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Analysing student talk in whole-class teaching

Jan Hardman

Abstract

International research suggests high-quality classroom talk is central to learning as it engages students and extends their thinking, argumentation and reasoning. Most empirical studies of whole-class teaching focus on teacher talk and the focus on student talk is often taken for granted or is somewhat peripheral to the analysis. This chapter will focus on student talk using a theoretically-grounded discourse-analytical framework. To illustrate the application of the framework, the chapter draws on a data set which formed part of larger study of a professional development programme designed to promote a dialogic pedagogy in the teaching of primary English, mathematics and science in primary schools serving socio-economically deprived areas in England. The framework provides a tool for the micro-analysis of 54 lesson transcripts identified as part of the systematic observation of 134 lessons using computerised software. It reveals rich and deep insights into the learning talk engaged in by students and identifies the repertoire of talk moves they used while sharing, explaining arguing and justifying their thinking and building on the ideas of other students. It concludes with a discussion of how the framework could be used by teachers and students to inform their implementation of a dialogic pedagogy to promote greater student participation and learning in whole-class talk.

Introduction

Studying the quality of teacher-student and student-to-student interaction in whole-class and group-based talk has received increasing attention over the past forty years because of its perceived role in improving pedagogical practices and student learning (Howe & Abedin, 2013; Resnick, Asterhan & Clarke, 2015). Drawing on socio-cultural theory suggesting that mental processes interact with social and cultural practices and such interactions are mediated through talk, researchers have increasingly focused on identifying productive talk moves used by teachers and students that are said to result in higher levels of student engagement and learning by extending their thinking, argumentation and reasoning in teacher-student and student-student interaction (Mercer & Howe, 2012; Hennessy et al, 2016). Whether the emphasis has been on whole-class or group-based teaching, research

into a dialogic pedagogy suggest there are common features of an active approach to student learning including greater involvement in the classroom talk, an open exchange of ideas, joint inquiry and construction of knowledge, multiple voices and respectful classroom relations (Haneda, 2017; Hang Khong, Saito & Gillies, 2017; Littleton & Mercer, 2013).

Despite the growing body of evidence showing that a dialogic pedagogy can improve student learning outcomes and social-emotional well-being, research into its implementation suggests teachers have found it difficult in practice and that it is rarely observed in the classroom (Davies, Kiemer & Meissel, 2017; Howe & Mercer, 2017; Wilkinson et al 2017). The research, particularly into whole-class talk, has also put a greater emphasis on researching teacher talk rather than the learning talk of the students as it is recognised that most class talk is teacher-fronted with teachers controlling the turn taking and that teachers need to made aware and supported in their attempts to create more space in the classroom talk for greater student participation.

In this chapter, the role of student talk is highlighted as it is a key feature of a dialogic pedagogy. It will look briefly at the research into the types of student talk found in whole-class teaching before going on to discuss how it was used to inform the design of the student talk analytical framework. It concludes with a discussion of how the framework could be used by teachers to inform their implementation of a dialogic approach in whole-class and group-based teaching to encourage levels of student engagement and thinking in order to advance their learning and understanding.

Researching student talk in whole-class teaching

Much of the research into whole-class talk has looked at student talk within the perceived limitations of what has become known as the ‘recitation script’ made up of teacher explanation and closed teacher questions, brief student answers and minimal feedback which requires students to report someone else’s thinking rather than think for themselves, and to be evaluated on their compliance in doing so (see, for example, Tharp & Gallimore, 1988; Hardman, Smith, Wall & Mroz, 2003; Nystrand, Gamoran, Kachur & Prendergast, 1997).

