

DOI: [10.20472/TE.2015.3.4.005](https://doi.org/10.20472/TE.2015.3.4.005)

## **THE NATURE OF DIALOGUE IN THE PRIMARY SCIENCE CLASSROOM IN INDONESIA**

*MUNASPRIANTO RAMLI*

### **Abstract:**

Dialogue plays an important role in classroom education since it is the place where teacher interacts with students and students talk to one another. This study explores the nature of dialogue in a primary classroom in Indonesia where the new curriculum has been implemented. To achieve this research purpose, I have addressed the following research question: "what are the key features and the pattern of classroom dialogue in the primary science classroom?" A case study approach is employed for this study and I am focusing my study on one primary school in the Greater Jakarta. Using triangulation as a metaphor, I have adopted two different methods for this study, including interview and classroom observation. The finding shows that both triadic - initiation response and feedback (IRF) - and nontriadic - initiation response prompt response prompt (IRPRP) - patterns of dialogue have occurred in the classroom talk. The study also indicates that most of the talk has adopted cumulative and exploratory talk.

### **Keywords:**

Dialogue, Classroom Talk, Primary Science, Science Education, New Curriculum

**JEL Classification:** I20, I29

### **Authors:**

MUNASPRIANTO RAMLI, Science Education Dept Syarif Hidayatullah State Islamic University Jakarta, PGR Manchester Institute of Education, University of Manchester, United Kingdom, Email: [munasprianto.ramli@uinjkt.ac.id](mailto:munasprianto.ramli@uinjkt.ac.id)

### **Citation:**

MUNASPRIANTO RAMLI (2015). The Nature of Dialogue in the Primary Science Classroom in Indonesia. International Journal of Teaching and Education, Vol. III(4), pp. 54-67., [10.20472/TE.2015.3.4.005](https://doi.org/10.20472/TE.2015.3.4.005)

## Introduction

Classroom is a place where talk takes place; talk between teacher and students or between a student and other students. Talk in the classroom plays an important role in teaching/learning process. Some research about the process of teaching and learning through talk has been carried out over the last forty or so years. In the field of science education, classroom talk has become a central issue in developed countries within last twenty years. Although the research focused in this topic grows rapidly in western country, this did not occur in Indonesia. There is no literature or study published about classroom talk in Indonesia.

There has been a major change in the primary school curriculum in Indonesia. In the new curriculum, the government has integrated religious values, living values and language in every subject taught in primary schools, including in science education. The Ministry of Education and Culture (2012) expects that the integration of religious and living values in the curriculum will help students develop their noble characters so they will be able to cure social and moral problems, such as corruption and violence. By integrating language skills in science education, the government hopes that the Indonesian students' performance will improve in PISA (Program for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study). The results of these two international standardised tests indicate that the Indonesian students' ability to understand complex information and their problem solving skills, as well as analytical thinking and investigation were very poor.

Compared to the previous curriculum in which teachers dominated the science lesson, the development of new curriculum, as signposted in the teacher guidebook, will give more room for dialogue to take place in the primary science classroom. The teacher books show that, in the introduction stage, teachers should initiate every lesson with a probing question to engage the students in the topic studied. This initial discussion will be followed by an experiment or exploration, group discussion and classroom discussion. Given the fact that there has been no research attention paid to teachers' and students' talk in Indonesia's primary science classrooms, I will conduct the current study on dialogue in primary science classroom.

The study aims to explore the dialogue in primary science classrooms that implement the new integrated curriculum in Indonesia. In order to achieve this research purpose, I address the following research questions "what is the nature of dialogue in the primary science classroom?"

### Dialogue in Science Classroom

Dialogue is a term used in a broad sense to mean the exchange of information, thought and ideas from the sources to audiences through both written and spoken language. In this study, the sort of dialogue I am interested in is classroom talk; even more specifically, talk in the primary science classroom. The talk can be between teacher and student, a student and another student, teacher and a group of students, and a student and a group of students.

