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Discourse Pattern Choices On Topics Perceived to Be Difficult in Biology at Selected Secondary Schools in Luapula Province of Zambia

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Abstract: ***This paper explores the choice of classroom discourse patterns used by teachers of biology when teaching perceived difficult topics in biology such as classification, mitosis and meiosis at senior secondary level. A collective case study design was used and data were obtained from students and teachers using observation schedules and interview guides. Purposive sampling was used to select the sample from the target population. Data collected were analysed using thematic analysis. The study found out that three discourse patterns were used during lessons on topics perceived to be difficult .These three discourse patterns include: Pupil to pupil discourse pattern, teacher led discourse pattern and teacher explanation discourse pattern. The choice of the discourse patterns depended on a number of factors such as non-availability of teaching and learning materials, amount of work to be covered, long experiments, lack of teacher preparedness and inadequate time allocated to mitosis, meiosis and classification of living organisms. Some of the recommendations made were that: Teachers should combine the three discourse patterns namely teacher explanation, teacher led and pupil to pupil discourse patterns when teaching biology because these patterns proved effective when used together. Teachers should avoid using one discourse pattern during lessons on topics perceived to be difficult. Workshops and seminars should be organised for teachers to enable them acquire skills of teacher explanation, teacher led and pupil to pupil discourse patterns for teaching biology.***

Keywords: Discourse pattern, classification, mitosis and meiosis.

1. Introduction

Although biology is supposedly the easiest of the science disciplines, research on student learning has shown that even high calibre, high achieving biology students at elite institutions taught by universally admired academics fail to build a scientifically conceptual and contextual foundation in biology. Perhaps because learning, teaching and assessment strategies in the discipline of biology have become ritualised (Ross, 2011). Biology examination papers usually cover a wide range of topics providing for a wide coverage of syllabus content. The papers usually include questions on recall of factual knowledge as well as questions on application and synthesis (CDC, 2000). The performance of candidates in the 3 biology examination papers in Zambia has not been good (ECZ, 2016). This underachievement of pupils in biology is not new. For example Table 1 shows countrywide biology school certificate results for 1992 and 1993

Table 1: Countrywide biology school certificate results for 1992 and 1993.

Year	1 and 2 Distinction	3 and 4 Merit	5 and 6 Credit	7 and 8 Pass	9 fail	Total
1992	371	2037	3404	6420	6139 (33%)	18370
1993	510	2048	3580	6811	6113 (32%)	19062
Totals	881(2.3%)	4085(10.9%)	6984(18.6%)	13231(35%)	12252(32.5%)	37432

Source: MOE 1994

It is clear from Table 1 that 67.5% of the candidates in the two years given above merely passed or failed biology. While again in 2002 the picture remained the same, 9975 (52.5%) pupils failed biology out of a total of 19000 registered candidates. In 2003, 11890 (58%) pupils failed biology out of a total of 20500 registered candidates (ECZ, 2004). This national picture in terms of pupil performance is similar to what is prevailing in Luapula province of Zambia. Figure 1 shows Luapula province biology school certificate results for 2016.

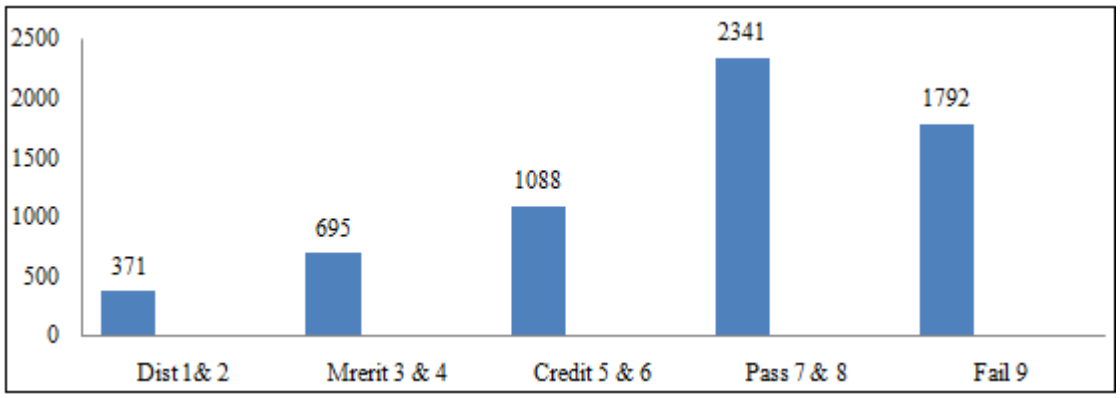

Figure 1: School Certificate 2016 biology results for Luapula Province (PEO, Mansa 2017)

