Chapter 7

Language, literacy and science learning for English language learners: Teacher meta talk vignettes from a South African science classroom

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Abstract

There is considerable research on the role of language in science teaching and learning from contexts in which non-native speakers of English are taught science by teachers who are either native speakers of or are proficient in English as the language of learning and teaching (LOLT). In many South African classrooms, students who are non-native speakers of English are taught in English, by teachers who are also non-native speakers. Furthermore, many students and teachers in these classrooms speak more than one local language, such that English is their third or subsequent language. Thus, most South African students are English additional language learners (EALs) as opposed to being English second language learners (ESLs). Many South African classrooms are therefore multilingual by nature. Yet, very little is known about the pedagogic demands of teaching science to EALs. Research on EALs experiences in science lessons in the South African context has potential not only to contribute to the broader literature on EAL teaching but also to inform teacher education on how to prepare teachers for these environments. Meta talk is one of the teaching strategies that may help facilitate EALs involvement in the lesson as well as promote deep engagement with content. The chapter discusses some vignettes from whole class discussions observed in a multilingual science classroom showing how one South African teacher uses meta talk to get his learners to engage with science concepts.

Keywords: Meta talk; pedagogy; language; ESLs; multilingualism

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Introduction

There is considerable research on the role of language in science teaching in which non-native speakers of the language of learning and teaching (LOLT) are taught science by teachers who are native speakers of the LOLT. Examples include migrant students in the USA and Spain, taught by native speakers of English or Spanish. The situation is different for most South African students. Although the Language-in-Education-Policy (Department of Education, 1997) allows schools to choose any of the nine official local languages as the LOLT, most schools choose English, even in situations where neither the students nor the teachers are proficient in English (Probyn, 2006; Setati & Adler, 2000). Thus, most South African students who are not proficient in English are taught in English by teachers who are themselves not first speakers of the English language. The situation is complicated particularly in the Gauteng province of South Africa. Gauteng is the most highly urbanised province experiencing high levels of immigration both from other provinces and from outside South Africa. Thus, many students and teachers speak more than one local language, such that English is not their second language (as would be the case for their counterparts in some international studies), but it is their third or subsequent language. In other words, many South African students are not English second language learners, ESLs but English Additional Language Learners or EALs (Department of Basic Education, 2011; Janks, 2010). Thus, while there are common concerns about language in science teaching and learning in South Africa as in other countries, there are some contextual complexities that play out in a unique way in South African science classrooms. In addition to language, an important factor is the differential access to science that persists as a legacy of the apartheid era. More than twenty years after the establishment of democracy, performance in science and mathematics continues to follow racial lines (See for example, Carnoy, Chilisa, & Chisholm, 2012; Howie, Scherman, & Venter, 2008; Mji & Makgato, 2006). Most EALs, in the poorer township and rural schools continue to underachieve in mathematics and science. They are therefore, still excluded from entry into science programmes in tertiary education and from taking up science related careers. Despite this being the case, only a few South African teacher education programmes specifically prepare teachers to teach science to EALs.

This chapter reports on findings from a project that worked with both practising and new teachers to identify teaching strategies which create opportunities for learning science for EALs. We focus on one such strategy, “teacher meta talk”. We consider teacher meta talk as a teaching strategy with potential to facilitate student involvement in the lesson as well as promote deep engagement with science concepts. The broader data set that form the basis of the analysis came from three teachers’ classrooms, but in this chapter we use excerpts from one teacher’s lessons. We show how he used meta talk to mediate student participation in class activities and to foster meaning-making during whole class discussions. The results are discussed within the context of learner involvement, conceptual engagement and understanding of science concepts. We discuss the implications for teacher education in South Africa as well as teacher professional development in general.

Theoretical framework

We take a sociocultural approach in framing teaching and learning of science in the classroom. The role of social interaction, particularly language and talk, in socio-cultural theories of learning has taken centre stage in research on science classroom discourse globally over the past few decades (see for example Lemke, 1990; Mercer, Wegerif, & Dawes, 1999; Vygotsky, 1978). Recognition of the role of social mediation, particularly in the learning of science is important in shifting views and understandings of the nature of science, not as a ready-made body of knowledge for transmission to learners but as a messy, socially constructed, value-laden enterprise which must be engaged with in order to be understood (Erduran & Dagher, 2014). Talk is an important cultural and psychological tool in the mediation of this construction of both shared and individual understandings of science knowledge. Teachers who take this view of learning then adopt socio-cultural approaches to pedagogy (Gibbons, 2007). For EALs such approaches can serve dual purposes: fostering understanding of science knowledge while facilitating language development. As Gibbons says, there are implications for classroom practice. Teachers have to be able to orchestrate classroom interaction in specific ways that achieve these dual goals of classroom discourse.