In recent years there has been a gradual growth of research interest in studying dialogue as a tool of teaching and the learning process in classrooms (e.g., Scott 1998, Wells 1999, Wegerif 1996, Mercer 2007, Wolfie and Alexander 2008). A number of pieces of research show how dialogue in the science classroom plays an important role in helping students develop their understanding of science concepts (e.g., Ametlerr and Scott 2010, Dawes 2004, Mercer and Hodgkinson 2008). The research shows that the hands-on experiment can be interesting and encouraging for students to get an idea; however, science teaching and learning can also occur through teacher-led talk and dialogue in the science classroom (Mortimer and Scott 2003).

Mortimer and Scott (2003) introduced the communicative approach which provides a perspective on how teachers and students can develop the interaction in the science classroom. Dialogue in the science classroom can occur in two dimensions: dialogic-authoritative and interactive - non interactive. The dialogic-authoritative dimensions represent how the teachers' and students' talk can influence the content and direction of classroom dialogue. And, the interactive-non interactive dimensions represent how students and teachers actively engage in science classroom talk. Accordingly, Mercer (1995) shows that the communication process in teaching and learning allows one person to help another develop their knowledge. Mercer (1995) describes three ways of talking in the classroom: disputational talk, cumulative talk and exploratory talk. Disputational talk is characterised by disagreement and individualised decision making, while cumulative talk occurs when students build an uncritical positive opinion of other students' ideas, which is characterised by agreement, confirmations and elaborations. Then, exploratory talk is likely to happen when students work in groups and engage critically but constructively with each other's ideas. Currently, talk in Indonesian classrooms is predominantly cumulative in its nature.

Researchers have also noticed the structure and pattern of talk in the classroom. Sinclair and Coulthard (1975) proposed the IRF pattern of classroom talk which is sometimes also called triadic structure (Lemke 1990). The classroom talk starts with an initiation (I) from the teacher which will stimulate students' response (R). Then, this interaction will be followed by the feedback comment from the teacher (F). In response to the IRF cycle, Wegerif (1996) introduced the IDRF structure, which proposes discussion between teacher initiation and students' response. As an alternative pattern to IRF and IDRF, Mortimer and Scott (2003) proposed the open and closed interaction chains (I-R-P-R-P-R and I-R-P-R-P-R-E), where P stands for prompt, R for response and E for evaluation. Some classroom talk ends with the evaluation from the teacher (closed interaction) whilst others remain open without evaluation.

## **Methodology**

I have used the sociocultural perspective as the theoretical framework for this study since this approach focuses on the construction of learning through social interaction, rather than as a psychological process. I am adopting this lens to understand how learning happens in the classroom through dialogue. Mercer and Littleton (2007) reveal that sociocultural perspective sees humans as unique creatures who have capacity to communicate, and whose lives are normally led within societies based on shared ways

of using language, ways of thinking, social practices and tools for getting things done. Education is a cultural institution where students and teachers work within a setting that reflects their values and social practices through a communication process or dialogue. Thus, a sociocultural perspective raises the possibility that the success of education may be explained by the quality of educational dialogue rather than simply by considering the competence of each student or the capability of their teachers (Mercer and Littleton 2007). This underlies the focus on dialogue in the research questions.

A case study approach is employed for this study. Three parameters, described by Yin (2003), were taken into consideration when I decided to choose the proposed strategy for this project. Yin (2003) reveals that the investigator can use a case study strategy when the research questions focus on “what”, “how” and “why” questions; the research focuses on contemporary events and the researcher is not required to control the event (Yin 2003). This project fulfils all three parameters. A case study approach is also suitable for this project, since the current knowledge on this topic in Indonesian classrooms is relatively inadequate (Rowley 2002).

I carried the study in a year 4 classroom at a primary school in the Greater Jakarta. The teacher, Mr. Dono, was an experienced teacher. He has been teaching for about 25 years. He was very supportive since he had experiences with researchers in the past. He taught 29 students in his class: 17 were boys and the rest were girls. Based on my observation and the conversation that I had with Mr. Dono, I noticed that the students came from homogenous socioeconomic background.

### **Data Generation**

Using triangulation as a metaphor, I adopted two methods including interview and classroom observation. The collected data consisted of the following:

1. Audio recording from interviews
2. Video recording of classroom observation
3. Classroom observation notes

Aproximately 15 hours classroom videos and 3 hours interviews with the teacher were recorded, and all relevant data were transcribed.