Work on the linguistic patterning of teacher-student interaction by Sinclair & Coulthard (1975) first revealed the initiation-response-feedback (IRF) exchange which is central to

teacher-led recitation. A similar pattern referred to as initiation-response-evaluation or IRE, was also developed by Mehan (1979) around the same time in the United States of America to reflect the fact that the third move in the triadic teaching exchange is often an evaluation of a student response. In its prototypical form teacher-led recitation consists of three moves: an *initiation*, usually in the form of a teacher question, a *response* in which a student attempts to answer the question, and a *follow-up* move, in which the teacher provides some form of feedback (very often in the form of a brief evaluation) to the student's often brief response.

While Sinclair and Coulthard found the follow-up to a student response was very often in the form of an evaluation as to its acceptability within the teacher's frame of reference, teachers sometimes used comments which exemplified, expanded, justified or added additional information to a student response. They also identified a *re-initiation* move which was often directed to another student if the teacher did not get the 'right' answer, although it could be used as a probing move where a teacher stayed with the same student to bring him/her round to the required answer. Both moves were seen as leading to what Hoey (1993) later called a complex exchange creating extending across more than one IRF exchange.

Building on the work of Sinclair and Coulthard, observational studies of teacher use of the IRF exchange in whole-class talk suggested it was largely being used in a restrictive way creating few opportunities for student participation as teacher presentation and closed question-answer sequences allowing for only one answer dominated most of the classroom talk. For example, in a study of video-recorded literacy and numeracy lessons (70 in total) using computerised systematic observation drawn from a national sample of 35 primary schools in England, it was found that open questions allowing for more than one answer made up 10 per cent of the questioning exchanges and 15 per cent of teachers did not ask any such questions. Probing by the teacher, whereby a teacher stayed with the same student and asked further questions to encourage an extended and reasoned answer occurred in just over 11 per cent of the questioning exchanges. Uptake questions, whereby a teacher built a student's answer into a subsequent question, occurred in only 4 per cent of the teaching exchanges and 43 per cent of teachers did not use such moves. Therefore, most of the student exchanges were very short, lasting on average 5 seconds, and were limited to three words or less for 70 per cent of the time and were given a simple evaluation 'ok', 'yes', 'fine' and 'good' by the teacher (Smith, Hardman, Wall & Mroz, 2004).

Similarly, in a study of dialogic episodes in whole-class discussion in 200 video-recorded eighth and ninth-grade English and social studies lessons in a variety of schools in the Midwest of America, using discourse moves such as open-ended questions, uptake questions, student questions, and level of teacher evaluation, it was found that an open exchange of ideas was rare. In grade eight 8 it averaged less than 50 seconds and in grade nine less than 15 seconds. Overall, in an analysis of 1,151 instructional episodes, marked by a shift in topic, only 66 episodes (6.69%) could be described as being dialogic in nature (Applebee et al, 2003; Nystrand, Wu, Gamoran, Zeiser & Long, 2003).

Opening up the IRF

In an attempt to open up the IRF exchange to encourage greater student participation in whole class talk, research focused on teacher use of ‘higher-order’ questions to promote reflection, self-examination and enquiry through the use of ‘open’ questions which invite students to speculate, hypothesise, reason, evaluate and to consider a range of possible answers (Wragg, 1999). A range of alternatives to teacher questions were also explored which included the use of provocative, open-ended statements by teachers to encourage students to ask their own questions, the use of ‘wait time’ to allow students to formulate their answers (Dillon, 1994).

The difficulty of managing the turn-taking of a large numbers of students in whole-class talk also led to questioning of the effectiveness of the IRF exchange structure and the development of group-based learning. For example, Barnes & Todd (1995) explored the promotion of exploratory student talk through the use of collaborative group work as a way of 'decentralizing' classroom communication and allowing for alternative frames of reference to be explored. Others have explored group-based approaches such as ‘philosophy for children’ (Topping & Tricky, 2015), ‘reciprocal teaching’ (Brown & Palincsar, 1989), and ‘dialogic interactions’ (Gillies, 2016) to encourage student questioning, argumentation and reasoning. Such forms of interaction allow students to constructively engage with each other’s ideas and to help develop student reasoning, problem-solving and understanding (Littleton & Mercer, 2013).

