

Discourse Analysis in an EFL Science Classroom

By: Nadia Hameed Hassoon

UNIVERSITY OF BABYLON/ COLLEGE OF ARTS

Abstract

This paper presents a discourse analysis of a Grade 5 science lesson in a Baghdad school. The purpose and context of the study is described in the introduction of the paper. This is followed by a literature review where the function of discourse analysis and its utility in a science classroom are discussed in the light of scholarly research. Some of the common techniques and frameworks employed in discourse analysis in classrooms are also identified and discussed in the literature review section. The problem statement for the present research is presented and followed by the research objectives and chosen methodology. The analysis section of the report presents an extract from the recorded transcript of the lesson which forms the basis for the subsequent analysis. The analysis studies the use of functional grammar, vocabulary, inclusive language and nonverbal language by the teacher. This used to identify how discourse in the classroom influences power sharing and role definition in the classroom. The findings are then used to conclude whether the classroom presents an engaging

1. Introduction

Discourse analysis consists of a number of methods to study the use of language in discourse. Discourse may be oral as well as written and can be analyzed. In addition to interpreting the meaning contained in a piece of written text, discourse analysis can also be employed to study how meaning is created and shared through dialogue or oral communication. Methods often used to analyze dialogue or oral communication through discourse analysis include analyzing interview transcriptions, conversation samples or focus groups. These instruments can be analyzed to discover the processes and relationships through which meaning is exchanged. Discourse analysis can be employed in a classroom because discourse is used in the classroom to achieve the learning and teaching objectives. Teachers and students exchange meaning and share information by employing various forms of discourse. Primarily oral discourse is employed in the classroom as teachers use oral words to explain concepts and give instructions to the students. On the other hand, students express their confusions and ask questions for clarification through oral means. Teachers and students use other forms of discourse too such as the use of tone and loudness to achieve desired effects. The use of oral discourse is also supplemented by non-verbal signs such as facial expressions and physical gestures. In addition to achieving the pedagogical objectives of the classroom environment, teachers and students also employ discourse strategies to achieve social functions such as determining the extent of the teacher's authority and the degree of freedom enjoyed by the students. This study uses the techniques of discourse analysis to study the ways in which the teachers and students use discourse to achieve the pedagogical and social objectives in the classroom. The science classroom of a primary school in Baghdad will be selected for this study because of a number of features. The science classroom requires the teacher to give explicit instructions about scientific concepts to the students. At the same time, the teacher is also required to stimulate the students' curiosity and to encourage them to explore the environment and observe scientific phenomena. Thus, the teacher has to employ different methods of discourse to create an imperative mood when giving instructions and a subjunctive mood when suggesting possibilities and unexplored areas of science. In addition, the science classroom undertakes practical work and activities to a greater extent than other classrooms. Hence, the

teacher has to use language to encourage practical work and teamwork among the students.