This chapter reports on how one teacher used meta talk as a tool in the social space of classroom discussion to mediate meaning making for learners engaging in a language in which they are not proficient. We consider teacher meta talk as a teaching strategy with potential to facilitate EAL student involvement in the lesson as well as to promote engagement with science concepts.

Meta talk seems to have its origins in language education where it was initially defined within the broad frame of meta language. For instance, Schiffrin (1980) made the following statement about meta language:

Because human language can be used to talk about virtually anything, individuals conversing with one another have available an infinite number of topics about which they can talk. One topic is talk itself ...many conversations allow talk to emerge as a subtopic within ongoing talk about something else. (p199)

According to Schiffrin, therefore, meta language is the use of language to focus on talk as a topic. As she later put it, “Language can be used to talk about itself, that is, it can serve as its own meta-language” in “talk about talk” (p200). Schiffrin’s proposed framework for analysing conversations placed focus of the analysis at three different aspects of talk. The focus could be on the code or how the interlocutors talk about language. Focus could also be placed on the speakers themselves and how they talk about their own and the other speakers talk. Finally, analysis could focus on the messages that are being relayed about language or talk. She noted however, that oral messages seldom serve a single purpose, but that they are multi-functional. They can serve a meta lingual function as well as a communication function, to prevent a breakdown in communication or to enlist the other’s participation. The latter assertion is important for analysis of classroom talk as we propose to use this framework in this chapter. In the complex interaction between a science teacher and his students the main focus (at least consciously) is the science content under consideration. The tendency therefore, is for both teacher and students to focus on the science content and not the ways in which they talk about their own talk or their own thinking unless probed to do so. Thus, it is important to make teachers aware of the ways to make language visible in the science classroom.

Reporting on work in a different context, Faerch (1985, p185) used the concept of meta language to analyse communication in foreign language (FL) classrooms. He defined, “those portions of ...lessons in which teacher and student focus on the linguistic code rather than on content. I refer to such phases of discourse as *meta talk*”. Faerch distinguished

between meta transactions, the parts of discussion that focused on the FL code, and content transactions, which focused on non-linguistic content. He argued that meta talk can take place in both types of transactions. Meta talk in a science lesson may be expected to take one or both of these two forms: talk focusing on the language of science as opposed to talk about the English language as the LOLT or the language in which the discussion happens. The language of science is not immediately explicit, even to native speakers of English, as the LOLT. And yet most science classroom discourse in South Africa and the rest of the world tends to be dominated by content transactions and hardly any meta transactions. Content transactions in this case, would be discourses in which the teacher's focus is on the science content. Meta transactions are more debateable in a science classroom. They could include any parts of the discourse in which the teacher focuses student attention on the "code" or the language, whether the language of science or the language in which science is being discussed, the LOLT. However, these are rare in South African science classrooms where teacher talk tends to dominate and interaction is more authoritative focussing on disciplinary knowledge (Webb, 2010). As Faerch (1985) argues, meta talk can be a good indicator of teaching methodology and of the views that teachers hold about learning. Teachers could adopt one of two possible positions:

The ideal of this natural approach is that meta talk in the classroom should be reduced to a minimum and that grammar rules belong to grammar books, to be studied out of (*science*) class. A diametrically opposite view of the role of meta talk is that it constitutes an essential part of FL classroom discourse ... Teachers of this opinion, or teaching within a context where they need to acknowledge this, will typically either reserve part of the lesson for meta talk and practice, or they will introduce meta talk whenever content provides a clue to do so (Faerch 1980, p185).