Within whole-class teaching research started to explore how the F-move of the three-part exchange structure could be opened up to encourage greater student participation (Cullen,

1992; Hardman, 2008; Smith & Higgins, 2007). For example, researchers used computerised corpus data software and transcript analysis to analyse micro-transitions occurring within and across 828 triadic teaching exchanges captured in 12 third grade (age 8 – 9 years) primary classes from five urban primary schools located in northern Italy. They found that teacher open questions were often followed by complex answers which in turn encouraged teachers to follow-up the student answers using high-level evaluation by probing for evidence and elaboration, asking other students to comment and by building the answer into subsequent questions (i.e. uptake questions) to create a thematic coherence across dialogic sequences (Molinari, Mameli & Gnisci, 2013).

Similarly, building on the Italian sequential analysis of teaching exchanges, 73 upper primary literacy lessons taught by seven teachers based in a large primary school in east London were video-recorded and analysed (Lefstein, Snell & Israeli, 2015). From their intensive sequential analysis of over 7000 discourse moves, Lefstein and colleagues found that while there was variation between teachers in their use of the talk moves, episodes in which teachers used a higher proportion of open, probing, uptake and repair questions generally promoted higher levels of elaboration and reasoning from the students.

Research by Michaels and O'Connor (2015) into primary science in the USA using an approach known as 'accountable talk' has also identified a number of teacher talk moves that have been found to be academically productive by opening up the third move in the IRF exchange to students. For example, some of the moves prompt students to share, expand and elaborate upon their ideas. Others help students to dig deeper into their own reasoning by providing evidence to support their claims and to build on the reasoning of others in the class.

In light of the greater focus on student talk discussed in this section, it has become apparent that there is a need for an analytical framework that adequately captures the types of talk moves used by students in response to the broader range of talk moves being used by teachers as part of a dialogic pedagogy, particularly in following-up a student response. The framework discussed in the next section was devised as part of an impact and process evaluation of a professional development intervention design to promote a dialogic pedagogy in the teaching of primary English, mathematics and science in 78 primary schools

serving socio-economically deprived areas in the cities of Birmingham, Bradford and Leeds (Alexander, Hardman & Hardman with Rajab & Longmore, 2017; Jay et al, 2017).

Analytical framework

Sinclair & Coulthard's (1975) original linguistically-informed descriptive model of classroom talk showed that it is hierarchical in nature consisting of ranks comprising of an 'act' (at the lowest rank), 'move' (made up of one or more acts), 'exchange' (made up of one or more moves), 'transaction' (a series of exchanges) and 'lesson' (at the highest rank consisting of an unordered series of transactions). As discussed above, their model typified a traditional primary lesson in England and the interaction under scrutiny is teacher-led and dominated. The model at the rank of moves follows a strict structure of teacher (often closed/test) question, student (brief/unelaborated) response and low-level teacher feedback/evaluation. The teacher feedback/evaluation move is retrospective in orientation hence it cuts short the classroom interaction and students' opportunity to talk is curtailed.

There is, therefore a need to reconceptualise the recitation model of classroom discourse so as to best capture a dialogic pedagogy in which the teacher opens up space within and across IRF exchanges to allow for greater student participation in whole-class talk. The most appropriate place for extension is at the level of moves and acts as it is in these ranks that a lot of interactional activity between the teacher and students can occur.

Figure 1: Dialogic model of classroom discourse

<i>Lesson</i>				
<i>Transaction</i>				
<i>T Initiation Move (I)</i>	<i>S Response Move (R)</i>	<i>T Feedback Move (F)</i>	<i>T Follow-up Move (F-up)</i>	<i>S Response Move (R)</i>
<i>Act</i>	<i>Act</i>	<i>Act</i>	<i>Act</i>	<i>Act</i>

The reconceptualization of the IRF exchange as part of a dialogic pedagogy involves extending the teacher re-initiation (R/I) move and the student response (R) move. Building on Sinclair and Coulthard's (1975) model, the teacher R/I move can be expanded to include

asking students for elaboration, argumentation and reasoning through such questions as ‘why do you think so?’, ‘do you agree with...?’, ‘what else have you got to add to that?’, ‘what do you mean by that?’, ‘does it always work that way?’

