Learning, Culture and Social Interaction xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Learning, Culture and Social Interaction

journal homepage: www.elsevier.com/locate/lcsi

Full length article

Developing a coding scheme for analysing classroom dialogue across educational contexts

Sara Hennessy [a,*], Sylvia Rojas-Drummond [b], Rupert Higham [a], Ana María Márquez [b], Fiona Maine [a], Rosa María Ríos [b], Rocío García-Carrión [c], Omar Torreblanca [b], María José Barrera [a]

[a] University of Cambridge, UK
[b] National Autonomous University of Mexico, Mexico
[c] University of Deusto, Spain

ARTICLE INFO

Article history:
Received 13 October 2015
Received in revised form 3 December 2015
Accepted 15 December 2015
Available online xxxx

Keywords:
Dialogue
Coding scheme
Communicative act
Classroom interaction
Sociocultural theory

ABSTRACT

The research reported sought to develop a framework for systematically analysing classroom dialogue for application across a range of educational settings. The paper outlines the development and refinement of a coding scheme that attempts to represent and operationalise commonalities amongst some key theorists in the field concerning productive forms of educational dialogue. The team has tested it using video recordings from classroom settings in the UK and Mexico, across age phases, subject areas, and different interactional contexts including whole class, group and paired work. Our Scheme for Educational Dialogue Analysis (SEDA) is situated within a sociocultural paradigm, and draws on Hymes' Ethnography of Communication to highlight the importance of context. We examined how such a tool could be used in practice. We found that concentrating on the 'communicative act' to explore dialogue between participants was an appropriate level of granularity, while clustering the 33 resulting codes according to function of the acts helped to highlight dialogic sequences within lessons. We report on the application of the scheme in two different learning contexts and reflect on its fitness for purpose, including perceived limitations. Development of specialised sub-schemes and a version for teachers is underway.

1. Introduction

Dialogue is a distinctive human achievement with evolutionary and social relevance (Müller-Mirza & Perret-Clermont, 2009). Theoretically, dialogue is a complex concept that draws on many different traditions, beginning with Socrates and Plato, and including Dewey as well as more recent authors (as elaborated in Section 2). However, in the literature the term has been elaborated in the classroom context using differing conceptualisations and terminologies (such as accountable talk, dialogic inquiry, exploratory talk, dialogic teaching, also elaborated in Section 2). While each of these has broadened and deepened our understanding of the field, this proliferation has prevented dissemination of a coordinated message that may ultimately have a stronger impact on policy and practice (Higham, Brindley, & Van de Pol, 2014). Nevertheless, there is an emerging consensus about the forms of educational dialogue that seem to be productive for learning (e.g. Littleton & Mercer, 2013; Michaels & O'Connor, 2013). In essence, these focus on attunement to others' perspectives and continuous co-construction of knowledge through sharing, critiquing and gradually reconciling contrasting ideas. Importantly, these forms of dialogue are cumulative over time and often make links to past/future events or wider contexts beyond the immediate interaction. Furthermore, productive dialogue is intelligible both as a pedagogical tool for constructing subject knowledge, and as a valued

* Corresponding author at: University of Cambridge, Faculty of Education, 184 Hills Road, Cambridge CB2 8PQ, UK.
E-mail address: sch30@cam.ac.uk (S. Hennessy).

http://dx.doi.org/10.1016/j.lcsi.2015.12.001

process in itself — linked to increasingly prevalent purposes concerned with critical thinking, making relevant links between and within subject disciplines, active and democratic citizenship and living peacefully (Kazepides, 2012).

Despite growing international evidence for the educational value of peer and pupil-teacher dialogic interactions in the classroom, researchers still lack an analytic framework for making sense of their form and function that is widely applicable to diverse educational contexts and to both teachers and students, consistent with the main theoretical perspectives and employing a single set of descriptors that capture their shared functions in dialogue. We report our progress in the production and refinement of such a tool. The Cam-UNAM Scheme for Educational Dialogue Analysis (SEDA) is the result of a 3-year British Academy funded collaboration (2013–15) between two large teams in the UK and Mexico with extensive collective experience of researching dialogue across multiple contexts.

The work draws on some of the main theoretical approaches to characterising and analysing dialogue. Our mapping and synthesis across a wide range of perspectives in the literature evolved iteratively through subsequent input from colleagues in the field and through initial trialling with video recordings of practice across diverse educational contexts in the UK and Mexico; from pre-school to higher education; across subjects (e.g. mathematics, literacy, science, humanities) and whole class and small group contexts; including activities with and without digital technology. This inductive–deductive cycle allowed us to distil out the essence of dialogic interactions and operationalise them in the form of a new scheme of systematic indicators for these productive forms of educational dialogue. In this paper we publish the scheme for the first time and present worked examples in order to illustrate its application to two different learning situations, one from each country. We exemplify how communicative acts (CA) and clusters that categorise them are assigned and help to characterise dialogic exchanges within lessons. Prior research was mostly conducted in primary schools owing to their greater flexibility and holistic approach that is more conducive to dialogue (Higham et al., 2014), but we include an excerpt from a secondary classroom too. One example is predominantly peer group interaction around a natural science topic, the other is a whole class dialogue in a history lesson. Our reflection on these examples includes the scheme's workability and usefulness of the chosen levels of granularity (CA and clusters) in characterising dialogic interactions.

2. Theoretical and methodological frameworks

2.1. Theoretical framework: sociocultural perspective on educational dialogue

The work is rooted in the growing body of literature on classroom talk and dialogic teaching-and-learning from a sociocultural perspective, which highlights the intrinsically social and communicative nature of human life. Sociocultural theory posits that education and cognitive development are cultural processes enacted through interactions with others, including symmetrical (peer) as well as expert–novice (e.g. teacher–student) relations (Cole, 1996; Fernández, Wegerif, Mercer, & Rojas-Drummond, 2001; Howe, 2010; Rogoff, 1990). Language plays a key role as a tool for thinking and a mediator of activity, on both the social and psychological planes (Mercer, 2000; Vygotsky, 1962, 1978). Participants' social and cultural values, unique background experiences, prior knowledge and assumptions are brought to bear (Wertsch, 1991).

Research over the last four decades has focused on how classroom dialogue allows teachers and students — and students working together — to co-construct knowledge and meanings and develop intersubjectivity (see review by Howe & Abedin, 2013). In particular, Alexander's (2001) ground-breaking work highlights the central role played by the quality of classroom dialogue in promoting student learning, and the cultural variations in how dialogic and other forms of pedagogy are manifested. His term '*dialogic teaching*' characterised and exemplified productive forms of dialogue in the classroom along five core principles: collective, reciprocal, supportive, cumulative and purposeful (Alexander, 2008). Participants in dialogic interactions construct meaning through chained sequences of utterances and chained lines of thinking and enquiry. As part of this enquiry, real questions are posed and the tentative answers are rigorously investigated (Wells, 1999). Values of respect for difference and equitable participation are an essential feature of dialogic interactions. However, several studies suggest that enhancing dialogic inquiry and genuine student engagement in productive interactions is a highly demanding task (Kumpulainen & Lipponen, 2010). Research further indicates that dialogic interactions are not commonly observed in classrooms and that teachers' awareness of how communicative practices unfold and their constitutive role in the process is limited (Nystrand, Wu, Gamoran, Zeiser, & Long, 2003). School culture usually expects participants to follow a particular set of conversational 'ground rules' that discourage students' reasoning, extended contributions, question posing and evaluation of peers' responses (Mercer & Howe, 2012).

