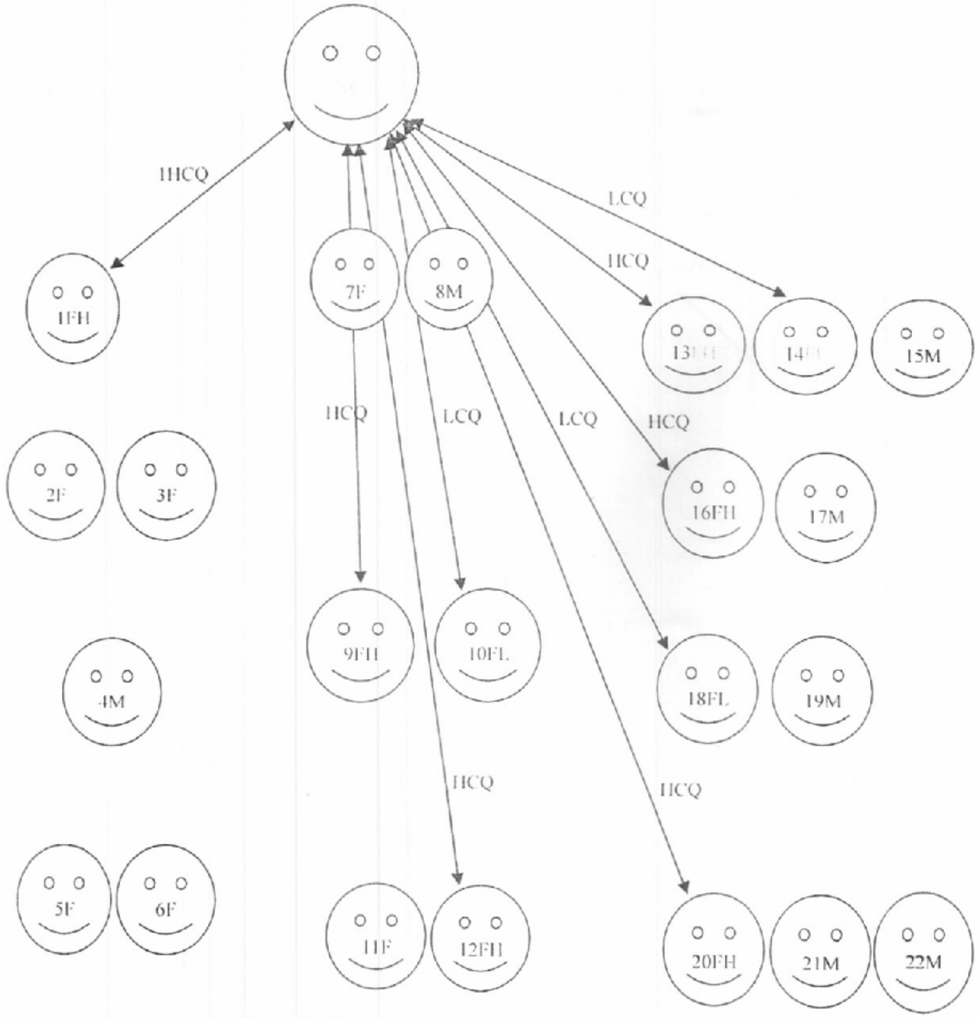