٢. Literature Review

The term 'discourse' refers to oral communication as well as gestures that achieve a communicative effect (Gee, ١٩٩٩). According to Gee (١٩٩٩), discourse serves a number of functions in the classroom such as performing social activities and creating social identities in the classroom. Discourse analysis is a methodology of analysis that emphasizes the importance of studying recordings of verbal and non-verbal discourse (Wood and Kroger, ٢٠٠٠). Critical discourse analysis is a method which helps to identify the relationship between language and social structure which includes elements such as power, identity and social roles (Fairclough, ١٩٩٢). In particular, critical discourse analysis studies the ways in which discourse is used to influence power relationships between actors. Zevenbergen (٢٠٠٠) explains that critical discourse analysis can be used to analyze discourse in the classroom and how it is employed to shape identity and power relationships between teacher and student. According to Fairclough (١٩٩٢), discourse analysis involves the analysis of text in terms of how vocabulary and grammar are used to create desired effects. This approach that analyzes discourse as a form of text also looks at aspects such as cohesion and structure to determine how the text presents information and influences the identities and perceptions of the audience. Two aspects of discourse analysis that are usually studied include coherence and intertextuality. Coherence refers to the way in which the audience is able to perceive the discourse as an integrated whole and extract meaning from it. On the other hand, intertextuality refers to the extent to which a particular text relates to earlier texts. Both these aspects of discourse are important for analyzing discourse in the classroom where each lesson has to build upon the earlier lessons. Wells (١٩٩٢) has noted that language plays an important role in teaching and learning of science in the classroom. It may then be argued that language mediates the way in which scientific concepts and knowledge are shaped in the classroom. Hackling, Peers & Prain (٢٠٠٧) explain that science education is a process by which students are cultured and inculcated with certain ways of perceiving the world from a scientific perspective. Hence, it can be argued that language plays an important role in making scientific knowledge accessible to the students and in shaping their perspectives into a unique way of interpreting the world scientifically. Hackling, Smith and Murcia (٢٠١٠) recommend that science discourse should be initiated by engaging with the prior assumptions of the students and then exposing them to experiences where they can observe and relate to scientific phenomena. This should be followed by presenting scientific explanations and then giving them an opportunity to apply the scientific knowledge in practice. Christie (٢٠٠٢) studies how functional grammar can be employed in discourse analysis to analyze how language choices influence the meaning which is constructed in the classroom. Functional grammar analysis also helps the researcher to study how instructional and regulative registers are used by teachers to direct conceptual learning and classroom behaviour respectively (Christie, ٢٠٠٢). Christie (٢٠٠٢) also notes how mood can be studied to determine the way in which information is exchanged on the basis of social relationship. Modality also helps to explain the way in which power is employed to achieve the goals of the teacher in the classroom. Lemke (١٩٩٠) suggests that science is often presented in a way that makes the subject too abstract and impersonal for the students with the teacher assuming a position of authority in the classroom. This feature of science presentation makes the subject appear difficult to most students (Taylor, ١٩٩٦). Lemke (١٩٩٠) states that science is taught as an elitist subject in schools and the norms followed by teachers in the discourse of teaching science fails to engage most students. Mortimer and Scott (٢٠٠٠) and Chin (٢٠٠٦) have studied how discourse analysis can be used to analyze discourse in the science classroom. Mortimer and Scott (٢٠٠٠) employ the flow of discourse framework to analyze science discourse in terms of classroom talk and the use of language to achieve the desired ends of the teacher. Language is shared between teacher and student in the form of

utterances which facilitates the exchange of conceptual themes and content in the classroom. Mortimer and Scott (٢٠٠٠) explain how the teaching narrative is instrumental in developing the scientific knowledge and conceptual line in the students. Furthermore, the teaching narrative plays an important role in shaping the meaning-making process in the students by promoting shared meaning and checking whether students have understood what is being taught to them. It also contributes to maintaining the narrative being held by the teacher (Mortimer and Scott). Scott (١٩٩٧) has studied how teachers can use questions in the discourse to guide students through an explanation of the lesson. On the other hand, Halliday (١٩٩٤) employs a different framework of discourse analysis called the systemic functional linguistic (SFL) model which studies the relationship between aspects of grammar and the meaning achieved by it. In specific terms, the SFL framework considers experiential metafunction, textual metafunction and interpersonal metafunction by analyzing the clauses used in the discourse for each of the three metafunctions of meaning. Koufetta-Menicou and Scaife (٢٠٠٠) explain that the classroom talk which facilitates engagement with science should be such where the momentum of the teacher talk is shaped by elements such as questioning and wait time. The teacher should invite diversity of responses and offer clarification. The teacher should seek evidence or detailed elaboration from the students so that they learn to make valid statements based on scientific facts or observed phenomena. Hackling, Smith and Murcia (٢٠١٠) state that the social plane of the discourse is vital in the science classroom because it supports the collaboration between the teacher and the student. As a result, knowledge and understanding of science is shaped mutually by the discourse exchanged between teacher and student. In other words, in order to have a positive effect on the students, the classroom talk should build on students' knowledge.

٣. Problem Statement

The problem statement for this research is whether the linguistic discourse in the Grade ٥ science classroom is designed to enhance students' engagement with scientific knowledge and with the lesson.