As can be seen from Figure 1, 2341 (37.2%) candidates barely passed and 1792 (28.5%) candidates failed biology in Luapula Province.

The distressing picture of poor performance in science at school certificate level reflects deficiencies at school level. MoE (1996) identifies the possible deficiency as being in the facilities, the resources or the teaching.

1.1 Statement of the Problem

Although researchers (Abimbola, 1998; Haambokoma, 2007; Cimer, 2012; Musonda, 2013; Chocha, Namayanga & Ndhlovu, 2014, Chifwa, 2015) have identified topics perceived to be difficult in biology, for teachers and learners, no studies have been conducted in Zambia to achieve knowledge and understanding of classroom discourse patterns during biology lessons on these perceived difficult topics in secondary schools in Luapula province. Hence there is no knowledge on this issue of classroom discourse patterns which needs investigation.

1.2 Purpose of the Study

The main purpose of this qualitative study was to explore classroom discourse patterns during lessons on topics perceived to be difficult in biology at senior secondary school level in selected secondary schools in Luapula province of Zambia.

1.3 Research Objectives

The objectives of the study were as follows:

1) To analyse the classroom discourse patterns during lessons involving topics perceived to be difficult in biology.
2) To investigate how teachers of biology arrive at the choice of discourse patterns they use for teaching topics perceived to be difficult in biology.

1.4 Research Questions

The study was guided by the following questions:

1) How are the classroom discourse patterns like during lessons involving topics perceived to be difficult in biology?
2) How do teachers of biology arrive at the choice of discourse patterns they use for teaching topics perceived to be difficult in biology?

2. Methodology

A qualitative research approach which focused on a collective case study was used in this study to acquire understanding of classroom discourse patterns during lessons involving topics perceived to be difficult.

The study was conducted at 4 secondary schools in Luapula province which had poor school certificate results for 2015 and whose pseudo names and actual school certificate pass percentages are: Mango had 47%, Orange had 46.6%, Lemon had 42.8% and Guava had 41.3% (PEO Mansa, 2016).

The study population was all senior secondary school pupils learning biology and all teachers of biology.

At each school only 10 pupils were selected to participate in the focus group discussions of the study. This means that a total of 40 pupils participated in the study. A total of 11 teachers were selected from the four schools, three teachers from three schools and two teachers from one school. The sample size is usually small in a qualitative study (Merriam, 1998).

Senior secondary school pupils were selected using purposive sampling. Teachers of biology were selected on the basis of availability and willingness to participate in the study. Eleven Lessons were video recorded and transcribed out of 33 lessons observed which were also purposively sampled.

Semi-structured interview guides and lesson observation schedules were used to collect data

Data collection was preceded by a pilot study at Lubwe secondary school in Samfya District of Luapula Province to check on the suitability of research instruments and data collection procedures.

Trustworthiness was achieved through prolonged field work and recording interviews as well as filming lessons.

Data analysis took place concurrently with data collection as advised by Creswell (2003). Data collected from interviews was analysed using thematic analysis approach (Kombo & Tromp, 2006). Lesson observations were analysed using discourse analysis (Louis, Lawrence & Keith, 2000).

Ethical issues were put into consideration such as seeking permission from participants before recording interviews and filming lessons. In addition,actual names of the participants and their schools have not been revealed in the report as recommended by Creswell (2003).

3. Findings

Findings of the study are presented according to the research questions. The first part gives the findings on classroom discourse patterns during lessons involving topics perceived to be difficult in biology. The second part analyses the choice of discourse patterns teachers of biology use when teaching topics perceived to be difficult.