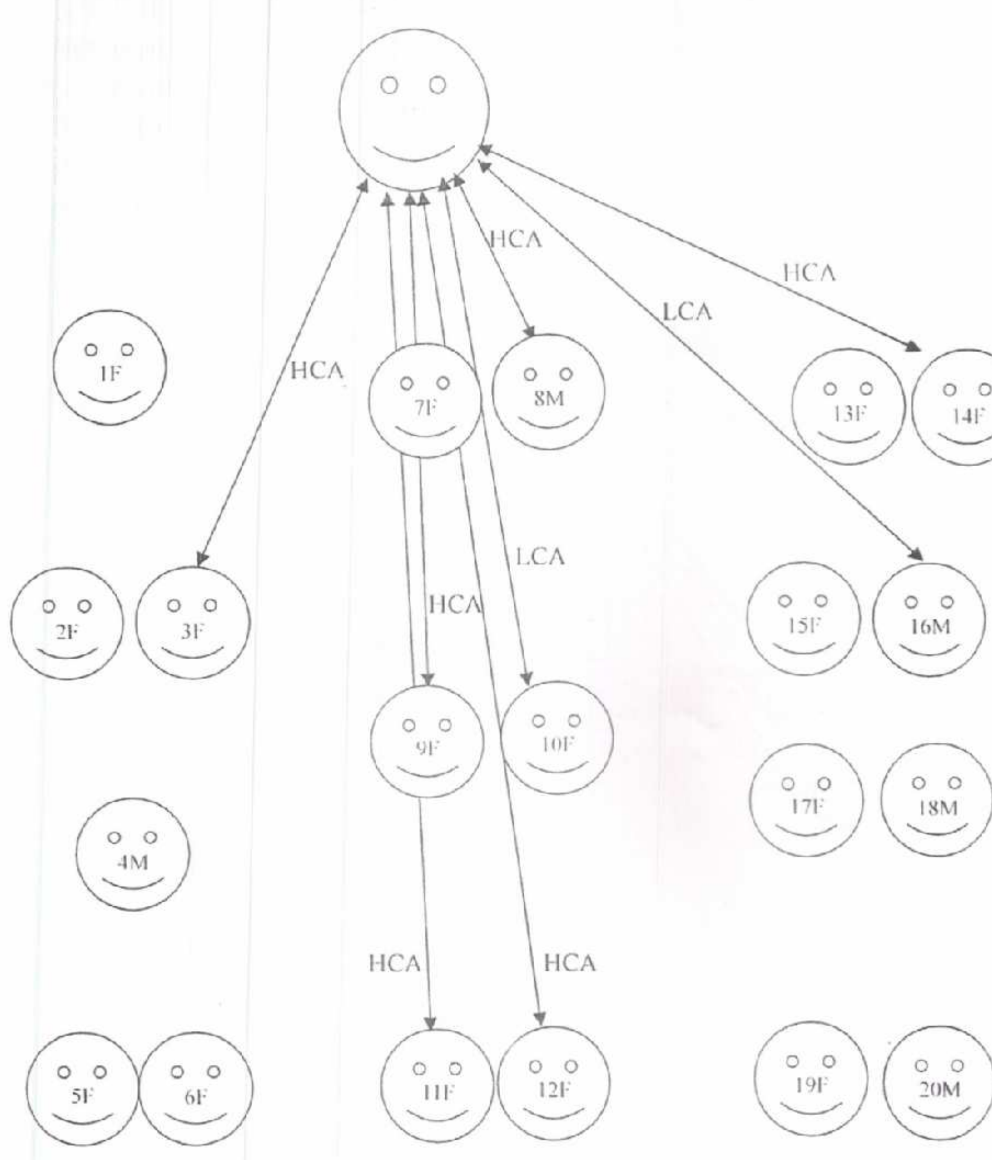