Of course the quotation above refers to language teaching where, as Faerch observes, "metalinguistic and metacommunicative knowledge is one of the explicitly formulated goals" (p200). However, the same could be argued of science classroom discourse. The focus of any science classroom discussion is to afford access to science concepts, the language of science and the requisite scientific communication skills, all of which can happen together or at different times in the same lesson or across a range of lessons. Where this discussion takes place in a language in which the student is not proficient, opportunities must be created for access to the LOLT at the same time. Thus, for EALs meta talk would have even greater potential to support learning. This places an added burden on the teacher who must therefore, be aware of its potential and be able to model it and generate awareness among his/her students. Moate (2010) argues that meta talk is the explicit awareness of talk as a tool and that as a skill such talk can be practiced and honed. It is therefore, important for teacher education and teacher professional development to understand teacher meta talk as an important pedagogical tool in both content and meta transactions in EALs science classrooms. For our data analysis we adopted Faerch's approach, identifying meta talk as any part of the discussion that focuses on language. We looked at meta talk about the technical language of science as well as about the LOLT.

We analysed transcripts of some classroom discussions to determine how teacher communication in the form of meta talk mediates student engagement with science. First, we identified incidences of teacher meta talk and then determine its explicit or implicit role in shaping, selecting or marking student ideas. In addition to this focus on engagement we also identified other functions of meta talk such as classroom management and affective functions as identified by Moate (2011) with Finnish teachers and students.

Our interest was in how the teacher talked about how he was talking about science and the activities under discussion as well as in how he engaged in talking about their ideas and their thinking about the content under discussion. In order to understand the nature and role of teacher meta talk in our sample, we drew on a number of sources both from language

education and science education. We refer to the work of Yore & Treagust (2006) as well as Rincke (Rincke, 2011) on language in the science classroom. Rincke proposes three languages of science classrooms: the home language, the language of instruction and the language of science and argues that research on second language learning is useful in understanding how ESLs or EALs might transition between the languages of the science classroom. According to Rincke, learning specific phrases is more beneficial for ESLs in acquisition of the target language than memorisation of single words. She argues that these specific or “automated phrases” have linguistic environment. For example, it is useful for ESLs (and EALs) when learning the words “decision” and “conclusion” to understand that one “takes or makes” a decision and “arrives” at a conclusion. Teachers therefore, need to *“model scientific language by explaining to students how they themselves are combining terms together in sentences”* (Rincke 2011, p. 235). Teachers are not always given the training and preparation required to be able to do what Rincke suggests for ESLs, much less so South African science teachers. In fact many science teachers would be trained to focus on the subject and its teaching, rather than issues related to language. Yet for ESLs and EALs, the subject and the language that is conveying the subject cannot be separated. Meta talk has the potential to address the gap in teachers’ understanding of language issues related to EALs. Meta talk can be used to mediate learning of content as well as to develop the linguistic proficiency that students require in order to engage effectively in classroom discussion and/or science communication outside of the classroom. Also, meta talk provides a lens for understanding how teachers who are themselves non-native speakers of English consciously or unconsciously mediate engagement with science concepts for EALs.

Methodology

As part of a bigger intervention at high school level in the Gauteng province of South Africa, we observed interactions between teachers and their students in Grade 10-12 (age 16-18) science classrooms. The data reported on in this paper were collected three years into the project, following teacher participation in several workshops and group discussions at which they were exposed to constructivist approaches to pedagogy. The teachers were recruited on a voluntary basis. Their students were invited to participate and then presented with information sheets about the project after which their informed consent was obtained. Since some of them were minors (below 18) their parents/guardians’ consent was also sought. For this project all the students consented to audio and video recording

Argumentation was selected as the key teaching strategy for the project and the teachers were introduced to the strategy during the workshops. Argumentation involves the justification of claims with evidence. It is a process that underpins scientific reasoning because of the centrality of evidence to science. A great deal of research has been carried out about the role of argumentation in science education in recent years (e.g. Erduran, Ozdem & Park, 2015). The researchers co-taught some lessons in the first year of the project to demonstrate the use of argumentation in whole class teaching and for small group discussions. This was in line with research findings that teachers do need to be taught argumentation skills before they can confidently use the strategy in their own teaching (see for example, Erduran & Jimenez-Aleixandre, 2007; Simon, Erduran, & Osborne, 2006). In order to contextualise argumentation and its potential for promoting student involvement and inquiry, teachers were made aware of the various discourse types that are possible in a science classroom. Types of variations involve different combinations of talk based on initiation, response, evaluation which can appear in different permutations. In a science lesson, different variations can be used depending on the purpose of the lesson and goals that the teacher has at a particular point in the lesson. We discussed the more traditional Initiation-