Current psychological investigations in this area have been inspired partly by Bakhtin's dialogic theory (Bakhtin, 1981). This author argued that the utterance produced by each speaker is the basic unit of analysis of communicative practices, representing the link that joins chains of dialogic interactions. A dialogic utterance reflects the interaction of at least two voices: those of the speaker and the listener. Each speaker's utterance is directed to an interlocutor (directionality) and is emitted taking into account previous utterances, as well as anticipating future possible ones (responsivity). Each utterance is further constructed as a response to other utterances within a dialogic sequence (sequentiality). Finally, each speaker assumes a position towards him or herself, as well as all the other participants (positioning), while recognising and legitimising the existence of diverse voices within dialogic interactions (plurality) (Fernández, 2014). Subsequent related work by Wegerif (2007) described 'dialogic' as the gap between two or more perspectives held together in the tension of a dialogue, and meaning as emerging from that 'dialogic space'. Out of the tension between viewpoints comes not only criticism and judgement but also insight and understanding.

Mercer (2000) has highlighted the key role of dialogue as 'a social mode of thinking' that allows participants to solve problems jointly, and in which students take responsibility for co-constructing their understandings: a process termed 'interthinking'. His

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

seminal work on peer interactions has centred on 'exploratory talk', given that it has special educational value. In exploratory talk partners engage critically but constructively with each other's ideas. Proposals may be challenged and counter-challenged via argumentation. Agreement is sought as a basis for joint progress. Mercer and colleagues, through their novel programme 'Thinking Together' (Mercer & Littleton, 2007), have supported the use of exploratory talk by British primary school children. The programme had positive effects on children's logical problem solving, as well as in mathematics and science. There are strong links between the notions of exploratory talk and 'accountable talk' in which participants prioritise development of ideas and issues over presentation and defence of their own positions (Michaels, O'Connor, & Resnick, 2008).

In Mexico, Rojas-Drummond and colleagues (e.g. Rojas-Drummond, 2000; Rojas-Drummond & Mercer, 2003) have found that dialogic styles of interaction between teachers and students are particularly effective in promoting preschool children's solving of mathematical problems and primary school children's reading comprehension and learning of natural sciences. Rojas-Drummond, Mazón, Fernández, and Wegerif (2006) have shown that children are able to adapt the use of exploratory talk to the task at hand, in terms of whether they make (or not) reasoning explicit via argumentation. A broader mode of 'co-constructive talk' was proposed for more open-ended tasks such as collaborative writing, which includes taking turns, asking for and providing opinions, generating alternatives, reformulating and elaborating on the information being considered, coordinating and negotiating perspectives and seeking agreements.

Rojas-Drummond, Torreblanca, Pedraza, Vélez, and Guzmán (2013), along with other researchers (Elbers, 1996; Mercer, 2000; Renshaw & Brown, 1999; Rogoff, 1990), have pointed out that students are active rather than passive participants in the process of dialogic interactions. Likewise, Mercer and Littleton (2007) assert that in teacher–student as well as peer interactions, dialogue enables sharing of ideas and pursuit of common goals. Thus, even where the research focus is on characterising teacher behaviours, students' contributions and responses inevitably shape the interaction in important ways, and in our view, must be explicitly taken into account in analysing dialogue; this underpinning principle has remained central throughout the development of the scheme.

In spite of advances in the field, there is much work to be done to develop an integrative conceptualisation of dialogic interactions. Similarly, we lack comprehensive instruments to enable researchers to assess levels of dialogicality through carrying out fine-grained analysis of what teachers and students actually do and say when they engage in dialogic interactions across educational contexts, how frequently certain established dialogic moves occur, and their impact on the course of subsequent interactions. In the next sections we propose a broad definition of dialogic interactions as well as a coding scheme that characterises these interactions as part of classroom practices.

In our work we often use the term Dialogic Teaching-and-Learning (DTL) (Rojas-Drummond et al., 2013). This term is closer than 'dialogic teaching' to Vygotsky's (1978) original concept of 'obuchenie', which refers to the integrated activity of teaching and learning as an indivisible unit (Wertsch, 1985). Extrapolating from the theory reviewed above, we conceive of DTL as that which: a) harnesses the power of language to stimulate and extend students' understanding, thinking and learning; b) is collective, reciprocal, supportive, cumulative and purposeful; c) engages in 'social modes of thinking' where possibilities can be explored collectively through creative problem solving framed by open-ended or authentic questions/tasks and reasoning can be made visible to others; d) encourages inquiry and equitable participation, where all, including teachers, are seen as co-learners who construct knowledge jointly; e) is open to new ideas and critically constructive, where negotiation of perspectives allows joint problem solving; f) promotes the creation of environments where diverse voices can be expressed, explored, contrasted, challenged, cumulatively built upon each other and synthesised, allowing analysis, transformation and reconciliation of underlying points of view; and g) brings into question the widely observed predominance of traditional and 'monologic' educational practices where only one voice (primarily the teacher's) tends to be heard, legitimised and sometimes imposed (Nystrand et al., 2003; Rojas-Drummond, 2000).

2.2. Methodological framework

Gee and Green (1998, p. 120) have argued that systems for analysing classroom discourse must be integrated within an ethnographic perspective to form a coherent 'logic-of-inquiry' that recognises the importance of established educational process and cultural practices in shaping the meaning of teachers' and students' contributions. Accordingly, our coding scheme employs tools derived from the Ethnography of Communication to establish levels of analysis systematically, starting from continuous strings of conversational turns (Hymes, 1972; Saville-Troike, 2003). These authors propose a system of hierarchical and nested levels of analysis to investigate conversations amongst participants in diverse social and cultural contexts, consisting of 'Communicative Acts' (CA) at a micro level; these are embedded within 'Communicative Events' (CE) at a meso level; which are in turn part of broader 'Communicative Situations' (CS) at a macro level (see Fig. 1). This hierarchical system is movable, so that the components can shift sideways.

Briefly, CA are identified by their interactional function. They obtain their status from the social context as well as from the grammatical form and intonation. CE are defined by a series of turns in the conversation where participants, participant structure (class, group or dyad), purpose, task, orientation and/or general topic remain constant. Changes in these elements introduce a new CE, and can be accompanied by certain linguistic markers. Note that definition of 'topic' may vary with research context since a larger curriculum topic (e.g. electricity) may span a whole lesson or lesson sequence, whereas more specific topics (e.g. circuits) may be addressed within that sequence, and more specific topics still (e.g. what materials are good conductors) may be the focus of particular tasks. Lastly, a CS is the general context within which communication occurs (see also Rojas-Drummond et al., 2006).