Figure 2. Sitting arrangement of pupils and pupils questioning pattern.

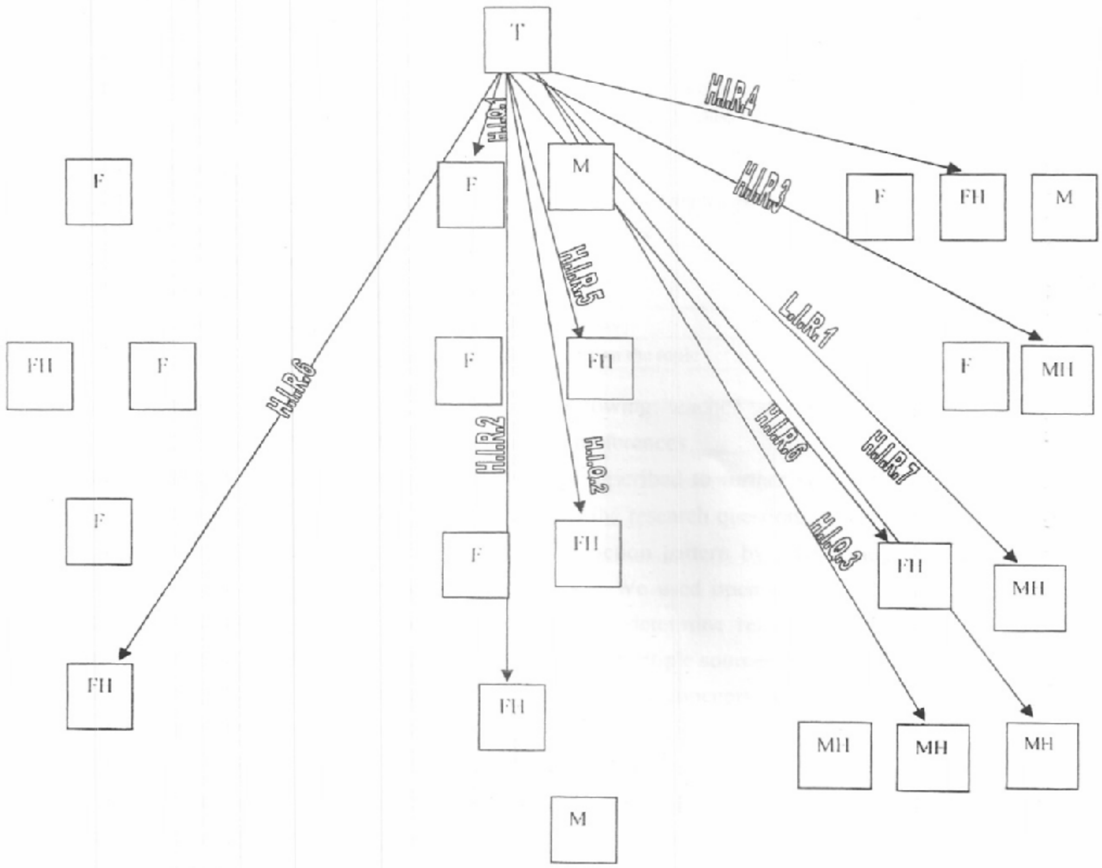
Notes. ☺ Teacher/pupil;
F = female;
M = male;
HCQ = high cognitive question;
LCQ = low cognitive question.



Notes. (smiley face symbol) = pupils/teacher;
F = female;
M = male;
HCA = high cognitive answer;
LCA = low cognitive answer;
Please be informed that the number of pupils in the first session of the lesson were 20 pupils while 22 pupils were in the last session of the lesson reason being that some of the pupils joined the class later.

As shown in Figure 2, arrangement of pupils in class is lopsided. Greater number of the pupils' are sited to the left side of the teacher. This corresponds with the uneven answering of questions across row which invariably could lead to poor classroom management. Responses from the pupils vary from low cognitive answers to high cognitive answers. Some of the pupils are inactive as they are not responding to questions.

Figure 3 shows that the most prevalent feature in the lesson observed is the predominance of teacher initiated talk in form of questioning. The teacher asked questions about the science concepts taught often. Responses from the pupils vary from low cognitive answers to high cognitive answers. Also, some of the pupils were passive listeners. They neither ask nor respond to questions.



Notes. M = male;
F = female;
FH = Female with high cognitive level;
MH = Female with high cognitive level;
[illegible]
H.I.R = High Intelligent response;
H.I.Q = High Intelligent question;
1, 2, 3, 4 ... = The way in which the students responded or asked questions.