### **Data Analysis**

Different approaches have been used in analysing classroom talk, for example those by Lyle (1993) Gee and Green (1998), and Mercer (2004). In this study, I am adapting the sociocultural discourse analysis introduced by Mercer (2004) which is relevant to my research questions and theoretical framework. Sociocultural discourse analysis has its own characteristic and differs from other approaches. It is because this approach is not only concerned with the process of classroom interaction, but also with the outcome of the interaction (Mercer 2004). Consequently, The focus of this study is basically on the process and histories, i.e. how students' opinions relate to their past experiences. Data transcription is from media (audio and video) to text form, then compiled and analysed by using Nvivo software.

## Finding and Discussion

### *Teacher's perception of the dialogue in the science lesson*

Through the three interviews carried out during the study, Mr. Dono described his awareness of the nature of dialogue in science classroom, its advantages and also the challenges that he may face as a teacher. He delivered different strategies in teaching science such as lecturing, hands on experiment, cooperative learning, and reading text book. However, he believed that his students like to learn science through experiment and group work rather than reading a text book or listening to the lecture from the teacher, as shown below.

Students like to do something when they learn science, carry out experiment like this picture. They may talk and discuss when carrying out the experiment. Some students were initially shy in classroom discussion, but they were able to express their opinion during the experiment.

They like it when I ask them to read then followed by group discussion. Should I deliver a lecture, they may listen but their thought may not be there. They look silent, yet they may not listen. However, if they read they will understand the context, and after that they can discuss with their friends in a group and in a whole classroom discussion.

The students' preference to do a group work and discussion in learning science is in line with the new curriculum guidance. Mr. Dono mentioned that compared to the previous curriculum, the new curriculum encourages students to learn more through discussion and group work. In particular he commented that:

Students had a group discussion in the past, but it has not as much as today even though it was encouraged by curriculum. Now, this teacher book requires student to discuss with friends and listen to others' opinion. In the previous curriculum, the discussion occurred once a month.

As a curriculum implementer, then, he decided to organize a group work in most of his science lessons. To ensure that the dialogue took place in group discussion, he employed different strategies in grouping his students. Sometimes, he grouped the students based on their ability and achievement, sometimes he created a random group by counting the number of students, and sometimes he simply asked the students to arrange their own groups. However, he believed that grouping students based on ability and pointing a leader for the group is an effective way in promoting interaction and dialogue in the group work. Students in a mixed ability group will encourage and support one another. He also observed that when passive students were gathered in one group, the group will be less productive in finishing the given task.

There are various ways, but it is important to point a leader for each group. Then, we can count the students. For example, if we want to arrange 6 groups then we ask students to count 1,2,3,4,5,6 repeatedly. We can also ask students to arrange their own group, however sometimes one student may not be elected to join the group, or we can arrange the group through game and play.

Sometimes, when students arrange their own group or we incorrectly arrange the group, this student is passive and that student is also passive... it is difficult. We have to keep motivating them. When there is a leader, there will be someone who initiates talk... If we incorrectly arrange the group, no discussion may occur.”

During the interview, Mr Dono also revealed that it is important for a teacher to take different roles in group work and classroom discussion. He mentioned that the teacher should walk around the classroom during a group discussion, so s/he knows what happens in the group work and is able to answer a question from the students just in case students are not really sure of the task. The classroom will be noisy or unmanaged if teacher just sit at the desk and do other works or leave the classroom while students are conducting a group discussion.

We should go around the class and ask students ‘any difficulty’? Teacher should go around from group to group. Even, when students get stuck, teacher should let the students know ‘this should be like this ...’ Especially when students have no idea on the difficult topic to understand’.

Moreover, Mr Dono recognised the importance of dialogue and a whole classroom discussion for students’ developments. He revealed some benefits of classroom talks to his students, including: development of confidence, attitude and knowledge. He told a story about one particular student who was really shy and afraid to talk. However, after certain periods of group discussion the student was able to talk in front of the classroom. He also mentioned that working in group and having discussion will help students learn how to work in team and respect each other’s opinion and contribution.