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

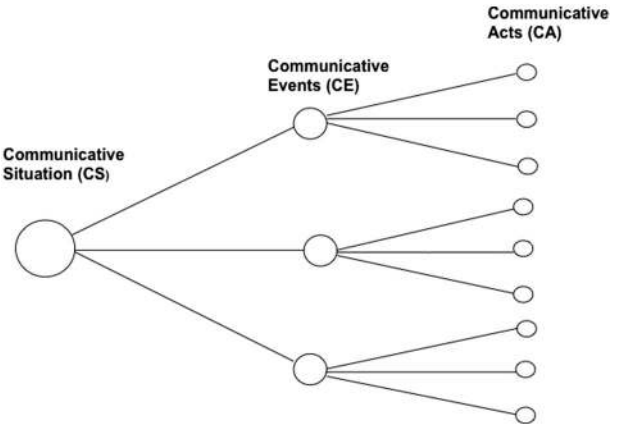


Fig. 1. Hierarchical and nested levels of analysis from the Ethnography of Communication.

The way these levels are employed depends on the specific aims of the researcher. The present coding scheme focuses mainly on the micro level of analysis, by defining a series of observable CA that are identified as key aspects in the development of teacher–student and peer dialogic interactions. This level of granularity is particularly illuminating since it allows us to carry out fine-grained, systematic analyses of what participants actually do and say in practice during dialogic interactions, permitting their operationalisation. This scheme further establishes that a CA in general corresponds to a contribution produced by a single person.

It is important to stress that the CA comprising the coding scheme are conceived as dynamic interactional processes, where the temporal sequencing of both the teacher's and students' interventions throughout a lesson (or a series of lessons) is crucial (rather than contributions being interpreted as isolated phenomena). For this reason, when coding the interactions, although we centre on the CA as the basic unit of analysis, we also take into account the other levels, as follows:

a) we carry out initial in-depth analyses of videos and transcripts of a selected lesson (or lesson sequence), in order to understand the general dynamics of the lesson(s) as a whole, including the goals pursued by the participants; the teaching-and-learning strategies employed; the sequencing of communicative interactions that occur throughout the lesson(s); as well as the cultural artefacts and tools (including digital technologies) that mediate these interactions;
b) for each lesson, we describe the CS (which normally corresponds to the general context of the lesson as a whole, or to a lesson sequence);
c) we further segment the string of interactions and turns which comprise the lesson into a series of CE;
d) we generate initial hypotheses geared at identifying certain CE which might concentrate dialogic interactions, and analyse these in more detail by using the scheme to code CA. Identifying key dialogic exchanges helps us to understand how knowledge is being constructed amongst participants.

This process is not linear but iterative, thus enabling the researcher to use a wide lens that can open and close its field, moving from the macro to the meso and micro levels of analyses in a recursive fashion. This procedure in turn allows us to be qualifying CA at a local level, while at the same time establishing how they are situated within wider contexts at more global levels. Thus, we can also make sense of the CE as linked chains of interactions (Mortimer, 2005), taking into account the context that frames each chain (Myhill, 2006), and shying away from the inherently problematic frequency counts of 'open' and 'closed' questions (Lefstein, Snell, & Israeli, 2015; Myhill, 2006).

Focusing recursively on the dynamic interactions amongst CA, CE and CS might provide valuable information to enable researchers to develop an interpretative narrative of the lesson (or series of lessons) as a whole; and to answer questions such as: how equitable is the participation of different learners; which teachers or lessons or sequences of interaction are more dialogic than others, for example are certain parts of a lesson or types of activity more dialogic; which particular chains of dialogic interaction are commonly observed (i.e. which contributions are followed by which responses, for example are invitations for reasoning made and are they taken up); how stable and diverse are these patterns of interaction within and across lessons and learning contexts; does interaction become more dialogic over time (for example, in response to a professional development intervention), and if so, how? The scheme does not, however, presently address questions concerning the affective dimension of interaction (cf. Pianta & La Paro, 2003), nor does it actually categorise or infer meaning from 'contextualisation clues' (Gee & Green 1998, p. 122) such as gesture, gaze and tone (although these are taken into account to clarify reference to people or objects that may otherwise be ambiguous).

In this paper we focus on development of a scheme for coding at CA level, while recognising that acts are always situated within exchanges at more macro levels (Gee & Green, 1998). Details and illustrations of coding CA are presented in the following sections. In line with a basic principle underlying our methodological framework, it is important to flag up here that coding benefits from taking into account the wider context of an act and especially, what preceded or is currently framing it. However, as endorsed by other authors (e.g. Wells, 1999), characterisation of an initiating act (e.g. ask for explanation) does not depend on

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

subsequent take-up or response (e.g. whether or not an explanation was provided) since it is the *dialogic intention or potential* that is paramount. (An exception is Nystrand et al., 2003, who employ discourse event history analysis).

3. A critical presentation of the development of the overarching scheme

The start of the British Academy funded project in January 2013 led to an extended, productive critical engagement that has substantially reshaped the coding scheme from its original foundations in the Mexican team's work. This section presents the emerging scheme, SEDA, and details its evolution.

3.1. Overview of SEDA

The present scheme contains 33 CA, each with an alphanumeric code label (Column 1), a key words summary (Column 2), the basic code definition (Column 3), an expanded description (Column 4), illustrative examples (Column 5) from our research studies over the past few years in both countries, and a list of explanatory notes guiding its use. The scheme is summarised in Table 1, which for reasons of space incorporates only a synthesis from the description column, and no examples. The full version and a condensed 1-page key words version (for use by researchers who have become very familiar with the scheme or for easy reference to all codes) are available on the project website at http://tinyurl.com/BAdialogue. The table shows that the 33 CA are grouped into 8 clusters, formulated as described below.

The scheme only codifies CA that contribute to the dialogic interaction. The proportion of any lesson that is coded will vary with how dialogic the interactions within the lesson are; SEDA helps us to determine this dialogicality, as well as the specific nature and progress of any dialogue observed. Of course, all lessons will include other important forms of communication, but coding these is not our particular concern.

Note that the scheme needs to respond to rich, multimodal forms of dialogue that integrate talk with interactions with text (multimodal and traditional written forms), as these commonly occur in classrooms today — especially within technology environments. Such CA coded using SEDA are thus defined as 'contributions' (rather than utterances) that are communicative acts in the wider sense. In fact, in order to capture more than oral communication and to understand the context better, coding of all CA is done using video recordings as well as transcripts.

A CA is defined by the minimum number of utterances or actions needed to reflect its function; if necessary, we break down a turn comprising several sentences, or even a single sentence, into smaller units or phrases, each allocated a line in the coding spreadsheet, applying two or more codes in sequence within a turn. Segmentation is not always straightforward and researchers need to make their own decisions about procedure here.

3.2. Foundational theoretical perspectives and development of clusters

A very valuable feature of this research relates to how the work of multiple, experienced academics in the field with different cultural and research backgrounds has been brought into inter-relation, and is being woven into an integrated framework. Joint development of the scheme between UK researchers and bilingual researchers in Mexico (and one from Spain) involved testing it with data derived from two different cultural contexts. In deciding which codes were central to dialogue came the challenging task of finding consensual definitions of the main concepts; each researcher's position was nuanced by the prior experience they had had and the kind of data they had encountered.