٤. Research Objectives and Methodology

The objectives of this research will be to determine how power, roles and identity are shaped within the science classroom through the use of language, verbal as well as nonverbal, by the teacher. In addition, the research will also seek to address whether the scientific knowledge is being made accessible to the students in the classroom or being withheld from them. This research employs discourse analysis by recording a fifteen minute discourse in the classroom. The discourse is from a lesson being conducted on changes of state of matter in a Grade ٥ classroom. The school is in the city of Baghdad in Iraq and the medium of instruction is English. Although the students and the teacher use Arabic as the first language, the class is being conducted in English as part of the effort of making students fluent in English language. The audio recording has been made with the consent of the teacher. In addition, the researcher is present in the classroom to observe the students and the teacher and how they interact. The use of functional grammar by the teacher is employed by the researcher to assess the use of inclusive language. Lexical chain analysis is made in this research to discuss how far ideas are reinforced during the lesson. The repetitive use of key words and functional words will be analyzed to evaluate how the scientific knowledge is made familiar to the students. Pacing is studied in the context of non-verbal and paralinguistic elements used by the teacher such as tone, facial expressions and inflection in the communication of knowledge. Gestures play an important role in explaining abstract concepts to young children and will be studied in this research. The paper also analyzes the discourse to identify verbal and nonverbal ways in which the teacher invites the students to become active participants in the classroom and collaborate with the teacher to shape

the discourse. Intertextuality is also explored by analyzing how the lesson ties in with the previous lesson and with the homework assigned in the previous class. The sharing of power between the teacher and the students will be analyzed with reference to the extent to which students are allowed to shape the discourse. The degree to which the teacher invites input from the students and uses their motivations and observations to shape the discourse will be explored. The extent to which the teacher allows cross-discussion and student talk during the lesson and during the activity session will be used to assess the power sharing in the classroom. It will also help in the overall assessment of whether the scientific knowledge is being made accessible and understandable to the students. The roles assumed by the teacher and the student will also be assessed in this research. It will help to inform whether students are assuming an active or a passive role in the classroom. The selection of the textbook will also be analyzed to inform the research. The observation and recording will be followed up with an interview with the teacher to identify her motivations and objectives behind the choice of teaching style.

• Discussion of Findings

The discourse carried out over fifteen minutes of the class is reproduced here for analysis:

Teacher: Yalla, Yalla! Sit down, class. We will start the lesson

[The students make some noise as they settle in their places]

Teacher: Assalamu Alikum students

Students: Waálaikum Ussalam

Teacher: How many remember what is molecular arrangement? Raise your hands?

Students: [Most students raise their arms and make soft noises to attract the teacher.]

Teacher: Ya Tarek. What is molecular arrangement of solid?

Tarek (Student): Teacher, molecular arrangement *ya'ni* it is how particles arranged in the solid, liquid and gas. In the solid, it is very close.

Teacher: Correct, ya Tarek. Good you remember. Who will come and draw molecular structure of solid on the board?

Students: [Most students raise their arms and make soft noises to attract the teacher.]

Teacher: Hassan, you come and draw.

[The student walks up to the board and draws the structure using a piece of chalk. The students start clapping as he draws the correct diagram.]

Teacher: Good ya Hassan. [She extends her hand to receive the chalk and gestures the student to return to his seat]

Teacher: Who likes ice cream, eh?

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[Students raise their arms and call out Me! Me!]

Teacher: Okay, now who makes tea in the house.

[Some students raise their arms.]

Teacher: Now what happen when you eat ice cream in hot temperature?

[The students say out loud that it melts while gesturing with their hands.]

Teacher: How it melts? [Rising intonation and wide-eyed expression]

Some students offer their explanations and are acknowledged by the teacher.

Teacher: When the ice cream is in the freezer, it is what state?

Students: Solid

Teacher: What happen when it is in hot temperature?

Students: It melted!

Teacher: It melts because the molecules take energy from the heat. She then moves on to present her own explanation on the board.