There are students who had initially lack of confidence level. Now their confidence level has developed and they are able to speak in front of the classroom. For example Alexa, at the beginning of academic year liked to hide under the table. He was afraid of teacher, he feared when I asked him a question, or when I ask him to talk. But now, he is able to talk...good student became better, the below average students are brave to talk now. And even I changed the group leader. I sometimes point out the students who are not smart and not brave to talk to be a group leader so they felt respected.

Apart from the advantages that Mr Dono saw in the talk in learning science, he also identified some challenges in promoting dialogue in his science lesson both for himself and his students. For example, sometimes he found silent students who were inclined to talk. He also recognized that only few students, who have ability to argue, use the clear reasons, the rest just argue without any reason. Another challenge was to improve his ability in developing science lesson because he has been a subject teacher in the last five years. He believes that he needs more training and workshop in term of pedagogical aspects.

***Whole Class Dialogue: Episode on the characteristic of coastal area and plain region***

The topic of discussion was about the characteristic of coastal, plain and high land. The teacher asked his students to look at the pictures on the textbook and read the passages for about 15 minutes. Students were encouraged to work in pairs to complete the table about the characteristic of the littoral, plain and high land in their textbook. After the students finished their tasks, the teacher invited all the students for a classroom discussion.

After fifteen minutes of pair discussion, Mr. Dono invited the students for classroom discussion. He invited the students to share the information they got from the passages and pictures.

- T : Everyone, our time will be over very soon, and you will have religious study. Has everybody finished his discussion with his peer? Does anyone want to volunteer?
- SB : Which one sir?
- T : The one in page 12 (walk to one table and see the textbook to confirm the page)  
Here, you are being asked to complete the table on the level of the area, its characteristic, function and the occupation of local residents. Has everybody finished? Dona, Fatih or someone else? You can bring your books.
- SB : I haven't finished sir
- SS : Have not finished sir
- T : OK, Fatih would you mind? Dona, Anna, Fatih please share your discussion. (three appointed students come to the front of class).  
Everyone, please pay attention!
- Fatih : Dona ...(inaudible).
- Dona : Fatih, please start!
- T : Please Dona!
- Fatih : Dona, please start!
- T : It is OK. There is no right and wrong. Your friend will add something.

As can be seen from the extract none of students want to report their works voluntarily since they were not ready yet. The teacher then appointed certain students to report their works; a strategy which seems to be in common use throughout the world (*OK, Fatih would you mind? Dona, Anna, Fatih please share your discussion*). It is interesting to see a short dialogue between two students (Fatih and Dona) about who should start the presentation. The dialogue ended when teacher decided one student to report his works. It shows the asymmetric role between teacher and student in which teacher has authority to control the activity. Teacher then encouraged the appointed student by using motivational language (*“There is no right and wrong. Your friend will add something”*)

Anna started her presentation and soon after she delivered her work Mr. Dono collected ideas from students about the characteristic of the coastal area and its functions.

Dona & Anna: Assalamualaikumwarahmatullahiwabarakatuh (Islamic greeting)

SS : Waalaikumsalamwarahmatullah

Anna : the altitude of coastal region is around 5 to 50 metres. The characteristic is hot.

T : What is the altitude? So, the altitude of coastal area is 0 to 50 metre. What about its characteristic? (pointing to Anna)

Anna : Hot

T : Fatih, one of the characteristic of littoral is hot, what else?

Fatih : if we seen a map, its [ ]

T : That is not what I mean. What do you think of the characteristic of the coastal area?

Fatih : There are lots of sand

T : Ok everyone. Pay attention please! The altitude of coastal area? The altitude of coastal area...

SS and T : 0 to 50 metres

T : What are the characteristic of coastal area? Besides hot, what are the characteristic?

SB : The water is salty

T : What?

SB : The water is salty.

T : The water is salty, what else?

The extract shows that student started the presentation by saying Islamic greeting (*assalamualaikumwarrahmatullah/ peace be unto you and so may the mercy of Allah and His blessings*). It is a kind of classroom culture and almost across Indonesia students start their presentation by reciting such an Islamic greeting. After greeting, Anna presented the information she got on the altitude and characteristic of coastal area. She mentioned that the altitude is 5 to 50 metres and the coastal is a hot region.