The present analytic tool has its origins in an earlier scheme devised by Rojas-Drummond et al. (2013) before our current collaboration began. This included 50 CA organised into Alexander's (2008) five key principles, which the authors called 'dimensions' of analysis. According to Rojas-Drummond et al. (2013), p. 16):

> The establishment and definition of these CA were initially based mainly on Alexander (2008) and Mercer and Littleton (2007) and Hennessy, Mercer, and Warwick (2011) and Wells (1999), as well as our own line of research for the last decade (Rojas-Drummond, 2000; Rojas-Drummond, Pérez, Vélez, Gómez, & Mendoza, 2003; Rojas-Drummond et al., 2006; Rojas-Drummond, Littleton, Hernández, & Zúñiga, 2010).

Rojas-Drummond et al. also drew explicitly on the literature on guided participation (Rogoff, 1990) and scaffolding, beginning with Wood, Bruner, and Ross (1976) and Vygotsky (1978) and developed in the extensive subsequent body of work reviewed by Van de Pol, Volman, and Beishuizen (2010). Further details of the original Mexican team's version of the scheme and illustration of its application are provided by Rojas-Drummond et al. (2013).

The scheme began to change when the British and Mexican teams started to collaborate. An early outcome of the interaction was an agreement to re-cluster the codes, abandoning Alexander's principles as headings — so central to the first version, owing to perceived overlap (corroborated by Sedova, Salamounova, & Svaricek, 2014). We agreed to focus more on agents' intentions, and to use more socio-linguistically functional codes instead. This tension between intention and function remained throughout as the clusters underwent subsequent iterations and oscillations, which are summarised in the diagram in Fig. 2. The final version (right-hand column) recognises the need for both: for example, 'guide' is intentional while 'express or elaborate ideas' is more functional. In the case of 'metacognition', we drew on relevant literature to highlight its centrality to learning (Alexander, 2008; Bruner, 1996; Fisher, 2007; Flavell, 1979). Although metacognition has historically been conceived mostly as an individual

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 1
Scheme for Educational Dialogue Analysis (SEDA).

Cluster code	Cluster name	Description
I	Invite elaboration or reasoning	*Invite* others to: 1. Respond critically to ideas, perspectives, problems, situations or artefacts through: explanation, justification, argumentation, analogy, categorisation, making distinctions, use of evidence; as well as exploration of possibilities, prediction or hypothesising, speculation. The invitation has to be explicit through typical key words or phrases such as: 'why?', 'how?', 'what caused…?' for reasoning; or conditional phrases such as 'what would/could/might happen if…?', when asking for speculation/prediction. 2. Elaborate, reformulate, provide examples, extend/add to or build on contributions/ideas/theories; evaluate or (dis)agree with another's contribution/idea/theory. Includes invitation to carry out the above actions based on *one's own or other's contributions*.
R	Make reasoning explicit	Make reasoning explicit through: explanation, justification, argumentation (providing an argument or a counter-argument), analogy, categorisation, making distinctions, use of evidence; as well as exploration of possibilities, prediction, speculation, hypothesising, and extrapolation. Turns coded R should indicate a *clear attempt at reasoning*, typically (but not necessarily or sufficiently) through key words such as 'because', 'so', 'therefore', 'thus,' 'if…then', 'not…unless', 'it's like…', 'imagine if…'. The attempt need not be 'successful' — that is, reasoning need not be judged good in order to be coded. It should be remembered that when engaging in reasoning speakers will often be tentative and less than clear in their expression.
B	Build on ideas	Includes explaining or speculating based on *one's own or other's ideas.* Make a relevant contribution to the dialogue by *building on, giving examples, adding to, reformulating or clarifying one's own or other's contributions*. Contributions should add something either in terms of content or in the way ideas are expressed; excludes repetition of one's own or other's ideas.
E	Express or invite ideas	Includes judging ideas to be similar or different to each other without evaluating them, and without giving reasons. If reasons are given, use R instead. When referring to comments, ideas or resources from outside the immediate dialogue either in time, place or person, use C instead. This cluster includes: 1. *Inviting or expressing opinions, ideas, beliefs or perspectives without specific or explicit reference to prior contributions, ideas or artefacts*. Includes open, general questions that do not name ideas or participants, but not closed questions that seek yes/no answers. 2. *Providing contributions that bring something not yet expressed to the discussion*, but related to the general subject. The contribution must be pertinent to the dialogue or task at hand. Includes generating ideas during a brainstorm or bringing ideas from a small group discussion into a larger discussion on the same topic — without making links to others' contributions. Includes simple feedback such as "I think that's a good point" or "I can see that point", but not simple "yes" or "no" responses.
P	Positioning and coordination	This cluster includes: 1. *Taking a position/stance in the dialogue* by: Evaluating different ideas/perspectives/arguments by comparing/contrasting/critiquing them; offering an opinion on the value or lack of value of an idea/position/argument/artefact in relation to the task at hand; explicitly acknowledging a shift of position; challenging other's arguments, beliefs or assumptions; stating agreement/disagreement/partial (dis)agreement with others. 2. *Coordinating ideas* by: Proposing to resolve differences/agree a solution; synthesising or bringing together ideas, or generalising.
RD	Reflect on dialogue or activity	This cluster includes: 1. Explicit *self or group evaluation or metacognitive reflection* on purposes/processes/value/outcome of learning or activity. 2. Engaging in *talk about talk/protocol for dialogue*. 3. An *invitation* to engage in any of the above.
C	Connect	Make *explicit links* to ideas/positions/arguments/artefacts/prior contributions or knowledge *beyond the immediate dialogue or context* by: 1. Referring back to earlier contributions within the group (not immediately preceding). 2. Making trajectories of learning explicit, including referring forward to an activity or contributions to be requested. 3. Referring to wider contexts: present, past or future, beyond the classroom or to prior knowledge and experiences. 4. Inviting inquiry beyond the lesson.

G	Guide direction of dialogue or activity	Take responsibility for shaping and directing dialogue or activity by: 1. Using *scaffolding* strategies such as: feeding in/highlighting salient ideas; introducing an authoritative perspective as part of the dialogue in response to participants' level of understanding; providing informative feedback on which the recipient can build; guiding or focusing the dialogue in a desired direction or towards key aspects of an activity (excludes simply reading out a task/question/text). 2. *Encouraging student–student dialogue* (includes whole class contexts; excludes simply setting group work without an explicit dialogic element). 3. *Proposing possible courses of action or inquiry*. 4. Explicitly inviting or proposing *thinking time*.