During the discourse, the teacher varied her pacing which helped the students to become more engaged with the lesson and what was being explained. Along with the pace of the lesson, the teacher also varied her tone including variations in loudness, pitch and intensity throughout the lesson. As a result, the students were interested in the lesson. This was an important part of the teacher's paralinguistic discourse because by these means the teacher was able to keep the students engaged and attentive towards her instead of getting distracted. The teacher made frequent use of inflexion in her voice to emphasize important or new concepts such as boiling, molecular energy, and forces of attraction. This was accompanied by the use of gestures and facial expressions to reinforce the verbal explanation. This strategy also provided multiple cues to the students so that they could understand the effect of heat on intermolecular forces of attraction. The teacher used mental and verbal processes to involve the students as active processes in learning the scientific concepts. She selected instances from the everyday life of the students to contextualize the scientific concepts in the everyday life on the students. The use of phrases like "When you eat ice cream" or "When you make tea in the kitchen" helped to construct the identity of students as active participants in the learning process rather than passive recipients of information. The teacher also used pronouns such as "you" and "we" to shape the identity of the students as subjects rather than actors in the learning process. Power was shared in the classroom between teacher and students as they participated in the lesson by giving examples and observations from their own experiences. Frequent references to the use of inclusive language helped to reduce the power distance as the teacher acknowledged the input from the students and showed interest in their observations by using phrases and responses such as "Really? That's excellent" or "That is very good" and repeating the input aloud for the whole class to listen. Intertextuality was also implemented in the classroom by referring to the lesson of the previous day and to the homework that the students had done earlier in the week. The concepts from these previous texts such as molecules, force and energy were used to expand on

the present lesson on how heat brings about a change in states of matter. This was noticeable at one specific point in the lesson when the teacher asked "Who will come on the board and draw molecular arrangement in a solid?" The students responded actively by raising their hands and calling out to the teacher. The teacher responded with a smile as she scanned the class to select a student. This action indicated that the teacher appreciated such enthusiasm from the students. When the student drew the correct diagram on the board, the teacher praised him for remembering what was taught in the previous lesson. A lexical chain was visible throughout the lesson as the teacher was explaining the process of change of state under the influence of heat. The lexical chain reflects the unity and coherence in the teacher's discourse. The terms heat, molecules and energy were used frequently as a form of repetition to familiarize the students with these terms. This contributed to the smooth progression of the lesson and related the essential concepts used in the lesson. The lexical chain relating to the change of state is summarized in the extract below: When the solid body is heated, the energy is transferred to the molecules. What happens to the molecules? They have more energy. They start moving more. Fast. Then they move so fast that they move away from each other. What is this called? What is it called when molecules in solid move away? How ice becomes water? Thus the lexical chain began with the use of the article "the" which refers to knowledge the students already possess. In this case it is knowledge of the concept of solid which means a state of matter where the molecules are most densely packed in a fixed arrangement. The definite article is also used before molecules, thus relying on the students' ability to recall previously learned concepts. Then the teacher used a lot of gestures to illustrate the phenomenon of energy being transferred and the molecules arriving at a higher energy state. Then she used her hand movements to show the molecules overcoming the force of attraction and moving away from each other, all the while maintaining eye contact with the students and demonstrating high energy levels. When the teacher asked students what the process was called in the end, she transfers the power to conclude her explanation to the students. One of the students knew that it was called melting and the teacher exhibited her pleasure by smiling towards the student and saying "Masha Allah!" She then repeated the term out loud and wrote it on the board before defining it for the class. The teacher was comfortable with student talk and allowed it during intervals and especially when she wanted the students to think about the answer to a question she had posed. She thought that such student talk following a question was helpful to develop students' scientific curiosity and the skill at teamwork and discussion. It was also serving as a breather for the students and helped them to relax after listening to the teacher at a stretch. The teacher later explained in an interview that young children have short attention spans so it is important to provide such breaks during the lesson where they can release their energy. The lesson was apparently teacher-centered as the teacher assumed the role of expert and source of knowledge for the students. However, she appreciated the knowledge and personal observations of the students and used it to pace the lesson and select examples for reinforcing her explanation. In this regard, the teacher was retaining the power of being an authority with herself but at the same time she was acknowledging the validity of the students' knowledge and thus giving them a share in the power too. The teacher used a lot of questioning in her lesson which was meant as a tool for stimulating students to think about the lesson and respond to it favorably. The questioning was used primarily to guide the students through the explanation rather than as a means to evaluate their understanding. The discourse in the classroom also showed that the teacher was sharing limited power with the students as much as was necessary to maintain order and to keep them engaged in the lesson. There was little use of pedagogical intervention during the lesson as the teacher did not allow the discussion to become sidetracked by the students' responses. She was quick to redirect the attention of the classroom to the task at hand by manipulating students' interest, such as by clapping to get attention or thumping on the board. The teacher was the only one who was asking questions as the students did not ask any questions unless the teacher invited them. Also, whenever the teacher asked a question, the students raised their arms and the teacher had to select who could answer her question. While students were encouraged to bid for answers, this shows that the teacher did not concentrate power but used it to maintain order and interest in the class. This shows that the teacher was mainly in control of the discourse but she also allowed freedom to the students so that they could develop an interest in the lesson and could relate the