In the light of the extended teacher re-initiation move, a coding system was designed to analyse an extended student R-move that followed either a teacher initiation question or teacher R/I question (Table 1). While student R-moves comprise mainly of answers to teacher questions, when teacher open up the F-move it can lead on to students elaborating on their thinking in the form of statements and questions that can be responded to by the teacher or another student. Student questions were sub-categorised into two: *closed/procedural* (CSQ) and *open/authentic question* (OSQ).

Student contributions were coded in terms of *brief student contribution* (BSC) and *extended student contribution* (ESC). A brief student contribution provides pre-specified information without any elaboration expressed in a word, phrase or a simple question. In contrast, an extended student contribution provides non-specified information and thinking that is developed to some extent through for example, explanation, expansion, evaluation, justification, argumentation, and speculation.

Table 1: Coding framework for student talk at the level of R-move

CODE	STUDENT TALK MOVES	DESCRIPTION	EXAMPLE (S = student)
CSQ	Closed student question	Student asks a closed or procedural question	S: Can we use diagrams? Like a venn diagram?
OSQ	Open student question	Student asks an open/authentic question	S: How does blood make it grow?
BSC	Brief student contribution	Student provides pre-specified, brief information without any development	S: Congruent means identical.

ESC	Extended student contribution	Student provides non-specified information and thinking. The contribution is developed to some extent through, for example, explanation, expansion, evaluation, justification, argumentation and speculation.	Examples are provided in Table 2 below
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In order to explore further the student R-moves, extended student contributions were further divided into act types. Table 2 below sets out 12 codes that give rise to dialogic episodes in the classroom. For example, students share and clarify information and thinking through *expand/add*, *explain/analyse*, *connect* and *recount*; listen carefully to one another to *rephrase* other's contribution, deepen their reasoning and engage with other's reasoning through *argue*, *justify*, *evaluate*, *challenge*, *speculate* and *shift position*, and think creatively through *imagine*.

Table 2: Coding framework for act types making up extended student contributions

CODE	SUB-TYPES OF EXTENDED STUDENT CONTRIBUTIONS	DESCRIPTION	EXAMPLE (T = teacher; S = student)
SE/Add	Student expand/add	Student says more by building on, adding to or extending own or another student's contribution e.g. 'You could also ...', 'I'd like to add...'	S: You could also have quotes with people that have seen it [Bigfoot], like, the mountaineer and the local ranger.
SCon	Student connect	Student makes an intertextual reference to something else, e.g. a previous discussion, another text, event, experience or resource	S: I've seen it in EastEnders. [<i>a UK soap opera</i>]

SE/Ana	Student explain/analyse	Student explains something in some detail or examines own or another student's contribution. (<u>not</u> to convince/persuade)	S: Maybe an easier way to explain it would be maybe put the biggest, biggest part of the number in the furthest place where you have your column to the left.
SRep	Student rephrase	Student repeats, reformulates or summarises own or another student's contribution e.g. 'I said', 'He said that...', 'I mean ...	S: Harvey said that like the things that are gonna be different is when you're times-ing and multiplying and you... When you're multiplying and dividing them you're doing it by different numbers.
SRec	Student recount	Student gives an account of an event or experience	S: He was driving, he was driving, and then saw a shiny object coming down from the sky. And then he went there...
SEval	Student evaluate	Student makes a judgement e.g. 'true', 'wrong', 'good', 'I like that idea', 'In my opinion', 'happy with'	S: I think it's like it's quite awful to say that like you wouldn't say that when someone's passed away because it's a bit like... I would say mean or a bit awful.
SArg	Student argue	Student states a position/opinion/argument e.g. 'I think that...', 'I (dis)agree' 'should', 'need'	S: I would disagree to use footage in a newspaper report because...
SJus	Student justify	Student provides reasoning/evidence (to convince/persuade) e.g. 'because', 'reason', 'so'	S: Because ice starts hard when it's not melting, and then when it melts it turns into liquid.