	Key words	Definition	Description
I Invite elaboration or reasoning			
I1	Ask for explanation or justification of another's contribution	Ask participant(s) to explain or justify another's or collective ideas, reasoning or the process of arriving at a solution.	Invite participants to take up someone else's or collective ideas, perspectives, reasoning, position, concept, hypothesis, viewpoint, academic content, or the process of arriving at a solution in order to respond critically to them through explanation, justification or argumentation. Asking someone to 'put themselves into another's shoes'. The invitation has to be explicit through phrases such as: 'explain what Jane meant by…'. 'why do you think Ana said that?'. It does not include simply asking others to repeat someone else's statement.
I2	Invite building on/elaboration/(dis)agreement/evaluation of another's contribution or view	Use previous contribution to *elicit further* responses, inviting addition to or elaboration/clarification/(dis)agreement/positioning/comparison/evaluation of another's contribution or idea.	This act includes: 1. Inviting participants to take up others' contribution(s) in order to promote the clarification, paraphrasing, extension, elaboration, or deepening of ideas. Includes bringing private contributions or knowledge objects (e.g. outcomes from group work) into the public arena, when further responses/additions are then invited. *Reference to specific prior ideas/contributions/views/theories must be explicit* (through naming an individual or referring to a specific idea). Excludes ambiguous cases such as "What do you think, Mary?" Consider E1—'Invite opinions/beliefs/ideas' for this. 2. Inviting *ideas that are different or similar* to others', or inviting others to identify whether ideas are similar or different. 3. Asking participants to *evaluate or comment on or compare/agree/disagree* with another's argument/position/conclusion by: – Asking participants to take a position in relation to the topic at hand or to agree/disagree with possible courses of action; – Asking for confirmatory or alternative perspectives;. Consider additionally coding C1—'Refer back' where positioning is invited in relation to a reference back to an earlier contribution.
I3	Invite possibility thinking based on another's contribution	*Invite speculation*/imagining, *hypothesis*, conjecture, or question posing based on another's contribution.	Invite participants to imagine new scenarios and to wonder, speculate, predict or formulate hypotheses about possibilities connected to previous contributions. Typically this might include a conjunction linking to a previous comment: e.g. 'So, what might happen if…' or 'Based on Billy's idea, who has a further question?' The important feature of this code is that, whilst it includes invitations to participants to ask open-ended questions, which are typical of creative and divergent thinking, it explicitly links these to ideas already expressed, rather than inviting new ideas (which would be coded as I5—'Invite possibility thinking').
I4	Ask for explanation or justification	Ask other(s) for *justification*/evidence or explanation of reasoning or the process of arriving at a solution.	Ask others to make their reasoning explicit. Includes asking for: explanation, justification, argumentation, analogy, categorisation, making distinctions, use of evidence, providing the meaning of concepts/ideas. Invitations must *explicitly* ask for reasoning, typically (but not sufficiently) with the use of key words such as 'why?', 'how?', 'what caused…?'. Otherwise, consider E1—'Invite opinions/beliefs/ideas' when ideas/views are invited; or I6—'Ask for elaboration or clarification' for invitations to add information or clarify previous ideas.
I5	Invite possibility thinking or prediction	*Invite speculation*/imagining, *hypothesis*, conjecture, or question posing.	Invite participants to imagine new scenarios and to: wonder, speculate, predict, make a conjecture, pose a question, or formulate hypotheses about possibilities and theories to explain a phenomenon based on present information or activity. Often involves extrapolation.

(continued on next page)

Table 1 *(continued)*

	Key words	Definition	Description
			Invitations must *explicitly* ask for possibilities, not just ideas/views; typically (but not sufficiently) identified through use of conditional tenses or thought experiments as in phrases such as 'what would/could/might happen if…?' Invitations sometimes use future or conditional tense (e.g. thought experiments; especially use of 'would', 'could' or 'might'). Also consider E1—'Invite the expression of different opinions/ideas/beliefs', including for open-ended creative thinking; or I4—'Ask for explanation or justification' for post-hoc explanations/justifications.
I6	Ask for elaboration or clarification	Probe/ask for clarification *or elaboration or extension or example*.	Ask someone to clarify, paraphrase, extend (say more about), elaborate, deepen or provide an example for their *previous* response/idea/contribution. It may imply asking someone to add information to the previous idea or changing it qualitatively. Note that a probe is not always an explicit question, an invitation may be implicit. This category does not apply when the participant asks for confirmation. Also consider I4—'Ask for explanation or justification', which involves making reasoning explicit.
R Make reasoning explicit			
R1	Explain or justify another's contribution	Provide or elaborate *justification/evidence* or explanation of another's reasoning or the process of arriving at a solution.	Explain or justify someone else's or collective ideas, perspectives, reasoning, position, or the process of arriving at a solution by: providing an argument or a counter-argument, drawing analogies, making distinctions, or breaking down or categorising topics/ideas. It may also include bringing evidence from inside or outside the current context into the dialogue to support an argument, opinion, proposal, prediction or theory. As in 'stepping into another's shoes'. The reference to another's contribution has to be explicit. It does not include simply repeating someone else's statement.
R2	Explain or justify own contribution	Provide or elaborate *justification/evidence* or explanation of own reasoning or the process of arriving at a solution.	This category encompasses various forms of reasoning, including: providing an argument or counter-argument, explaining, drawing analogies, making distinctions, and breaking down or categorising topics/ideas, as well as accounting for the process of arriving at a solution. It may also include bringing evidence from inside or outside the current context into the dialogue to support an argument, opinion, proposal, prediction or theory. Also consider B2—'Clarify/elaborate own contribution' for clarifications without explicit reasoning.
R3	Speculate or predict on the basis of another's contribution	Speculate, hypothesise, conjecture, imagine or express one or more different possibilities on the basis of another's contribution	Speculate, predict, hypothesise, conjecture, imagine or express one or more different possibilities and theories to explain a phenomenon on the basis of another's contribution. Includes thought experiments or more explicit predictions/hypotheses. It also includes the expression of different possibilities based on present information or activity. The reference to another's contribution has to be explicit. Often involves using future or conditional tense (e.g. 'if… then', 'not… unless', 'would', 'could' or 'might').
R4	Speculate or predict	*Speculate, hypothesise*, conjecture, imagine or express one or more different *possibilities or theories*.	*Speculate, predict, hypothesise*, conjecture, imagine or express one or more different *possibilities or theories to explain a phenomenon*. Includes thought experiments or more explicit predictions/hypotheses. It also includes the expression of different possibilities based on present information or activity. Often involves using future or conditional tense (e.g. 'if…. then', 'not…. unless', 'would', 'could' or 'might'). It is different from compare/evaluate alternative views in P2, which requires exploring the difference between at least two possibilities or theories. Also consider R1—'Explain or justify reasoning or solution' for post-hoc explanations/justifications.
B Build on ideas			
B1	Build on/clarify others' contributions	*Build on, clarify, revoice, elaborate, make explicit, highlight* or transform contributions provided by other(s) or collective idea, opinion or reasoning.	Make a *responsive* contribution based on another person's previous comment, argument, idea, opinion or information. This is used when building on, clarifying, reformulating, exemplifying, elaborating or transforming someone else's idea/opinion/suggestion. It goes further than the original contribution did: *it may either clarify* (to them and/or to others), *add something*, or change it qualitatively.