Response-Evaluation/Feedback (IRE/F) triads (Mehan 1979) and explained how most teaching in South African classrooms still tends to follow this teacher centred closed form in which the teacher initiates interaction and a learner responds, to which the teacher provides some feedback before proceeding to initiate the next interaction triad. We then introduced the teachers to the more dialogic discourses such as Mortimer and Scotts' (2003) extended IRPRP..E and IRPRRR chains (where P denotes prompting) which open up for more elaborate student contributions. In the extended chains, the teacher initiates the interaction but allows students to interact with each other by questioning or supporting or extending and explaining their peers' contributions, thus creating chains of interaction. The role of teacher questioning techniques in shaping these forms of engagement was discussed. Some of these techniques were modelled in the participating teachers' classrooms during co-teaching sessions. Teacher-researcher reflection sessions were conducted after selected lessons.

Each of the teachers worked differently with the strategies that were introduced during the intervention and produced various hybrid forms of argumentation based teaching. They applied different argumentation skills into their classroom discussion as well their questioning techniques, such as ability to evaluate evidence and draw conclusions from evidence. In the case of Mr McFar's lessons, the interaction manifested as meta talk and we wanted to understand the nature and role of meta talk in his lessons.

Data were collected in the form of audio and video recordings of the lessons. The lessons were a mix of teacher centred exposition and learner discussion, and engagement with definitions of elements, compounds and mixtures. In other words, sometimes the conceptual knowledge was being developed through discussion themselves while at other times, the teacher mediated the introduction of the concepts." The recordings were transcribed and the transcripts analysed for teacher meta talk. In this chapter we discuss a form of teacher-student interaction that emerged in one of the teachers' lessons. We have changed his name to Mr McFar. All the names of the student participants in the excerpts have also been changed and pseudonyms are used.

Results

Mr McFar used meta talk quite frequently in his lessons. He used the strategy to mediate student meaning making during whole class discussion. He explained what he was doing or saying and what he was asking his learners to do or say and why. He used meta talk to make explicit the connections between concepts and ideas. He did this by asking probing and open ended questions about what the students were saying and why they said it. We did not see this use of meta talk in the other teachers' classrooms in the project.

The excerpt below illustrates how Mr McFar showed links between concepts through meta talk. In this episode the class was trying to determine whether momentum was a scalar or vector quantity:

Teacher:	according to eh Kelvin's definition momentum, that it can be regarded as a measure of the product of the mass and the velocity. Now think about mass in terms of the quantity ... can we regard mass as a vector quantity or is it a scalar quantity?
5 Students:	vector ... scalar... scalar ... vector
Teacher:	now I will say that again think about it carefully
Students:	<i>(all talking at the same time)</i>
Teacher:	think about mass how do we regard mass because he has used the words mass and velocity

- 10 Len: scalar
 Teacher: why?
 Len : because yah the mass is got size
 Langa: yah it does
 Melo: mass is got size
- 15 Teacher: **so why am I asking this?** Because one of the biggest problems that we experience is that most of us cannot distinguish between this and that (*underlining vector and scalar*). So let's just refresh quickly. Len you said this is scalar and why are you saying this is scalar?
- 20 Sindi: because it has size ...
 Teacher: thank you very much so we only have size **which can be also be referred** to as ...?
 Kelvin: magnitude
 Teacher: magnitude. So here (*pointing at the word "mass"*) we have size or magnitude
 Sipho: **no direction**

In the opening turn the teacher reiterated Kelvin's definition of momentum and then to provide the class with a cue to think through the question he asked them to "think about mass in terms of the quantity can we regard mass as a vector quantity...?" The class chorused variable answers to which he told the learners to "think about it carefully". When Len says that mass is a scalar quantity (Line 10) the teacher asks "Why?" thus creating an opportunity not only for Len to justify his answer, but also for the rest of the class to think through the various answers they had chorused earlier in Line 5. In response, Len provides justification for his answer drawing from the scientific evidence that mass has size. In Line 15 the teacher then engages in meta talk about his reasons for the probing, "so why am I asking this?" In so doing the teacher helps learners recall information from past lessons and from earlier grades that relates to the current lesson. The teacher's question at the close of the turn (Lines 18-19) and what the teacher did with the answer in Lines 21-22 indicates a shift in teaching purpose as he cues the learners to introduce a more "scientific" term for size (magnitude). The episode closes with an unsolicited contribution from Sipho in Line 26, providing support for the argument that mass is a scalar quantity since it only has magnitude and "no direction". This could be construed as an indication that Sipho has reached an understanding of the difference between vector and scalar quantities. For a non-speaker of English, it is important to point out the substitution of magnitude for size as the similarity in meaning of the two words may not be obvious and learners need to be made awareness of the specific use of one (and not the other) in science.