The information she delivered were similar to her works on her text book as can be seen bellow. The teacher then invited students to share their idea of the characteristic of coastal area. Until the end of this part of the discussion, both teacher and students produced the list of the characteristic without engaging in deep discussion.

After discussing on the characteristic of coastal region, Mr. Dono invited his students to talk about the natural resources of coastal area and its function.

T : Lets continue. What about the natural resources on the coastal area?

Fatih : Sea salt farmers.

T :Natural resources on coastal area?

Anna : Fish.

T : What else? What natural resources can be found in coastal area?

Fatih : Salt.

T : What else?

SS : Water.

---

T : Let's continue our discussion on the function of coastal area. What do you think of the benefits of coastal area?

Fatih : Place to work.

T : Louder please!

Dona : For tourism attraction.

T : Tourism destination, what else?

Fatih : Place to work.

T : What else?

SS : Residential area.

...

The extract shows that Mr. Dono did not explore the ideas brought by his students. Again, the discussion generated the list of natural resources of coastal area and its functions without any critical engagement and further discussion.

Now Mr. Dono invites his students to share their knowledge on the plain region.

T : For lain area, who will be a volunteer?

(two students raise their hands)

T :Susan?

(Susan walks to the front, and asks her friend to accompany her.)

T : Do not need to bring a book.

T : What is the altitude of plain?

Susan: The altitude (in audible).

T : Can't hear you. Get closer here.

Susan : the altitude is around 200 to 400 metres.

T : The altitude is 200 to 400 m, is it right?

SS : Right.

T : Yes the altitude is around 200 to 400 m. What about its characteristics?

- Susan : The temperature is hot.  
 T : Some plains are hot, some are warm. What else?  
 Susan : High level of air pollution.  
 T : What happens with the air?  
 Susan : high level of air pollution sir.  
 T : Students, your friend said that the level of air pollution is high in plain regions, why do you think this happens?  
 Fatih : a lot of vehicles, sir.  
 T : Vehicles, what else?  
 SG : human bad habits.  
 SB : Smoking.  
 T : Smoking, said your friend, what else?  
 SG : a lot of factories.  
 T : What's wrong with factory?  
 Fatih : They are generating waste.  
 T : Yes, Smoke from the chimney.  
 ....  
 T : Yes, what are the livelihood of people in the plain areas?  
 Fatih : Farmer, seller.  
 SS : Entrepreneur, lecturer.  
 SS : Pilot, Police.  
 T : Ok! That's all for plain, give applauses to Susan. Due to time limitation, the class will over very soon and you will learn Islamic study.

In this part of class discussion, teacher did not need to point certain students to report their pair discussion. Two pupils raised their hands and become volunteers. This shows how the experience in early discussion helps students in reporting their work. (Part 1, *Teacher mentions no right and wrong and you will get additional opinion from your friends*). Apart from generating the list on the characteristic of plain area, Susan brought the idea of the air pollution in the plain regions. The class discussed the reason why they think the air pollution is high in the plain area. The discussion then continued on the functions and the functions of plain area and livelihood in this area until teacher closed the discussion due to time limitation.

### ***Pattern of the Dialogue***

Both patterns of Triadic (initiation-response-feedback/IRF) and Nontriadic (Initiation-response-prompt-response-prompt/ IRPRP chain) exchanges are recognizable here. Mr. Dono began the class by initiating students to share their pair discussion. He invited all the students to share the information they got from the passages and pictures (*Have you finished your pair discussion? Can you please come up to the front of the class, please?*) However, none of them want to report their works voluntarily due to the fact that they have not finished their task yet. The students responded "*I have not finished sir*". As a form of feedback the teacher then appointed certain students to report their work; a strategy which seem to be in common use throughout the world (*OK, Fatih*

would you mind? Dona, Anna, Fatih please share your discussion). The cycle of IRF was repeated until the end of discussion mixing up with the IRPRP chain.