Figure 4 reveals the pattern of teacher-pupil interaction typified by questioning and high intelligent questions from some pupils. It shares common features with classes described in Figures 2 and 3.

Table 1

Mean and Standard Deviation of Pupils' Response on Learning Variables That Promotes Their Interest in Science

S N	Item	Mean	Std De
1	Pupils listening to the teacher while the teacher is talking	1.54	2.65
2	Teacher teaches by asking pupils' question	2.71	3.2
3	Teacher engaging pupils in group work	3.52	2.47
4	Teacher telling interesting stories relating to the science topic	3.54	2.48
5	Pupils making simple objects (i.e.. making matchbox, making eyes with clay, rainbow)	4.25	3.1
6	Doing a nature discovery walk by pupils and the teacher around the school compound	4.33	3.36
7	Teacher making use of local materials to give explanation in science class (e.g.. pawpaw stalk to produce sound)	4.44	3.62
8	Pupil observing by using the sense organs	4.79	3.46
9	Pupils' performing simple experiements (i.e.. blowing bubbles. making leaf print)	5.25	3.7
10	Teacher's explanation agree with my religious beliefs on the topic	5.29	4.39
11	Teacher using stories to teach science	5.5	5.57
12	Teacher using my language (vernacular to teach)	6.38	5.28
13	A nature discovery through other means (e.g .. television: dstv)	6.58	5.15
14	Teacher's explanation not contradicting my cultural beliefs on the topic	6.92	5.42

As shown in Table 1, teaching prompted by the following: teacher talk, questioning, group work, and story-telling are most favoured by pupils as their learning preferences

Qualitative accounts of the classroom dynamics are described to further substantiate our discussion on classroom interactions pattern and also provide answers to the research questions 2, 3, and 4. In furthering our analysis, we pursued a more detailed description of interaction pattern by relying heavily upon the use of multiple sources to support assertions or coding decisions. We used open coding to identify, describe, and categorize pupils responses and later used axial coding to determine relationships among the categories. Triangulation was used to arrive at emergent themes from the multiple sources (interviews and narratives).

Teacher employed probing questions to inquire about science concepts. An example of this can be seen in Figure 1 where questioning was the only mode of inquiry. We further accentuate this by the accompanying narrative mode:

The teacher introduced the lesson by asking pupils to remind him of the last topic, a pupil answered plant and animal. The teacher thereafter engaged pupils in discussion and asked then what they know about plant, a boy then said that plant cannot move and another girl equally responded same manner. He them asked pupils about animal and a girl told him that animal can breathe. The first boy who earlier talked equally told him that an animal can eat. The teacher thereafter told them that today's topic is differences between plants and animals and wrote the topic on the chalkboard i.e. Differences between plants and animals.

The teacher asked the pupils the difference between plants and animals and a girl at the right column of the back seat said that animal can move but plant cannot move. The teacher them explained by providing the answer in a tabular form. He wrote the difference on the chalkboard. The teacher explained to the pupils that animal depends on plant for feeding and that plant manufactures their food through the process of photosynthesis. A girl who occupied the sit to the front left column said animal have eyes and plant does not have eyes. Another girl to the middle of the column said animal can talk but the teacher did not accept that. The teacher told them that animal responds to stimuli quickly while some plants do not respond quickly. The teacher also told them about a plant that responds quickly, he asked them of any other response that can serve as difference between plant and animal. A girl who occupied the seat in front and to the right column said that animal can give birth but the teacher told her that plant equally do that. The teacher then told them that plant have leaves and a pupil who seated in the front and to the second left column said that plant grows on land only, but the teacher disagreed with her. The teacher always move round the class throughout the lesson as he discusses.