			It includes: – Paraphrasing (but not just repeating) another's contribution to emphasise, clarify or make it explicit to others, – Explicitly recognising the contribution made by another, but not just by praising. – Completing an idea or comment and chaining ideas between two or more participants; —introducing a different, new idea that is related to a previous contribution. – Rephrasing technical terms used by a previous speaker. – Identifying one's own idea(s) as similar or different to another's.
B2	Clarify/elaborate own contribution	Clarify, *elaborate, exemplify* or extend *own* opinion/idea/belief or question.	Applies when the same person makes a new comment/response based on *their* previous comment or elaborates their own previous question (without a justification). It goes further than the original contribution did: *it may either clarify* (to them and/or to others), *add something*, or change it qualitatively. Also consider R2—'Explain or justify reasoning or solution' for justification. Also consider E2—'Make relevant contribution' for extended contributions including elaboration of a new idea.
E Express or invite ideas			
E1	Invite opinions/beliefs/ideas	Invite the expression of *opinions/ideas/beliefs/knowledge* from others.	Ask for opinions/ideas/beliefs, *without* either: – an explicit reference to previous speakers, comments or ideas in the dialogue; or: – an explicit relation to evidence, theories, disciplinary knowledge, support or further argumentation.Emphasis on promoting participation by the collective, but includes asking just one person. Typically involves asking a question like 'What do you think?' Contrasts with invitations to guess the one 'right' answer. Excludes just calling on someone in order to invite them to speak (which is uncoded unless another function is explicit). Includes inviting open-ended creative thinking, but consider I5—'Invite possibility thinking', when inviting speculation, hypothesis, conjecture or question posing. Also consider I4—'Ask for explanation or justification', which asks for reasoning, not just ideas/views.
E2	Make other relevant contribution	Offer a pertinent, *contribution*/suggestion/idea/perspective/information that progresses the collective activity at hand.	Offer a pertinent, *contribution*/suggestion/idea/perspective/information that progresses the collective activity at hand. Includes generating ideas during a brainstorm or bringing ideas from a small group discussion into a larger discussion on the same topic — without making links to others' contributions. To use this code, the contribution has to bring something not yet expressed to the discussion that is related to the general subject, and it must be pertinent to the task at hand. Does not apply when someone repeats or emphasises their own prior contribution, except when doing so to someone not present before. Includes simple feedback such as "I think that's a good point" or "I can see that point", but not simple "yes" or "no" responses. *Important: Always use a more specific code (only) where one applies.*
P Positioning and coordinating			
P1	Synthesise ideas	Synthesise or summarise others' or collective ideas	Bring multiple perspectives or ideas into inter-relation and draw out or distil a key idea(s)/conclusion/implication. Must include ideas from more than one person/source (two in total is sufficient), or own ideas in the collective synthesis. May include ideas from immediately preceding discussion or earlier in lesson/lesson sequence; as well as integrating or summarising or recapping, e.g. after class brainstorm or during/at the end of a group discussion.
P2	Compare/evaluate alternative views	*Compare/evaluate* different opinions/perspectives/beliefs.	Also consider B1—'Build on/explain/clarify other's contributions'. Compare/evaluate at least two arguments/positions/suggestions (may include own or other's), with explanation or justification.

(continued on next page)

Table 1 *(continued)*

	Key words	Definition	Description
P3	Propose resolution	Propose a resolution after discussing a task, issue or problem.	Also consider B1—'Build on/explain/clarify other's contributions' for identifying similarity or difference between ideas without judging their value. Also consider R4—'Speculate, hypothesise or predict' for speculations, hypotheses and predictions. This act includes the result of seeking consensus/agreement, either by suggesting a solution that could be shared by all, or by suggesting that participant should partially agree, or disagree entirely, *after discussing a task, issue or problem*. Other participants need not agree or share the viewpoint.
P4	Acknowledge shift in position	Participants acknowledge that they have *shifted their position* in response to the preceding dialogue.	It includes clarifying a misconception or changing opinions/ideas/beliefs. There has to be evidence of the shift/adjustment in position or change of mind in the dialogue. E.g. change in the argument or idea that the participant was exposing earlier. It requires an explicit statement.
P5	Challenge viewpoint	Challenge viewpoint/assumption	Also consider P6—'State (dis)agreement/position'. Challenge/confront others' view/assumption/argument. The challenge must be evident through verbal (or nonverbal) means, including questioning. This should not be used when a simple 'no' response is given. Includes partial agreement.
P6	State (dis)agreement/position	State that one or more participants (dis)agree with others or acknowledge differences	If it is an explicit statement of disagreement use P6—'State agreement or disagreement'. One or more participants state that they agree or disagree with at least one other. This act includes the result of seeking agreement, either by arriving at a solution or acknowledging participants' differences *after discussing a task, issue or problem*. For agreement, at least 2 positions must have been expressed previously so that one is chosen over the other. For disagreement or partial agreement, a simple statement is sufficient (since we assume two perspectives have been compared). Includes agreeing a course of action (under above conditions). Positioning in relation to other must be explicit. For a statement of different viewpoint, consider P5—'Challenge viewpoint'. If a reason is given, also code with R2—'Explain or justify reasoning or solution.'
RD Reflect on dialogue or activity			
RD1	Talk about talk	Participants talk about talk, reinforce protocols of dialogue, or model effective dialogic techniques.	This includes: – talking about or constructing ground rules for communication. Refers to metacognitive talk about talk rules/protocols, whether rules are established or not.-Modelling productive ways of interacting, e.g. by showing how to 'think aloud'; how to explain; how to argue by providing reasons, justifications and evidence; and how to hypothesise. Includes talk about quality or purpose of talk.Does not include reflection on use of language, eg technical terminology; consider RD2-'Reflect on learning process/purpose/value'.
RD2	Reflect on learning process/purpose/value	*Comment/talk about the process* of carrying out the collective activity or evaluate own performance. Or *reflect on the importance*, usefulness, purpose or outcomes of learning or of the task, as part of a collective activity.	This includes: 1. Analysing the processes involved in the development of the task and/or the effectiveness of their (individual or collective) performance during a collective activity. Participants might reflect on how they are learning/have learned (including from others) or whether they are/were using effective strategies for the task at hand; how well they performed; their level (or lack) of understanding; what they can do to improve their performance; what the next steps are to complete the task; to what extent they have achieved the goals of the activity, etc. Assumes an element of evaluation or reflection. In this act there has to be an *explicit statement that refers to the collective* activity. Includes *affective* dialogue: feelings/experiences about working together; e.g. How did I feel when we were doing the task together? What do I feel about my performance? What do I feel about the outcome of the collective activity? 2. Analysing, reflecting on or evaluating the importance of learning and/or outcomes. Includes discussing and reflecting on past-present-future trajectory. E.g. Why do we need to learn x? How/where can we apply what we learned? When will it be useful? Includes talk about the purpose of a shared discussion