Moreover, the IRPRP chain can be seen when dialogue shifted from the characteristic of coastal area to natural resources on the coastal area. “*T: What about natural resources on the coastal area? (Initiation), S: Sea, salt, farmers. (Response) T: Natural resources on the coastal area? (Prompt) S: Fish. (response) T: What else? (prompt)*”. This chain ended when teacher checked students’ knowledge on the topic discussed earlier “*So, we have so many resources in coastal area, do you remember? Can anyone mention them?*” in which teacher started a new chain of IRPRP chain. Both IRF and IRPRP cycle were repeated until the end of discussion.

It is also interesting to see that the term “*what else*” is reappearing like an echo in this episode. Using the lens of cohesive tie (Halliday and Hasan 1976), It is recognizable that the teacher derived this episode by referencing the terms of *what else* to the topic of discussion; *characteristic, “natural resources, and functions of coastal and plains region”*. The appearance of cohesion ties (e.g., repetition and reference) in the dialogue linked the utterances to make dialogue extended and allow us to follow and understand the dialogue.

### **Speaker Intervention**

As can be seen from the excerpt, the teacher employed various techniques to promote talk: direct elicitation, cued elicitation, confirmation, repetition, reformulation, literal recap (Mercer 1995). He delivered such techniques to ensure that his students were able to construct their knowledge. In promoting dialogue the teacher used direct elicitation in utterances; (*what natural resources can be found in the coastal area*), (*What do you think the benefits of coastal area?*) and (*what are the livelihood of people in coastal area?*). Teacher also delivered cued elicitation to draw out information and knowledge students got from passages or previous experiences, such as, (*I want to ask you, what do we need so the waves do not hit the coast?*) and (*What about lifeguard? Is there any lifeguard in the beaches?*) Again, the repetition and confirmation strategies appear in several utterances to maintain the dialogue. The strategies helped teacher gain the students’ attention and confirm their understanding of the knowledge they shared. Then, to check his students’ understanding of the topic, the teacher recapped what they have been discussing by asking question: (*So, we have so many resources in coastal area, do you remember? Can anyone mention them?*)

However, it is recognizable that teacher did not elaborate and explore students’ ideas. Students shared knowledge without critically engaging. As a result, during the classroom discussion students jointly constructed their knowledge by listing the characteristic of coastal region without exploring deeply of the characteristic. It is sufficient to construct knowledge on the list of natural resource and function of coastal area, however, inviting students to think more deeply of the topic of discussion will be beneficial for students. Delivering questions such as (*why do you think the sea water is salty?*), (*how is mangrove able to reduce coastal damage*), and (*can you tell me more about sea salt farmers?*) will maintain the dialogue and encourage students to think and develop their knowledge.

## Resources

In response to teacher's questions, students take benefit from their experience. This historical context shows how daily experience or past time learning helps students in developing their idea. By looking at the passages given, it becomes clear that fewer ideas come from the textbook, than students' historical experiences. The only ideas that come from the text book are the altitude of regions, the definition of coastal regions and limited information on functions and livelihood. The rest of their knowledge such as salty water, coral reefs in the beach, playground at the tourist beach, the coastal regions used for residential area may be invoked from their past experiences. These ideas may have come from the magazine they have studied, the book they have read and their experiences of visiting coastal areas and playing on the beach.

Moreover, the cultural aspect is also considered influential in student talk. When teacher asked the question (*can we take sand?*) in response to the student's statement (*Sea salt and Sand*), student brought the idea that salt is useful for playing and building materials. It is very common that people play with sand when they are visiting beach. Pupils usually find sand box around school or playground to play within their spare time. And, in the community they grown up sand mostly used for building materials.

An interesting feature is when Mr. Dono rejected Fatih's idea when he tried to relate the discussion to the previous lesson (*Fatih :if we see a map, its...*). The teacher may think that the idea does not have any relation to the topic of discussion since they are discussing the characteristic of coastal area physically but the student brought the artificial characteristic (in this case characteristic appear on the map).

Another interesting feature of this episode is the issue of air pollution brought up by student. It is completely different from the picture of their study (the picture they are looking at is a green padi field). This idea indicates that student contextualized experiences and this affected student's knowledge. The school and students residential area is situated in a quite crowded plain in the greater Jakarta in which the level of air pollution is high. This formed student's opinion that the high level of air pollution is one of the characteristic of plain area. Then, common knowledge that society share, such as pollution caused by manufacturer's waste and smoking, are revealed in this discussion, and it is an evidence that shows how historical and cultural contexts influence students opinion.