How are the classroom discourse patterns like during lessons involving topics perceived to be difficult in biology?

From the 11 lessons which were video recorded and transcribed, two lessons were used for this paper, classification of living organisms and mitosis. Below is an excerpt ofthe lesson introduction on classification of living organisms which took about 10 minutes.

Teacher: What is classification?
Pupil 1: Classification is an orderly grouping of organisms according to common features
Teacher: To which phylum does an earthworm belong?
Pupil 2: Oligochaeta
Teacher: No
Pupil 3: Nematoda
Teacher: No
Pupil 4: Annelida
Teacher: Yes

The correct answer is Annelida. However, pupils find it confusing to state the correct phylum due to different classes and phyla. The teacher rejected Oligochaeta because this is the class to which earth worms belong. The teacher also rejected Nematoda because this is another phylum where round worms belong.

The teacher explained that there are various ways of classifying organisms. The teacher said that the common system used by biologists is called natural classification, where organisms with similar features are grouped together.

The second lesson was on mitosis and here is an excerpt from the main part of the lesson:

Without the help of any teaching aid or diagrams on the stages of mitosis, the teacher started asking pupils questions on mitosis as follows:

Teacher: What stages are involved in mitosis?
Pupil 4: Interphase
Pupil 5: Anaphase
Pupil 7: Telophase
Pupil 8: Metaphase

The teacher described the process of interphase by saying the cell has its normal structure. This was not clear to the pupils and one pupil asked the teacher to explain clearly what he meant by interphase.

Pupil: What is interphase?
Teacher: This is a stage where the genetical materials are enclosed in the nuclear membrane.

Still this explanation from the teacher was not adequate because pupils did not understand what happens during interphase.

Teacher: What happens during prophase?
Pupil 2: During this stage nuclear membrane disappears
Pupil 3: Centrosomes will form the fibres
Pupil 4: Centrosomes move to the poles

The teacher did not clarify any of the answers coming from the pupils concerning the process of prophase. The teacher did not explain clearly what was meant by interphase because he only said that during interphase the cell has its normal structure. This made one pupil to seek clarification from the teacher on the process of interphase. The teacher's explanation this time around did not satisfy the pupils because he said that interphase is when the genetical materials are enclosed in the nuclear membrane thereby not explaining what happens during interphase.

4. Findings on the Choice of Discourse Patterns

4.1 How do teachers of biology arrive at the choice of discourse patterns they use for teaching topics perceived to be difficult in biology?

The choice of discourse patterns for teachers of biology normally depends on the teacher's experience, interest, ability and the intelligence level of the class he is teaching. Since the approach to the teaching of science and methods to be used depend on various circumstances, the teacher of science should study these factors and choose a particular way of teaching which his experience convinces him to be best suited for the particular situation.

4.1.1 Non availability of teaching and learning materials

One of the reasons which teachers of biology were giving for the choice of discourse patterns they used was non availability of teaching and learning materials. One teacher had this to say;

I had difficulties in accessing teaching aids such as videos, which I should have used to show the pupils on mitosis.

4.1.2 Desire to cover more content

Another reason reported for the choice of discourse pattern was the amount of work to be covered. A large amount of scientific content can be presented to pupils through a discourse pattern which involves teachers giving out information to pupils who are expected to merely listen, therefore a wide syllabus can be covered within a stipulated time. This was also observed by one teacher who said that;

I used the lecture method to save on my time. I covered a lot of content in 80 minutes which was not going to be possible if I had used group work.

Another teacher had this to say:

I did not use the question answer method for a long time because pupils were taking time to

answer questions so I opted to start explaining most of the time to try and cover a lot of items.

Moreover, the nature of content sometimes determines the method of teaching to be used. In fact, the lecture method is used to introduce a new a topic or unfamiliar content. This was pointed out by one teacher who said that;

The lecture method was appropriate for this topic because the content was very new to the pupils. I was going to waste pupils' time if I had used group work because pupils were not going to find answers easily.

4.1. 3 Engagement of pupils in lesson

The choice of discourse pattern also depends on whether the pupils will be engaged in the lesson or not. This was mentioned by one teacher who said that;

Pupils follow properly if they are actively involved in the lesson

The teacher should acknowledge the pupils by involving them in the discussion this is usually done when the teacher draws a good number of pupils into a discussion and prevents brighter pupils from monopolising the discussion.