The next excerpt comes from a chemistry lesson, an introduction to properties of compounds. Here again, we see Mr McFar making the links between current and previous coverage of similar content explicit:

- 5 Teacher: They are elements what else? They are elements, they are gases what else do you know about hydrogen and oxygen? So we are using the terms now elements we are using the term gases we are using what else? If you think about hydrogen ... Tebogo?
- Tebogo: I would say Sir, compound
- Teacher: **Now you are using another word.** We are saying we know what is an element (*teacher writing words on the board*) we know what is a compound a chemical compound ... Now just briefly is there anyone in this class who can refresh our memory with regard to

- an element? What do you understand by the word element? Simphiwe?
 Simphiwe: A substance that cannot be broken up into smaller particles
 Teacher: He says a substance that cannot be broken up into smaller particles.
 Remember that Monday we struggled to find this. Any other person
 that can tell us the definition of compound?

In the episode above the teacher helps his learners to recall word definitions and to link to work done in a previous lesson. He draws learners' attention to related concepts and principles within and between lessons. By talking explicitly about how he and the learners were talking about the words and concepts, he makes clear the progression from simpler to more complex concepts:

- 59 Teacher: Right while you are still thinking about a gas I am looking at hydrogen and I am looking at oxygen can we classify hydrogen or oxygen as a mixture? **So I am asking what is a mixture** (*Writes 'mixture'*)
 60 Sebuka: (*shouts*) adding ... adding
 Teacher: Sebuka? (*addressing learner who is shouting*)
 Sebuka: adding different things
 Teacher: **different chemical substances put together**
 Class: Yes
 65 Teacher: That is a mixture. So how does a mixture differ from a compound? **If there is a difference.** Siviwe?
 Siviwe: In a compound elements are in fixed proportions while a mixture is different ...
 Teacher: **Please listen to that.** A compound (writing on the board) has fixed and **the word he uses is pro...**?
 Siviwe: [... portions]
 Teacher: [... portions] And a mixture? It doesn't have a specific ratio isn't it so? **Now why am I doing this again? because I'm gonna come back to a molecule** but our aim for and our objective for today is to look at how Magnesium will react with ... air. What chemical in air?

In turn 59 at the beginning of the episode the teacher uses meta talk to explain a question. After asking the learners if hydrogen or oxygen gases could be regarded as mixtures, he elaborates "So I am asking what is a mixture?" The previous episode closed with a reminder about Monday's struggle to define an element. The teacher here brings to contrast an element and a mixture by referring to oxygen and hydrogen and then in meta talk explains what the actual question is.

Later in this lesson, Mr McFar used a practical demonstration to show the reaction of magnesium with oxygen. He had a few learners upfront to help ignite the magnesium strip and this led to the following discussion:

- 134 Class: Oh oohh aah (*as magnesium ribbon ignites*)
 135 Teacher: Right there we are. Please don't shake it just turn your hand around a little bit. I want you all to have a look at it. **This is ... I don't want to use the word.** But this is something that was formed after magnesium and oxygen have reacted (*laugh*) **I can't use the other word for now.** So please look at this colour and write it down as well. So this becomes **that word that I want**, a (*pause*) of magnesium and oxygen

- Smitherson: what is that word? mixture of ingredients?
 Teacher: Ok, I am not gonna waste time I am gonna tell you. It is the product of, product of. So now I already have this part of the word. When magnesium and oxygen react we get a product. So the right hand side of the chemical equation is called the product or products. Now what do we call the left hand side? If that (*pointing to right side of equation*) gives us the product what will cause us to have a product?
- 140 Smitherson: mixture
 Neliswa: ingredients
 Dana: (*inaudible*)
 Teacher: **he says a ...? say that again** Dana
 Dana: reactant
 Teacher: Right. So we are saying these are the substances that reacted to form a product. **Reactants plural form.**