			activity, where there may be no ground rules explicitly operating. Includes reflecting on use of language, eg technical terminology. Also consider RD1—'Talk about talk'.
RD3	Invite reflection about process/purpose/value of learning	*Invite others to reflect* on the importance, usefulness, processes or outcomes of learning from collective activity.	Encourage others to analyse or evaluate their own learning processes and/or outcomes. There has to be an *explicit statement that refers to the collective* activity. Includes inviting to reflect on purposes/goals of learning or the activity or on past-present-future trajectory (e.g. Why do you learn x? How/where can you apply what you learned?); and encouraging *affective* dialogue, such as feelings/experiences about working together (e.g. How did you feel when you were doing the task together? What do you feel about your performance? What do you feel about the outcome of the collective activity?)
C Connect			
C1	Refer back	*Refer back to prior contributions* or observations or knowledge objects or discussions after contributions.	This code should be used when explicitly reviewing, referring to or bringing in a specific contribution (by an individual or group; of one's own or another's) or observation, linking prior knowledge, concepts, beliefs, hypotheses, agreements/conclusions reached, opinions, arguments, ideas, learning content to the current topic or activity. Contributions could come from the current or previous lessons. Includes reference back to prior learning from interaction with texts including multimedia resources where these are linked to present/future activities. Consider E2—'Build on others' contributions' when responding rather than explicitly referring back, even if the contribution responded to was earlier than the preceding turn. Consider C2—Making learning trajectory visible (if reference is to activity or to prior learning from/interaction with texts including multimedia resources, rather than contributions).
C2	Make learning trajectory explicit	Make learning trajectory explicit, providing continuity *within and across lessons*, including *by highlighting relevance to prior or future activity*.	This code should be used when reviewing past activities and *linking* them to present/future activities, as part of making the trajectory explicit. Includes referring forward to an activity or contributions to be requested and encouraging others to record ideas and/or outcomes of dialogue. May include making explicit goals or purpose of learning trajectory. Also consider C1—'Refer back' for linking to past contributions. Consider B1—'Build on/clarify others' contributions'.
C3	Link learning to wider contexts	*Make links* between what is being learned and a *wider context*.	Bring knowledge from outside of the classroom or school (i.e. beyond, before or after the current lesson) into the discussion of what is being learned, relating previous experiences within or outside the school, linking given and new information. This relates to the temporal dimension of learning (in different time frames, from very local to very extended in time, and also creation of inter-textual and inter-contextual relations). Includes generalising to other similar instances/contexts. This may include personal experience/memory, analogy or anecdote, especially from younger children and/or when used to justify.
C4	Invite inquiry beyond the lesson	Ask others to pursue their own inquiry before, or after lessons.	Consider C1—Refer back — if the reference is to previous contributions or lesson activities. Ask others to pursue inquiry prior to teaching a topic or to deepen knowledge afterwards. (This leaves open the possibility for inquiry. It sustains and extends dialogue across time and space). This may include asking others to pursue individual or shared enquiry, withholding information, evaluation and feedback, or ending a lesson in suspense. It may also include inviting individuals or groups to conduct an independent investigation beyond the lesson and bring back results to be collated and/or discussed as a whole class. For enquiry within the lesson consider G2—'Propose action or inquiry activity' or I5—Invite possibility thinking.
G Guide direction of dialogue or activity			
G1	Encourage student–student dialogue	Encourage student–student dialogues by giving pairs/groups or class the responsibility for the direction and/or outcomes of the dialogue or the collective activity.	Includes allocating responsibility to students, pairs or groups for the dialogue or the activity — whether or not the teacher is moderating the discussion. Not used when simply setting group work or asking pairs to work together; there needs to be some dialogic element in the task.

(continued on next page)

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 1 *(continued)*

	Key words	Definition	Description
G2	Propose action or inquiry activity	*Propose possible courses of action or an inquiry activity*.	Propose a course of action in the context of a dialogue or collective activity, or propose an inquiry activity. It may also include inviting individuals or groups to conduct an independent investigation and bring back results to be collated and/or discussed as a whole class within the same lesson This is not applicable to simple instructions which are not of a dialogic nature (such as reading out a task or question, which is uncoded). Consider R2—'Explain or justify reasoning or solution' if it includes explanation or justification of reasoning. For inquiry beyond the lesson use C4—'Invite inquiry beyond the lesson'. Also consider I5—Invite possibility thinking.
G3	Introduce authoritative perspective	Explicitly introduce *authoritative perspective or explanation as part of the flow of dialogic interaction*, in response to participants' level of understanding.	Implies invoking voice/perspective of expert from beyond the present dialogue, e.g. to challenge others' thinking or to take on that perspective. This may include authoritative contribution — i.e. making a teaching point — that builds on a learner's contribution or knowledge. Includes introducing or bringing in technical terms. NOTE: Determining if it is adjusted to learner's level is difficult and needs to be established through the particular context of the dialogue. In addition, an authoritative explanation deals with reliability and knowledge of the content. Act may be accompanied by diagnostic strategies such as closed questions or prompting to confirm that students have understood or learned target concepts, but these strategies are not part of the CA.
G4	Provide informative feedback	*Provide informative feedback* on which others can build.	This refers to formative or diagnostic feedback instead of simple positive, negative or non-committal judgement, or mere repetition of the respondent's answer. This code may be used alongside others that indicate the form of feedback, e.g. B1—'Build on/explain/clarify others' contributions', or it may be accompanied with justification, explanation or elaboration, in which case assign two codes.
G5	Focusing	*Focusing the dialogue on key aspects of the activity*	This may be used when *guiding* or focusing the dialogue in a certain desired direction or towards certain key aspects of the activity. Involves feeding in/highlighting salient ideas. This act may involve: (1) feeding in through questioning or suggesting or pointing out salient information about the task or problem. This includes clarifying the task or problem or deepening the discussion. May help to *narrow* the field of focus or pre-empt undesirable conclusions. This includes bringing participants back to the matter at hand. Excludes repeating an earlier question. (2) extending the field by stimulating thinking in another direction not yet thought about. (3) encouraging others to 'discover' new knowledge (as in scaffolding). Excludes simply reading out or turning to a task or set question (which is uncoded). G5 may be used alongside other codes that indicate the form of focusing, e.g. I6—'Ask for elaboration or clarification', I4—'Ask for explanation or justification' or R3—'Speculate on the basis of another's contribution'.
G6	Allow thinking time	*Invite or propose* to pause to think, reflect, or respond or talk.	*An explicit invitation or proposal* to pause, for example to think or reflect or decide. *Optionally*: Code when the elicitation is not verbally explicit and there is a pause of at least 3 s after an invitation. Code only pauses within the exchange.

Total: 33 local codes.

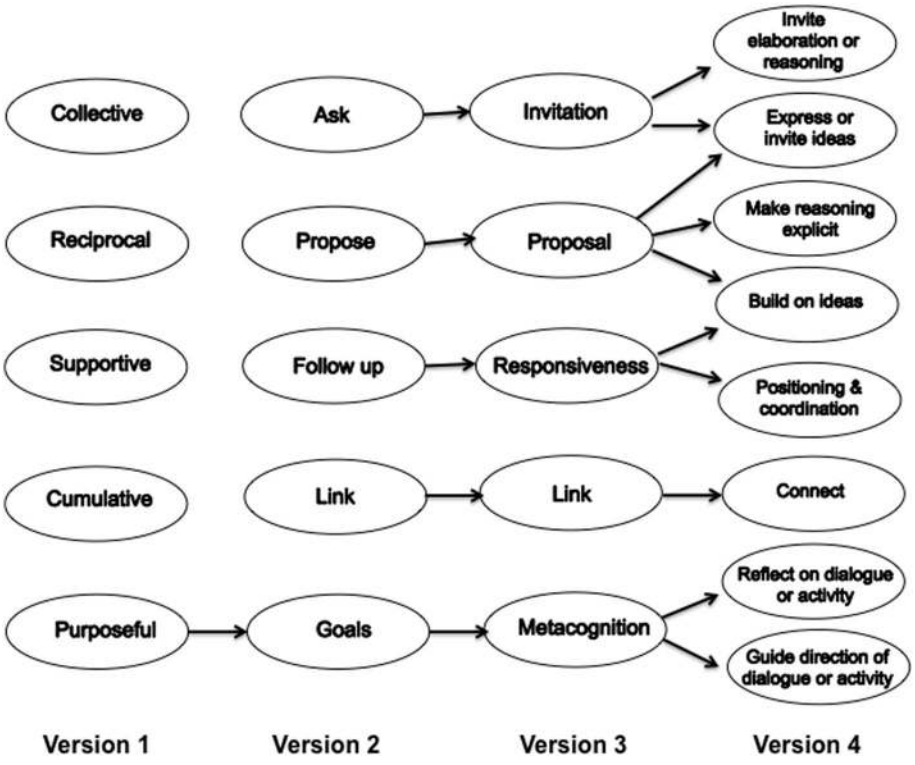


Fig. 2. Reformulation and continuity in cluster names through four iterations of the analytic scheme.

process, more contemporary literature emphasises its social nature, as well as its pivotal role to help achieve collective goals when metacognitive reflections are shared amongst participants during dialogic interactions (Iiskala, Vauras, Lehtinen, & Salonen, 2011; Larkin, 2009). The present scheme adopts this second, dialogic vision.