## Conclusion

Teacher believes that students like to learn science by carrying out experiment followed by discussion. Teacher should develop various strategies to encourage students to talk because students can develop their confidence level, attitude and science knowledge through dialogue during the lesson.

The study shows that the dialogue in science classroom has adopted both triadic (IRF) and nontriadic pattern. In addition, in response to teacher questions, students take benefit from their experiences of previous lesson and outside classroom.

## Acknowledgements

The author is an awardee of Indonesian Ministry of Religious Affairs Scholarships for Doctoral Degree Program.

## References

- Ametlerr, J. and Scott, P. (2013) *Classroom Discourse, Dialogic Teaching and Teacher Professional Development in Science Education: a selective review of literature*. [online] Available At : [https://www.academia.edu/2600954/Classroom\\_discourse\\_dialogic\\_teaching\\_and\\_teacher\\_professional\\_development\\_in\\_science\\_education\\_a\\_selective\\_review\\_of\\_the\\_literature](https://www.academia.edu/2600954/Classroom_discourse_dialogic_teaching_and_teacher_professional_development_in_science_education_a_selective_review_of_the_literature) [Accessed 1 August 2013]
- Dawes, L. (2004) Talk and Learning in Classroom Science. *International Journal of Science Education*, 26 (6), pp. 677-695.
- Gee, J. P. and Green, J. (1998) Discourse analysis, learning and social practice: a methodological study. *Review of Research in Education* 23: 119–69.
- Halliday, M. A. K., and Ruqaiya Hasan. 1976. *Cohesion in English*. London: Longman.
- Lemke, J.L. (1990) *Talking Science. Language, Learning and Values*. New Jersey: Ablex Publishing Corporation.
- Lyle, S. (1993) An investigation into ways in which children 'talk themselves into meaning'. *Language and Education* 7(3): 181–97.
- Mercer, N. (2007) Dialogic Teaching in Science Classrooms: Full Research Report. *ESRC End of Award Report*, RES-000-23-0939-A. Swindon: ESRC.
- Mercer, N. (2004) Sociocultural Discourse Analysis: analysing classroom talk as a social mode of thinking. *Journal of Applied Linguistic* 1 (2): 137-168
- Mercer, N. (1995). *The Guided Construction of Knowledge: talk amongst teachers and learners*. Clevedon: Multilingual Matters.
- Mercer, N. and Hodgkinson, S. (2008) *Exploring Talk in School*. London: Sage Publications.
- Mercer, N. and Littleton, K. (2007). *Dialogue and The Development of Children's Thinking; A Sociocultural approach*. Milton Park: Routledge.
- Mortimer, E.F. and Scott, P.H. (2003) *Meaning making in secondary science classrooms*. Maidenhead: Open University Press.
- Mortimer, E.F. and Scott, P.H. (2000) Analysing discourse in the science classroom. In Leach, J., Rowler, J. (2002). Using Case Studies in Research. *Management Research News*, 25 (1), pp. 16-27.
- Scott, P.H. (1998) Teacher talk and meaning making in science classrooms: A Vygotskian analysis and review. *Studies in Science Education*, 32: 45-80
- Sinclair, J.M. and Coulthard, M. (1975) *Towards an Analysis of Discourse. The English Used by Teachers and pupils*. London : Oxford University Press.
- Wegerif, R. (1996) Collaborative Learning and Directive Software. *Journal of Computer Assisted Learning*, 12, pp.22–32.
- Wells, C. G. (1999) *Dialogic Inquiry : Towards a Sociocultural Practice and Theory of Education*. Cambridge: Cambridge University Press.
- Wofie, S and Alexander, R.J (2008). Argumentation and dialogic teaching: alternative pedagogies for a changing world. [online] Available at <http://www.beyondcurrenthorizons.org.uk/wp->

[content/uploads/ch3\\_final\\_wolfealexander\\_argumentationalternativepedagogies\\_20081218.pdf](#)  
[accessed 17 Sept 2013].

Yin, R. K. (2003) *Case study Research: Design and Methods*. Thousand Oaks: Sage Publications.