Amidst the learners oohs and aahs at the bright flame of the burning magnesium ribbon, Mr McFar shifted the discourse to commence development of the scientific story linking what they had just seen with the previous discussion and moving on to the focus of the day's lesson, properties of compounds. The episode starts with a teacher utterance in which he uses meta talk several times. He was targeting a specific word to describe the outcome of the chemical reaction, "... *This is ... I don't want to use the word... I can't use another word for now ... So this becomes that word that I want of magnesium and oxygen*". He wanted to get the learners to come up with the word "product" by getting them to think of a word that describes the outcome of the reaction. When the learners failed to come up with the word, he volunteered the answer so as not to "waste time". This was a common statement in Mr McFar's lessons. He would give the learners a chance to come up with the answer, always providing clues. Occasionally he would cut the interaction short and provide the answer so as "not to waste time". When asked about this in the reflection discussions he explained that while he wants to help his learners think for themselves and practice talking in class, he was also mindful of the curricular requirements and the strict timelines in which he had to cover the prescribed content. This is a common tension for many South African teachers. Recent research findings show that while teachers are eager to take up and use teaching strategies that have been shown to promote science learning for EALs, they often have to make pragmatic decisions in the interest of time and meeting deadlines (Mji & Makgato 2006; Msimanga & Lelliott 2012; Probyn 2009).

The next excerpt is from a discussion towards the end of the lesson. This excerpt illustrates how Mr McFar again used meta talk to mediate different forms of link-making. Scott and colleagues recognised three ways in which a teacher can help learners make connections between concepts and across topics or lessons. They identified link-making for knowledge building, in which a teacher makes explicit the connections between concepts; link-making for continuity, which shows how different parts of the lesson or different lessons build on each to develop concepts and ideas; as well as link-making for emotional engagement, which is a way in which the teacher can appeal to student interest and emotional engagement to facilitate science learning (Scott, Mortimer, & Ametller, 2011). Mr McFar seemed to draw on all three forms of link-making.

Earlier in this lesson as he took the class through recall of definitions of the terms molecule, element, mixture and compound, he asked "Why am I doing this again? Because I'm gonna come back to the molecule later ..." In the next excerpt we show how he makes the links to that earlier conversation. The class was now discussing an equation, $\text{Mg} + \text{O}_2 \rightarrow$

MgO₂ which Kgotso and Zama's group had put up on the board for the combustion of magnesium in air:

- 177 Class: *(chorus answer)* mg mg mg
 Teacher: Right so the symbol for magnesium is Mg *(points to the expression)*
 Thabisile: plus O-2
 180 Teacher: **what are you saying Thabisile? Say that again**
 Thabisile: *(silent)*
 Teacher: hah? **Why are we writing it as O-2 and not as O? Why are we writing it as O-2 and not as O?**
 Kgotso: oxygen is diatomic
 Teacher: **Thank you very much...** So oxygen is a diatomic molecule. Is there anyone else that will explain to us **what we mean by the term diatomic? Remember I said when I started that I will come back to the specific definition a specific term.** What does di- mean? Kabelo? Lerato? Melo? Bongani?
 185 Bongani: Two
 Teacher: **Thank you.** So, **Kgotso wrote this *(expression)* down** for Magnesium

The episode above illustrates the teacher's use of meta talk to link the current discussion to earlier ones in the same lesson. Again, the teacher used probing questioning to open up the discussion, resulting in an interesting discourse type in the form of Mortimer and Scott's (I)RRPRPRE closed chains. Mr McFar and the class were now reviewing the equation that Kgotso and Zama had put up on the board. The teacher had initiated the conversation by asking what the symbol for magnesium was, to which the class now responded in chorus "mg mg". However, before he could continue Thabisile made a (unsolicited) contribution, calling out "Plus O-2". This was an unsolicited learner contribution but appropriately presented as the next term in the equation that they were constructing. The teacher followed this up with a meta talk utterance that seems to have two of Schiffrin's (1980) focus points. There appears to be a focus on the message of Thabisile's utterance of turn 179 as the teacher asks what seems to be a clarification question, "what are you saying Thabisile? Say that again". However, the rephrased question in turn 182 shows that he was actually focusing on the content of the utterance, probing Thabisile's reasoning. Thabisile's reaction, in turn 181 is interesting. Her reluctance to repeat her answer seems to suggest that she may have interpreted the teacher's response in turn 180 as negative evaluative feedback, that her answer was incorrect. However, from the teacher's follow up in turn 182 it becomes clear that he was genuinely probing for Thabisile's understanding of "O-2" as she put it. Since the discussion was about molecules, the teacher may have wanted to confirm that she and her peers understood the difference between the molecule of oxygen, O₂ and its atom, O. This seems to be confirmed in the way the teacher responds to Kgotso's answer that oxygen is diatomic (turn 183). The teacher thanks Kgotso (turn 184) and repeats his answer, thereby affirming his contribution and marking his answer as correct and probably important. Thanking Kgotso for clarifying Thabisile's answer could be seen as creating a safe space for the two learners, link-making for emotional engagement according to Scott et al (2011). We see this again in turn 186.