4.1.4 Need to relate lessons to real life situations

Some teachers decide on the discourse pattern to use when they want pupils to appreciate the link between lessons and real life situations. One teacher had this to say;

I wanted them to appreciate how the knowledge obtained from classification can be useful in their lives.

Pupils appreciate very much lessons which are linked to their real life situations. This is normally achieved when teachers give real life examples during lessons.

4.1.5 Skill in managing groups

In most cases teachers use discourse patterns they are very conversant with. One teacher was asked why he used the pupil to pupil discourse pattern during the lesson on mitosis he said that;

I had very good understanding of how to manage pupils in groups and how to make group work successful.

Teachers tend to use discourse patterns they are familiar with so that they are able to resolve conflicts and misunderstandings easily.

4.1.6 Pupil participation

Reluctant participants also make teachers decide on the use of group work because they rarely speak though they may be listening. Therefore in order to involve them in the lesson teachers try to use stronger pupils to help weaker pupils. This came out from one teacher who said that;

I think I used group work to make each and every learner to participate and those who are slow learners to be helped by fellow pupils.

In this case the teacher should even stop dominating participants from consuming much air time by talking too much.

When a lot of pupils are not involved in the lesson some teachers try to use classroom discussions to involve them in the lesson. This was observed by one teacher who said that;

Not all the pupils were involved in the lesson as a result I came up with class discussion instead of group discussion.

In this case the teacher directs the discussion by pointing at each and every pupil in the class to participate.

4.1.7 Need to provide concrete examples

Some teachers decide to use charts because they believe that there pupils are not good at reading and that it is difficult to make sense out of words on the stages of mitosis. One teacher had this to say;

I experienced challenges because pupils do not know how to read, meiosis is very difficult for pupils to understand that is why I brought out the pictures for the pupils to see.

Certain pupils tend to make words from pictures, therefore it is important that stages of mitosis are first shown to pupils in form of diagrams before describing them using words.

A good number of teachers brought out a lot of real specimens during classification of living organisms in order to make the lessons realistic. This was also mentioned by one teacher who said that;

I wanted to make the lesson more realistic, if pupils see the organisms they were going to appreciate the lesson very much.

When pupils are shown real specimens during lessons on classification of living organisms which they can see with their eyes and verify they tend to enjoy the lessons very much.

4.1.8 Laziness

Some pupils thought that their teachers choose certain ways of teaching due to laziness. One pupil had this to say;

Whenever the teacher gives us group work then he has nothing to teach us, he even goes out of the classroom to talk to his friends, we just remain without any guidance on how to go about the work as a result we just start making noise.

This is particularly true because some teachers did not even have lesson plans and they just introduced the lessons and went on to divide their classes into groups which they did not even monitor.

5. Discussion on Classroom Discourse Patterns

The study established that teachers asked low level questions during their lessons and that pupils had very little opportunities to ask questions. The predominant mode of classroom talk during question and answer sessions was Triple **A** which is **Ask, Answer, Accept** orDouble **A** and then **R** which is **Ask, Answer and Reject.** Teachers could not clarify why the answer given by pupils was correct they simply accepted it to be correct and they never gave a reason to wrong answers provided by pupils, they simply rejected the answer. However, this method of teaching encouraged active participation of pupils in the classroom through exchange of ideas with the teacher. Provided a forum for questions, feedback, and clarifications. Biology is a tricky subject and many pupils fail biology at the end of grade 12 (ECZ, 2015). If you teach a large class, you won't be able to answer every question aloud during class time. You should have a forum for your students to ask questions both inside and outside of class time.It was discovered in other lessons

that despite the syllabus emphasising the diversity of algae, mosses, ferns, corniferous plants and angiosperms. Teachers only taught angiosperms. This was also seen under kingdom animalia where teachers had to ignore the arthropods and concentrated on the phylum chordata. It was very clear from the lessons observed that some teachers taught kingdoms which are not in the syllabus leaving important aspects of kingdom plantae and animalia which are in the syllabus.