Another excerpt elucidates our view:

Teacher: Who can remind us of our last topic?
Mistura: Difference between plant and animal.
Teacher: Is that correct?
Class: No sir.
Teacher: He called on student A: what can you say about plant?
Student A: Plant cannot move.
Teacher: Yes! Any other person.
Student B: Plant can grow.
Student C: Plant can feed.
Teacher: Good.
Teacher: Can you talk about animal?
Student D: Animal can move.
Teacher: Animal can breath, yes any other one?
Student E: Animal can feed.
Teacher: Good, any other.
Student F: Animal feed.

Inquiry is commonly employed in science to draw home meaning of concepts. While doing so students' responses could lead teacher to determine whether or not pupils acquire knowledge of the concepts. Of particular interest to us was the correct and incorrect responses the pupils gave:

Teacher: Is there any difference? Observe what each can do, he writes on the board, difference between plants and animals.

Student G: Could not speak loud, teacher moves closer to hear his response, she said animal can feed but plant cannot.

Teacher: Class is that correct?

Class: No.

Teacher: He tried to mention the differences by explaining to them.

Student F: Animal can move from one place to another but plant cannot move.

Teacher: Look at the coconut tree outside, does it move from one place to another, what about the dog at home? Does it move from one place to another?

Class: Yes.

Teacher: He drew a table on the board while the pupils watch what the teacher is writing. Is there any other difference between plant and animal?

Teacher: He asked any question?

Student F: Animal can eat.

Student G: Plant cannot produce young ones.

Teacher: He explained that plant reproduce through stem, leaf and even root.

Teacher: Any other difference?

Student E: Animal can swim but plant cannot swim.

Teacher: He said plant swim even more than animal. He further mentioned that there are plants that grow in water.

Teacher: He said so far, we have been able to learn about the differences between plant and animal. He tries to emphasise the differences again.

This suggests some degree of common understanding among pupils. Most commonly however, pupils rarely express their lack of understanding which require further explanation from the teacher.

The mapping of the classroom interaction (see Figure 2) showed complete absence of experimental work. Other data collection approaches (interview and narratives) further substantiated the lack of experiment throughout the lesson. This possibly could be explained by the short time duration (30 minutes) of the lesson. It was expedient to have engaged pupils by way of home work in some experimental activities judging by the nature of the science concepts discussed. It was however glaring that the teacher never planned to engage pupils in any experiment. Excerpt from the interview best describe this:

Interviewer: Do you usually get home work when you learn science?
Learner: Hen.
Interviewer: Do you usually get science home work? Does your science teacher give you home work.
Learner: No sir.
Interviewer: He has never given you an home work.
Learner: Yes.
Interviewer: Are you sure.
Learner: Yes.
Interviewer: So, all you do is come to class, learn and then go back.
Learner: Yes.
Interviewer: They don't give you home work at all.
Learner: Yes sir.

Several approaches were employed to capture talk initiated by the pupils. This was succinctly described by the classroom mapping. The following are responses from the narratives identifying active involvement and talks initiated by pupils in learning of science:

Student A: What is the meaning of stimulus?

Teacher: I don't know how to explain it but let us look at it from this angle, if somebody pinch you with a sharp object, you quickly responded by withdrawing your body.

Student D: How does plant move? How does plant produce their own food?

Teacher: He explains by telling student that plant takes water and other minerals from the soil and transport it through the root to other parts of the plant.

Student E: How does plant grow?
Teacher: It grows normally.
Student H: How does plant breath?

Teacher: There is an opening from the leaves through the stomata opening, breathing takes place around the green area.

Teacher: Any other question.
Class: No sir.
End of lesson

Again it is noteworthy that pupils' involvement in initiating talk is not often and usually delayed towards the end of lesson. This was typical of brilliant pupils who are really reflecting on the concepts learnt as demonstrated by the intelligent questions raised.

Discussion of Findings

Any attempt at improving science knowledge acquisition must at the very best involve meaningful attempts at unveiling current practices in science classrooms and forging new trajectories. It was these reasons hat guided the present study in investigating the discourse that occurs in science classrooms and associated nhibiting factors on pupils' interest.