In turn 184, the teacher then uses meta talk to link this episode to an earlier one where he had said that he would come back to the definitions later in the lesson, "Remember I said when I started that I will come back to the specific definition a specific term" (turn 184). This was link-making for continuity, showing the learners how this part of the lesson links to the beginning. Meanwhile he was also mediating for the learners another way of

making connections, link-making for knowledge building (Scott, et al., 2011). He was demonstrating how the concepts are linked. He had raised the questions in turns 180, “What are you saying Thabisile?” and 182, “Why are we writing it as O-2 and not as O?” to check understanding of the concept of molecules (O₂ versus O). In the rest of the episode he questioned, probed and provided cues for learners to be able to distinguish between a diatomic molecule and its atomic (element) form.

Often in reflection meetings Mr McFar would refer to the importance of making links between lesson episodes and between lessons explicit, especially for ESLs. He also sometimes told his learners this. For instance, at the beginning of this lesson on momentum, he said to the class “now I said I said to them (referring to the project team) that my introduction will be on types of collisions but when I got here I realised something else. So I just changed my introduction to check if people still remember these concepts and to show you how these things are all related from the last lesson to today’s lesson. Now I need to go back to my plan and that’s where we are starting and we go forward”. This was common in Mr McFar’s interaction with his class, explaining why he was doing or saying something at the time.

Discussion

The potential of meta talk as a teaching strategy for EALs seems to be threefold: making explicit the purpose of various forms of classroom talk; making connections between different sections of the same lessons and/or previous lessons or grades; and explaining or calling attention to important terms, thus, mediating conceptual engagement. In Mr McFar’s case meta talk sometimes took the form of questions such as, “*So why am I asking this?*” or “*So why am I doing this?*” and thus foregrounding important content or skills required of students. To mediate link-making or to make connections he used statements like, “*I will come back to it*” and when he did, “*I said I will come back to it...*” Finally, Mr McFar used meta talk to alert students to important terms, “*So we are using the term ..., we are using the term ...*” or “*Now you are using another word ...*” Meta talk sometimes works, sometimes not. At times Mr McFar was able to establish a rich dialogic discourse, while at others talk tended to remain closed and teacher centred in spite of the use of meta talk to help open up talk. However, overall the use of meta talk may still be helpful in addressing the language problem for those teachers who do not believe in use of home language, but are happy to scaffold student struggles with learning in a language they are not proficient in.

Learning and teaching science through a non-native language is a challenge for teachers and learners. It places demands on teachers to think about language. Meta talk can help teachers address EALs difficulties in science classrooms. While we acknowledge that meta talk as a strategy would benefit all science learners, whether native speakers of English or EALs, we argue that as teachers’ skills in managing meta talk in the lessons improve, they become better equipped in dealing with EAL-related difficulties as well.

In this chapter we have demonstrated teacher use of meta talk in a South African high school science classroom for purposes other than classroom management. Mr McFar used meta talk to show conceptual connections and to point learners to continuities between concepts and within the lesson. He successfully used meta talk to mediate conceptual understanding for his learners. We illustrated meta talk within Faerch’s (1985) teacher-student content transactions and demonstrated its potential as a teaching strategy to enhance learning of science by EALs. Teacher education can draw on these findings to plan programmes that can empower teachers for effective science teaching to EALs in South Africa and elsewhere. Further research is also required to provide empirical evidence of the effectiveness of the strategy and to demonstrate the learning gains for the EALs.

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