SSpec	Student speculate	Student predicts/hypothesizes an idea or situation e.g. 'maybe', 'might', 'if'	S: If courgettes was the best-selling last year, they're going to... they might be the best-selling this year.
SImag	Student imagine	Student creates an analogy, mental image or scenario e.g. 'imagine if', 'could'	S: We could draw like a bee coming into a flower.
SChal	Student challenge	Student provides a challenge or counter-example e.g. 'Yeah, but...?', 'But then...', 'What if...?', 'No'	S: No they're not [<i>amphibians</i>], they're reptiles.
SSP	Student shift position	Student indicates a change of mind or perspective	S: I've changed my idea.

These categorisations largely correspond with Michaels & O'Connor's (2015) teacher talk moves which prompt students to share and expand upon their ideas, to provide evidence for their claims, and to build on, elaborate and improve the thinking of the group. The sub-types of extended student contributions also reflect Alexander's (2018) repertoire of learning talk consisting of: narrating, explaining, instructing, questioning, building on answers, speculating/imagining, exploring and evaluating ideas, discussing, arguing, reasoning and justifying, and negotiating.

Identifying act types

Within the framework different student contributions are categorised by acts. An act is a small unit of discourse realised by one or more utterances produced by the same speaker. It occurs as a constituent segment of a talk turn or corresponds with a turn itself. Act boundaries within a stretch of discourse are indicated in one or more ways: a change of speaker, a change of talk focus, a change of discourse type (e.g. from narration to evaluation), and a change of semantic relation between acts often explicitly signalled by such connectives as 'and' (additive), 'because' (causal), 'but' (adversative), and 'and then' (temporal).

Identifying act types are also often indicated by signalling words such as ‘reason’, ‘because’, ‘agree/disagree’, ‘I think’, ‘should’, ‘imagine’, ‘wrong’, ‘why’, ‘might’, ‘if’, ‘maybe’, ‘would’, ‘could’. Seeing certain words as proximal indices of talk types has been discussed in the works of, for example, Mercer, Wgerif and Dawes (1999) and Soter et. al (2008). Another factor to take into consideration when categorising student contributions is that acts tend to go together in pairs, for example, *student evaluate* and *student justify* as in ‘I like that because...’ and *student argue* and *student justify* as in ‘I think...because...’. Furthermore, the position of an act within a teaching exchange (i.e. what precedes and follows it) can be used to determine the type of act. For example, teacher questions such as ‘can you explain that?’, ‘do you agree or disagree and why?’ and ‘can you repeat what has just been said?’ directly influence the types of act that follow.

Inter-rater reliability

Four coders were recruited and trained and involved in the iterative process of testing and refining the coding scheme. The coding inter-reliability between the coders was calculated using Cohen’s Kappa. After four training sessions, the level of agreement reached nearly 80 per cent ($K = .738$). Despite drawing on a combination of indicators to identify the boundaries and types of acts, the coding process was not without challenges. A key challenge was a lack of fit between the form and function of an act. For example, an unmarked *student explain* and a linguistically-signalled (‘because’) *student justify* are quite different in form but may serve the same function in relation to the ‘why?’ question. To address this challenge, inter-reliability checks were carried out with four coders and the definitions were refined accordingly, resulting in distinctions being drawn, for example, between the function of *student explain* (i.e. not to convince or persuade) and *student justify* (to convince or persuade). There were also cases where more than one code could be applied to a particular act. In this instance, the same iterative process of conferring between coders was carried out to reach a consensus on, for example, discourse markers, juxtapositions and changes in the focus of the talk.