Our analysis addressed four main research questions and the emergent pattern of classroom interactions ffer valuable insight into the conceptual and methodological challenges involved in instructional practice in cience classrooms. Result of this study indicated that the teacher employs more commonly questioning as the node of interaction. This coincides with usual lesson evaluation strategy and supported earlier findings made y ([illegible]). A prime concern however is the sole use of questioning. Judging by the nature of science, tudents involvement in hypothesising, drawing conclusions and extrapolating enhanced proper understanding f scientific concepts (Mehdi et al., 2011). Any classroom practices devoid of this make a student a passive artner and promotes learning by regurgitation of facts.

Most commonly while answering questions, pupils' response varied from low cognitive answer to high ognitive answers. Research has previously supported the notion that pupils have poor conceptual nderstanding of science ([illegible], 2012). This line of thought is supported by previous esults in public examination. A possible stronger causative factor could be the predominance of questioning at he expense of more tasking inquiry modes. The essence of tasking pupils on higher order inquiry modes is to levelop their taught processes and capacity. While doing that, pupils are equipped with ability to engage in leep thinking, critically appraising a phenomenon and ability to come up with independent self valuation of an bserved process.

It would be interesting to also note that teacher's use of higher order inquiry mode such as engaging pupils in hand-on activities facilitate collaborative learning and ensures equal participation. This might in no small neasure provokes high cognitive questions and high cognitive answers from the pupils. A clear evidence of oupils meaningful learning and understanding of science.

One could extend this claim to suggest that the predominance of teacher initiated talk as found in this study was the aftermath of the trade-off between predominance of questioning and lack of hand-on activities. Over domineering talk by the teacher leads to a teacher centred class and makes teaching a one-way traffic. Such classroom environments are devoid of meaningful social interaction which according to Vygotsky (1962) occurs only in a learning context where students are actively involved. The conceptual richness expected in a model science classroom remains a mirage in such an atmosphere.

Lesson can also be drawn about the interplay between teacher initiated talk and pupils initiated talk. A situation where teacher initiated talk is predominant suggest the very low involvement of pupils initiated talk as it is in the present study. Within any given framework, low pupils initiated talk may make the classroom discourse more boring, uninteresting and learners' inactive and passive listeners. In general, the quality of interaction of a given classroom may be highly influenced by the quality and depth of students' involvement in the learning tasks. Research (Benson et al., 2005) has previously supported an active classroom environment. There is over-arching agreement that an active learning is much better recalled, enjoyed and understood. Active learning enables learners make our own meaning. That is, develop their own conceptualisations of what they are learning. There is well documented evidence of the relevance of active learning in promoting students achievement. Active learning gives the learner feedback on their incomplete task, provides information to the teacher on which of the learners understand or needs help. It also helps learners to use their learning in realistic and useful ways, and see its importance and relevance.

A final but critical issue concerns the complete absence of pupils' involvement in experimental work. This finding seems consistent with earlier findings (Daniel et al., 2009). Given the significance attached to practical work in science curriculum statements, it is unclear why science classroom climate should be completely devoid of experimental work. However, concerns have been expressed by sections of the science community that school in general are not doing enough practical work (Martin & Mike, 2005). Teaching science nowadays includes more teaching of experimental methods than it formally did. Laboratory work is almost ubiquitously seen as being of great importance to science education. Practical work promotes the engagement and interest of students as well as develops a range of skills, science knowledge and conceptual understanding. Flurry of research have shown that experimental activities enhanced relational and pro-school attitudes development among pupils, and moderate learning gains. It also ensures sharing and co-construction of knowledge, increase motivation and desire to learn.