The study also revealed that classification is not taught practically as a result pupils connect classification with a task of memorising a list of biological names. This is in line with ECZ (2016) where the chief marker reported that pupils fail to use scientific names of locally known plants and animals.

Pupils find it difficult to describe the stages of cell division. This confirms findings of an earlier study (Haambokoma, 2007). In this study pupils indicated that they were unable to master the various stages of mitosis and meiosis.

This is also supported by ECZ (2008) where the chief marker reported that many candidates failed to answer a question on meiosis. Even those who attempted to answer failed to bring out the actual events during meiosis which could cause each ovum to be genetically different from one another.

5.1 Discussion on the Choice of Discourse Patterns

The second research question was, 'how do teachers of biology arrive at the choice of discourse patterns they use for teaching topics perceived to be difficult in biology?'

The findings clearly show that choice of discourse patterns depends on a number of issues such as the availability of teacher and learning materials. Inadequate teaching resources contribute to ineffective teaching in secondary schools.

It is true that the amount of work to be covered also determines the choice of discourse patterns employed by teachers. Large volumes of work are properly covered by teacher explanation discourse where pupils have very little time to ask questions. Teachers held a view that group work was not appropriate for a lot of content which needs to be covered in a short period of time. Others argued that lecture method is very appropriate when the teacher wants to capture pupils' minds when introducing new concerts. This confirms findings fromUgwuadu (2011) who argued thatthe authoritative discourse pattern affords little or no interaction between the teacher and pupils during classroom activities. In addition, pupils are not allowed to share ideas and opinions with the teacher. The main task of the teacher is verbal presentation of facts and principles to pupils while pupils remain passive

Teacher explanation discourse patterns are also used when difficult concepts are introduced to pupils. Other teachers who were against the lecture method argued that pupils learn properly if they are involved in the lesson such teachers were striving for methods which involved pupils such as discussion and question and answer sessions. Care was usually taken to control brighter pupils from monopolising the lessons and making other pupils passive.

Teachers also prefer methods where they link lessons to real- life examples. Field trips are preferred for the teaching of classification but they are not conducted because teachers feel that they waste a lot of time. In most cases teachers wanted to use methods they were very conversant with. They did not want to pick on methods where they had very little to implement. Many teachers opted for the group work where they gave pupils challenging work and went round the groups moderating the discussions to make learning successful.

In some instances teachers wanted methods which could involve a lot of pupils in the lesson. This is the reason why teachers wanted to use group work. Other teachers thought that during group work a lot of average pupils were assisted by above-average pupils. Still others thought that pupils could only be involved in the lesson during the teacher led discussions where the teacher directed which pupil to talk during the lesson thereby involving every pupil in the lesson.

Choices of using pictures during mitosis proved to teachers that they captured pupils attention and thereby contributing to successful learning. Other teachers preferred the use of practical demonstrations by showing pupils specimens and studying their characteristics.

Pupils held the view that teachers picked on methods where they had very little to do in the class. Pupils described this as laziness on the part of the teachers who liked using group work. This is particularly true because teachers chose methods which were less involving on their part. This was also seen when teachers were found without lesson plans such that it was difficult even to predict their line of action in the lesson. Lessons were usually haphazard and different unsuccessful methods of teaching were employed by the teacher.

6. Conclusion and Recommendations

The study has revealed discourse patterns used by teachers when teaching aspects of classification, mitosis and meiosis andmost importantly the findings have shown that the choice of discourse patterns was guided by many factors such as the availability of teaching and learning materials, the instructional materials to be taught to pupils, the quality of the learners, the preparation of the teacher and the number of pupils in the class. The study established that there was no single method which was best suited for all the topics and for all the teachers and pupils.

In view of the findings above, the following recommendations are made; teachers should combine the three discourse patterns namely teacher explanation, teacher led and pupil to pupil discourse patterns when teaching biology because these patterns proved effective when used together. Teachers should avoid using one discourse pattern during lessons on topics perceived to be difficult. Workshops and seminars should be organised for teachers to enable them acquire skills of teacher explanation, teacher led and pupil to pupil discourse patterns for teaching biology.

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