Illustrating the application of the coding framework

As part of the process evaluation of the dialogic teaching intervention 134 video-recorded lessons, each lasting one timetabled hour, were collected from 15 teachers in the intervention

schools and 11 teachers from the control schools. In order to systematically analyse the large database of lesson recordings, a computerised observation software package known as The Observer XT 12.5 was used to quantify the coded talk moves (see Alexander, Hardman & Hardman with Rajab & Longmore., 2017).

A sub-sample of the video-taped lessons (54) were transcribed and lesson episodes from these were qualitatively analysed with a focus on student talk moves and acts using the coding schemes in Tables 1 and 2 above. A primary aim of the analysis was to examine the kinds of student talk promoted by the dialogic teaching intervention. Excerpts of different lengths representing mathematics, English and science from the intervention group of schools have been selected for the purpose of illustrating the identification and analysis of a range of student moves and act types.

Transcript 1 is an episode taken from a mathematics lesson. The discussion in this episode is about solving mathematical problems which involved measuring the sizes of different fields and figuring out which vegetables of different sizes (e.g. carrots, potatoes, and courgettes) could be planted so as to get the best return.

Transcript 1: Mathematics

TURN			R-MOVE	ACTS
1	S1	I disagree with Sharee about putting courgettes in the smaller field.	ESC	SArg
2	T	Yeah, go on.		
3	S1	I think put the courgettes in the big field, because it's a bigger field and you'll get more than if you put in the smaller field.	ESC	SArg SJus
4	T	You will. Go on Michael.		
5	S2	But won't you want the same amount? Because it doesn't matter how many you put in field four with the potatoes, or the carrots, it still won't get to the courgettes and you're just helping the courgettes get more and more and	ESC	SCh SJus

		more and more.		
		So I think I have to disagree with you on that one,		SArg
		because I think you've got to keep it a balance,		SJus
		like if I were there.		
6	S3	I'm still going with Charlie,	ESC	SArg
		because if you put the courgettes in the bigger		SJus
		field, you're going to take them to the shops and		
		they're going to give you more money.		
7	T	They're going to give you more money. Yeah,		
		probably, probably. Maeve?		
8	S4	I'm going with Michael on this one	ESC	SArg
		because if you put the courgettes in the smaller		SJus
		field, that means- you get, like, more ... like better		
		stuff that you want to put in the bigger field, so if		
		you just like courgettes that much, you could put		
		them in the smaller field, but if you like turnips		
		more than ... didn't like courgettes, you could just		
		put turnips in the biggest field.		
9		Put them in the biggest field. Alfie, shaking your		
		head. Go on.		
10	S5	If you actually figure out from last year's harvest	ESC	SSpec
		which was the best-selling, you can put the, what		
		was the best-selling one in the biggest field,		
		which is two.		
11	T	Yes, super.		
12	S5	So I don't agree with Michael and Maeve.	BSC	SArg
13	T	You don't agree with either of them, no. I like it.		
14	S4	I've changed my idea.	BSC	SSP
15	T	You've changed your idea, interesting. Go on.		

This excerpt captures a rich whole class discussion involving a number of students and illustrates a diverse range of discourse moves used by the students. For example, in Turn 1, S1 expresses her position by disagreeing with another student's contribution ('I disagree with Sharee...') and, in Turn 3, states her opinion ('I think...') followed by a justification (because...). In Turn 5, S2 joins in the discussion and makes an extended contribution consisting of *student challenge* ('But won't you want the same amount?') followed by a *student justify* ('Because...'), and *student argue* ('So I think I have to disagree...') followed by *student justify* ('because..'). The occurrence of the paired *student argue* and *student justify* can again be seen in the subsequent Turn 6 by S3 and Turn 8 by S4. A different type of act *student speculate* ('If you...') occurs in Turn 10 by S5. A *student shift position* by S4 ('I've changed my mind') can be seen in Turn 15.