This study further revealed that the ways students have been exposed to the learning of science have greatly influenced their learning preference. As shown in Table 1, teaching prompted by the following: teacher talk, questioning, group work and story-telling are most favoured by pupils as their learning preferences. Incidentally, this coincided with the earlier findings of this study that teacher centered and passive approach was more prominent in the classroom observed. It further corroborated the dominance of teacher directed teaching in primary science classrooms. This finding however contradicts the globally advocated strategies of teaching in science (Shultz, 2012; Lumpe, Czerniak, Haney, & Svetlana, 2012) pivoted on active learning. Active learning pre-supposes active doing by pupils in the classroom. Pupils can only be gainfully and actively engaged in learning through such strategies as project work, carrying out simple experiments, modelling and use of process of science in learning. Active learning ensures that students access their own prior knowledge develop self-confidence and self reliance. The need to produce, forces learners to retrieve information from memory rather than simply recognizing a correct statement (Michael, 2006). Active learning promotes greater student-student interaction. Also, students are not over-loaded with information as they get time to think about, to talk about and process information. It is surprising that active ways of learning were least favoured by pupils. With a mind-set that teachers are role models and their demeanour is mostly imbibed by pupils, it could be adduced that pupils were only familiar with the ways their teacher teaches science and least experience these plausible alternatives.

It is interesting to note that teaching in mother tongue was least favoured (see Table1) despite the policy provision that it should be the medium of teaching for the first three years of primary education. This corroborated P. A. Okebukola, Owolabi, and F. O. Okebukola (2013) finding's that mother tongue as medium of teaching was least favoured and as medium of communication less prominent. This is understandable because the sampled school is elitist hence pupils involved in the study are likely less proficient in the use of mother tongue as medium of communication.

Implications and Future Research

The results of this study provide implications in the following areas of science education: classroom practice, teachers' professional development and instructional materials.

Classroom Practice

The finding revealed that the classroom observed was highly expository and teacher centered. This practice makes science teaching a didactic and esoteric enterprise. It also negates the recommended teaching method (guided discovery) and the acquisition of desirable skills and scientific attitude intended. Practicing science teachers should endeavour to use laboratory activities, discussions, familiar experiences and exercise, which often contain some open-ended questions, meant to stimulate curiosity and creativity in the learners.

Professional Development

By the findings of this study, teachers are admonished of using inappropriate methodology. It implies they require retraining on the recent innovations and discoveries in science teaching. Training is needed to update their knowledge and pedagogical wherewithal. Training could take the form of refresher course, regular participation in workshops, seminars, symposium, recent academic and conference proceedings.

Instructional Materials

By the nature of science, doing is the prime concern and this requires avalanche of resource materials utilization. Perhaps the absence of practical activities emanates from the perpetual lack of relevant resource materials. A well planned science practical activity cannot be divorced from availability of relevant resource materials. Improvisation should be considered as an alternative resource materials strategy. It is desirable to expose teachers to acts of repairs of science materials. This is in view of the seemingly lack of knowledge and competence of teachers in the act of repairs of faulty science apparatus and equipment ([illegible]).

Conclusions

Classroom interactions dynamics in science is highly potent and possess over-domineering influence on learning processes in science. It plays a primordial role in professional improvement and development of teachers. Its role in institutional development of teachers' underscored the call for quality control mechanism to ensure quality delivery of instruction. This is especially true given the increasing serious interest on what goes on in the classroom. Using an observation protocol, we captured the various transactions in the classroom between the teacher and students, students and students. Graphical illustrations of these transactions were displayed. We also accentuate the consequential influence of sitting arrangement on learning effectiveness in science.

After establishing a large body of data for this study, mappings of these transactions were carried out and provided far-reaching evidence about the quality of questions asked either by the students or the teacher. It also illuminates our understanding of the level of answering attained by the students. In order to achieve a valid judgement of the entire classroom processes, data were sought from other channels which included descriptive field notes and interviews protocol. We then use triangulation to further substantiate and bring to glare the nitty-gritty and minute details of classroom dynamics of a typical science classroom. This approach further sensitized us to possibly look beyond transactions other than that of students and the teacher. It underscored the latent but significant role of sitting arrangement.

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