scientific concepts to their daily life experiences. The selection of the textbook used in the classroom is also reflective of the quality of discourse. The textbook is very basic and does not contain a lot of explanation. It is written in very simple English and contains simple sentence structures. Illustrations and photographs are used and this helps to provide much of the explanation in the book. The choice appears to be appropriate for the class because the students do not possess a high level of English fluency and could not read and understand a more detailed text. However, the teacher makes up for the limited text in the book by offering strong verbal explanations and engaging the class in constructing the discourse. The examples used by the teacher are different from the ones used in the book and relate to the everyday experiences of the children such as having ice cream, watching clothes drying on a clothesline and preparing tea in the house. These examples are also used in the book but the teacher enriches them by allowing students to digress to share personal anecdotes and jokes while discussing their observations about melting and evaporating. This reflects that the teacher believes that the learning of science should be based on everyday observations and should be shaped from the actual experiences of the learners as opposed to the objective explanation and description given in the textbooks. This also shows that the teacher acknowledges the influence and role of the student as an active participant in the creation of classroom discourse. At the same time, the teacher retains the role as a moderator, regulator and guider of the discourse to keep it on track and relevant. The teacher does not decontextualize the anecdotes of the students, but uses them to inform the lesson and the discourse. The teacher appears to have an interest in making scientific knowledge accessible to all students in the classroom. She repeats almost all the concepts she had used in the previous lesson to help students recall the terms and become fluent in their use. One of the challenges of the science classroom is that the terms used in this classroom are not likely to be used by many students in their home environment considering that everyday terms are likely to be used to refer to the same phenomena. Furthermore, it is more likely that Arabic equivalents for the English terms used in class would be used most of the time. Hence, by repeating the terms frequently in the classroom, the teacher is helping the students practice their usage and make those terms a part of their vocabulary. This approach also helps the students to clarify any misconceptions they may have about new scientific terms they come across in the classroom. The teacher's style is similar to spoken text as she does not use a very structured style that is common in written texts. Her discourse contains a variety of structures including statements, questions and commands. However, the questions that the teacher asks were of such a nature that acknowledged diversity among the students' experiences and understanding. Questions such as "What things can melt?" and "Who makes tea in the house?" invite a diversity of responses from the students. She also balances open-ended questions with appropriate close-ended questions. She makes some use of colloquial language in Arabic and English to reduce the distance between the teacher and the students during the lesson. This particularly amuses the students as they are able to relate to the teacher as a common person rather than as a distant authority figure. It also helps to attract students' attention whenever they become distracted during the lesson. These features also help the teacher to increase the persuasiveness of her lesson and increase the receptiveness of her audience to the information. In terms of lexical density, the teacher talk could be characterized as having a moderate density. The teacher did not fit in a lot of scientific jargon and terminology in her explanation and interspersed it by referring to common phenomena of change of state in the natural environment. At the same time, she purposely did not digress much away from the discussion because it would have been difficult to get the students back on track. The use of meta-discourse was also reasonably balanced as long as it was necessary to create an inclusive and relaxed atmosphere in the classroom. Generally, the students were relaxed and engaged during the lesson and engaged in frequent brief discussions and talk with one another. In terms of representing scientific knowledge to students, the teacher increases students' access to scientific concepts and knowledge by incorporating everyday talk into the discussion. This helps the students to relate the lesson with their personal experiences and interests. Through such a coherent approach, the teacher helps the students to address their personal needs and issues through the science lesson. The teacher also uses the input and responses from the students to