Transcript 2 is an episode of an English lesson. The focus of this whole class discussion is on the costs of buying healthy foods compared to unhealthy foods.

Transcript 2: English

TURN			R-MOVE	ACTS
1	T	Yeah, so chocolate has a longer sell-by-date, doesn't it? But having fruit, it can go out of date quite quickly, so expand on that.		
2	S1	Well, if you buy, like, loads of fruit, you'd have that one day, then two days later you're going to have to buy more, a little bit more.	ESC	SE/Ana
3	T	Good, that's a really nice idea, actually, so therefore it's going to have an impact on the amount that your parents have to spend. Randeep?		
4	S2	Miss, like, say you walk into Tesco or Lidl, or whatever shop you shop in, and the first thing, which most people used to see, is now – it's like the season where you see Easter eggs, and	ESC	SImag

Easter eggs, and chocolate. So you walk in, and	
you can see lots of chocolate; but then, you	
see the chocolate, and chocolate can be,	
like what Sukina said, chocolate can be a pound,	SSrep
and then you go over, and –	
I went to the shop and actually saw this – and	SRec
there was this little box, like this big, and it	
had three watermelon sticks, and it was £2.	

In Turn 1 the teacher explicitly asks S1 to expand on her idea ‘*so expand on that*’. In response, a *student expand* is provided in Turn 2. The discussion is kept open and in Turn 3 the teacher nominates S2, Randeep (who raised his hand) to contribute. S2 then makes an extended contribution consisting of three act types: *student imagine* (‘Miss, like, say you walk into Tesco or Lidl...’); *student rephrase* (‘like what Sukina said...’) and *student recount* (‘I went to the shop and actually saw this...’). This contribution reinforces the argument that healthy foods are more expensive than unhealthy foods.

Transcript 3 presents a short segment of a whole class discussion in a science lesson. The discussion is about growth and is comparing a living thing (human body) with a non-living thing (balloon). This excerpt illustrates a very rare example of *open student question* in Turn 2 (‘How does blood make it grow?’), which is followed by *student explain* in Turn 3.

Transcript 3: Science

TURN			R-MOVE	ACTS
1	T	So you're saying the air that we put into it, the blood is what looks(?) into us and we get that put into us, that's into us, that's produced and that's the air, go on Luke, say it?		
2	S1	How does blood make it grow?	OSQ	
3	S2	Like, do you know when your hand pumps all the blood around, when it moves up and down, it like expands a little bit -	ESC	SE/Ana

Overall findings from the micro-analysis of student talk

As shown in Table 3 below, the micro-level analysis of lesson transcripts using the coding framework as set out in Table 2 reveals the nature, character and quality of student talk to be much richer in intervention schools following the dialogic teaching professional development programme than that traditionally found in teacher-led recitation.

In the control schools, the analysis shows that student talk in English, mathematics and science was limited in type and quality and that the explanation offered by students often lacked reasons and evidence and therefore read as assertions. Other types of learning talk such as expansion/addition (i.e. saying more by building on, adding to or extending own or another student's contribution), argument (stating a position or opinion), justification (providing evidence or reasoning) and challenge (providing a challenge or a counter-example) were used but to a limited extent. In science, the control group of students predominantly provided explanation, accounting for 66 per cent of their contributions, and in mathematics it accounted for 85 per cent of their contributions.

By contrast, the repertoires of student talk moves used by students in the intervention schools were much broader, relying less on student explanation and using a greater range of act types which reflect a deeper conceptual understanding and high levels of evaluation, justification, and argumentation across English, mathematics and science.

Table 3: Sub-types of extended student contributions in English, mathematics and science

Sub-types of extended student contributions	English		Mathematics		Science	
	Intervention	Control	Intervention	Control	Intervention	Control
S expand/add	6.87%	7.01%	3.96%	-	5.30%	5.66%
S connect	3.05%	-	0.79%	-	2.27%	-
S explain/analyse	33.58%	42.10%	22.22%	85%	39.39%	66.03%
S rephrase	1.52%	7.01%	3.96%	5%	0.75%	3.77%
S recount	1.52%	1.75%	-	-	0.75%	3.77%
S evaluate	3.81%	1.75%	-	-	0.75%	-

S argue	25.95%	7.01%	30.95%	10%	14.39%	7.54%
S justify	15.26%	7.01%	27.77%	-	31.06%	7.54%
S speculate	4.58%	5.26%		-	-	3.77%
S imagine	1.52%	21.05%	1.58%			1.88%
S challenge	2.29%	-	6.34%	-	4.54%	-
S shift position	-	-	2.38%	-	0.75%	-
Total		57	126	20	132	53
Mean frequency		7.12	12.6	2.5	13.2	6.62

Overall, students in the intervention group students had become markedly more expansive in their contributions and exhibited higher levels of explanation, analysis, argumentation, challenge and justification, suggesting their talk was more dialogic in nature compared to their control group peers. Differences between the two groups was most marked in mathematics, whereby extended student contributions in the intervention group was six times (mean frequency =12.6) higher than that of the control group (2.5). Students questions, however, were rare in both the intervention and control schools.

Discussion and conclusion

As discussed in this chapter, the purpose of the analytical framework was to advance our understanding of student learning talk in the whole-class teaching of primary English, mathematics and science as teacher broaden their repertoire of questioning approaches to achieve a better balance of open and closed questions and by opening up the F-move to promote higher levels of student contributions and prompting them to share, expand and elaborate upon their ideas by providing evidence to support their claims and by building on the reasoning of others in the class.

Extended student contributions can be regarded as a key indicator of the quality of classroom talk. Such indicators can be used by teachers, mentors and students as an analytical tool for investigating pedagogical practices while striving to implement a dialogic pedagogy leading to different levels of student participation and engagement. Research into the professional development of teachers suggests monitoring and self-evaluation will need to become a

regular part of in-service training so as to give teachers a degree of ownership of the process of school improvement (Coe, Aloisi, Higgins & Elliot Major, 2014; Darling-Hammond et al, 2018). Critical reflection on classroom practices is seen as a way of enhancing expert thinking and problem-solving so as to bridge the gap between theories and actual classroom practice (Sedova, 2017). Teachers also need opportunities to theorise their teaching so as to make confident and professionally informed decisions about the way they interact with students so as to encourage greater participation and higher levels of cognitive engagement (Hennessy, Dragovic & Warwick, P. 2017).

Studies looking at dimensions of teacher development suggest that it is essential that teachers have supportive interactions with peers through modelling and feedback if the teacher-led recitation script is to be changed (Sedova, Sedlacek & Svaricek, 2016). Coaching and talk-analysis feedback making use of key indicators as discussed in this chapter are useful tools for professional development whereby sympathetic discussion by groups of teachers of data derived from their own classrooms can be an effective starting point for implementing a dialogic pedagogy. The use of video-recordings, audio and transcribed sections of lessons capturing critical moments selected by teacher and observers can also be a powerful means of promoting critical reflection on professional practice (Saito & Khong, 2017). Video-stimulated critical reflection of critical moments selected from lessons has been found to be an effective way of encouraging teachers and students to articulate and demonstrate their own understanding of their interactive and discourse practices by provided opportunities for monitoring and self-evaluation. In addition to the provision of more powerful professional development programmes, there is the need for more longitudinal research to provide comprehensive evidence, for both teachers and policy makers, that a dialogic pedagogy encouraging more active student involvement in the guided co-construction of knowledge in whole-class teaching can produce significant gains in student learning as well as social and emotional benefits (Resnick, Asterhan & Clarke with Schantz, 2018).

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