shape the content and pace of the lesson. She seems particularly attentive to non-verbal feedback from students such as a lack of energy, vacant stares or blank expressions on their faces. By inviting input and responses from the students and incorporating their everyday expressions into the discourse, the teacher builds a learning community in the classroom. In such an environment, the students are encouraged to use their own cognitive resources and experiences to learn about science and its application. The teacher adopts a responsive teaching style and is sensitive towards the needs of the students as well as the demands of the curriculum. She adapts her teaching style according to the complexity of the concept and the readiness level of the students. Her teaching style does not put the gifted or talented students at any particular advantage over other students as she adopts a pace and vocabulary that is accessible to the majority of the students. The teacher also creates a positive environment and shares power by creating some opportunities for dialogue with the students as well as allowing cross-discussion where it supports the teaching objectives. The teacher also uses teaching aids in the classroom such as marbles in the classroom to illustrate the concept. She brought in a plastic tray and placed some marbles in it in a specific arrangement. The students were invited to come at a time to her desk and observe as she demonstrated how the marbles in a solid behaved when they were heated. While one group was observing the activity, the other students were engaged in cross-discussion and having casual conversations with one another. The teacher tolerated these discussions but asked the students to keep quiet if they became too noisy. She did this by beating her hand on the desk and calling out "Keep quiet, class!" A variety of mood and modalities can be observed here as the teacher varies from the use of subjunctive mood to imperative and interrogative mood throughout the lesson. In this way, the teacher performs several roles such as the role of an expert, an authority, and a moderator of classroom activity. At the same time, the students are encouraged to listen attentively, participate in the discourse by responding to questions and accepting invitations to offer feedback. Furthermore, they also perform as active participants in the process by bringing in their own perspectives and experiences and sharing them with the teacher and other students. This is facilitated by the creation of the learning community environment by the teacher's use of language and non-verbal behaviour. Interviewing the teacher after the lesson shows some important insights into the teaching style and aids the discourse analysis. The teacher states that she tries to make the class interactive and interesting for the students because they cannot understand the lesson only by reading it from the book. She states that the students are interested in learning but they need to relate the lesson with their daily life. She states that if she is unable to do that, the students will feel alienated and will resort to rote-learning for the test. The teacher says that she tries to make the students inquisitive about the things in their environment so they can plan experiments and make interpretations from them when they go up to higher classes. The teacher also felt that time was a major constraint in conducting her lessons. She said that the duration of each period was 30 minutes whereas it should be at least 40 minutes for Grade 9 students. She said that because of this problem, she often was unable to engage the students as richly and would simply give a one-way lecture to them without inviting any input from the students.

Conclusion

The discourse analysis of the classroom showed that the teacher was pursuing a strategy and teaching style that engaged the students with the lesson. Given the fact that scientific knowledge may not be accessible or within the home environment of the students, the level of engagement in the classroom largely affects their competence and fluency in scientific concepts and terminology. In this regard, it was found that the teacher showed interest in the information possessed by the students and she used it to shape the lesson discourse. Moreover, power was shared with the students instead of keeping it concentrated in the teacher. Thus the teacher allowed the explanation to be modified by what the students were saying. It may be noted that the teacher retained some power to regulate the discipline and order in the classroom, considering that these were mostly 10-11 year old boys. Overall, the teaching style, integration in the explanation and use of inclusive language was instrumental in creating an engaging

classroom environment.

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