The team agreed that expansion to eight clusters provided sufficient distinction between key dialogic features to allow coding for reliability at the cluster level; this served to increase reliability and practicability, additionally allowing for both quantification and use by practitioners.

3.3. Mapping

We attempted to distil out and incorporate in our developing scheme key ideas underpinning educational dialogue of some main theorists, as outlined above. Some researchers take a systematic coding/checklist approach, while Alexander (2008, pp. 40–41) argues against this, owing to concerns about overlap and feasibility, preferring to offer indicators for dialogue. We attempted to capture the key concepts in both kinds of account. The process of mapping came largely in the latter stages, owing to our aims to build a new scheme from the bottom up, and to avoid insufficiently critical adoption of others' ideas. However, it was considered important to engage with other schemes as a critical mirror to minimise the chance of overlooking important practical and evidence-based distinctions. At the later mapping stage the team drew in particular on the detailed coding schemes of Wells et al. (Wells, 1999; Wells & Arauz, 2006) for discourse, Michaels and O'Connor (2011) for academically productive talk moves (APT), and a shorter scheme for teachers' 'Accountable Talk'® proposed by Resnick, Michaels, and O'Connor (2010). Where others' codes described CA that we deemed not intrinsically dialogic (e.g. 'repetition'), these were not incorporated. We also drew on attempts to operationalise dialogue through: offering parameters or descriptors of dialogue or quality talk and its pre-conditions, mainly at a meso or macro (rather than CA) level (e.g. Alexander, 2008; Wolfe, 2006); listing types of productive questions (e.g. Nystrand et al., 2003); investigating the presence of 'key' or reasoning words (Mercer, Dawes, Wegerif, & Sams, 2004); or noting language which suggested more provisional thinking (Maine, 2015). Soter et al. (2008) devised a scheme that included all of these. Some of these schemes relate to teacher discourse moves only, or they code students and teacher moves differently (Osborne et al., 2015), and some are for analysing discourse generally, not just dialogic forms, so, despite significant overlap, many categories do not apply. A distinctive feature of our scheme is its analysis of CA solely according to their function within the dialogue rather than to role of the speaker, in order to recognise the potential malleability of roles (cf. Freire, 1996).

The mapping yielded very few significant changes (mainly minor elaborations of code descriptions rather than new categories), although in a few cases it helpfully reaffirmed our decisions where these had been debated amongst the team. The Michaels and O'Connor (2011) scheme and their shorter TERC version of the tool (Michaels & O'Connor, 2012), while focusing on teachers' talk only, contained many similar categorisations to ours. Crucially, they produced empirical evidence for the possibility of reliably

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

distinguishing between explicit reasoning and talk which extends and clarifies — a difference that had seemed important in other literature, especially Mercer's work (see also Sedova et al., 2014, who emphasise rational argumentation), but that early testing had suggested was difficult to distinguish in practice. Assured by these findings, this distinction became central to the clustering of the final scheme. (We note that the Practicum Academy to Improve Science Education [PRACTISE] argumentation rubric for teacher development combines 'press for' elaboration with press for explanation/evidence though: Osborne et al., 2015.)

3.4. Condensing and refining

From an initial inclusive activity of listing familiar dialogic features, over 100 codes emerged; since then there has been a focus on reducing these to a manageable number. The main mechanism was identifying overlapping codes, and moving their distinctive features to their longer descriptions and examples within the scheme; for example, P1 was expanded to incorporate both synthesis and summary of others' ideas. Another mechanism was the removal of parallel codes which differed in relation to the agent's role as teacher or student (as mentioned in Section 3.3). Their initial purpose had been to recognise greater significance of dialogic moves made by students as opposed to the teacher, but it was agreed that this could be either pointed out descriptively in researchers' analyses, or reintroduced by researchers for frequency analysis as required. Rationalisation was also aided by expert judging of CA as central versus peripheral indicators of dialogic interactions.

In addition, codes seen as indicative of environmental features supportive of dialogue, or describing exchanges rather than individual turns, were moved to form a new set of 'global descriptors'. These should help to interpret sequences of local CA (e.g. 'Extended questioning'), thus qualifying the nature of dialogue at a coarser level of granularity than individual acts. Some global descriptors might encompass more than one function, e.g. 'Co-constructive talk/interaction' or 'Exploratory talk'. Through grouping acts that occur in combination, these descriptors help to recapture what is lost via the inevitable erosion of theoretical perspectives when we distil them down to CA. Due to its focus on the micro level of CA, this paper does not report global descriptors, which are still under development at this time; their further refinement is a priority for the team. Other researchers may want to define them from their own perspectives too. As the team started testing the scheme, we developed notes for both disambiguation within code descriptions to clarify the inter-relationships between codes, and general coding rules. It was agreed that only one code from each cluster could be applied to one utterance/action. The teams thus ranked the codes within each cluster, using the following criteria: 1. codes concerning others' views rather than own; 2. higher order dialogue codes (more sophisticated forms); 3. higher order thinking codes; and 4. more specific codes rather than more general category codes ('other', e.g. E2). In case of more than one code being applicable, coders should select the higher one. Note, however, that this hierarchy is arguable. Cluster assignment can also be contentious; for instance P4 (Acknowledge shift of position) might be seen principally as the result of evaluating contrasting perspectives (P cluster) or as metacognitive self-reflection (RD).

3.5. Iterative testing

While extensive testing of SEDA continues, iterative testing has been undertaken throughout the project, focusing on maximising validity and inter-rater reliability. This has been central to the scheme's development, counterpointing decisions grounded in dialogic theory, to ensure that it is practicable as well as theoretically sound. Some of the major issues that arose are highlighted here.

A need recognised early on was to reduce ambiguities of attribution, sequence and meaning amongst speakers; use of video alongside transcripts often helped here and is strongly recommended when coding using the scheme. However, one distinction proved particularly difficult to make reliably: interpreting whether students are simply making a relevant contribution (E2), or building on those of others (B1) — especially during fast-paced peer dialogue. This raised some theoretical differences within the group about the validity of attributing ideas in dialogue to particular speakers. While Merleau-Ponty (1968) argues that in a true dialogue it is no longer possible to say whose thoughts are whose, others asserted the value of attributing agency to speakers and recognising their concrete contributions. We agreed that E2 identified contributions that may be very significant in terms of progressing a dialogue by introducing new ideas or speakers even where there is no explicit connection to previous contributions (as distinct from elaboration and explicit reasoning). E2 thus includes short, unlinked responses during a brainstorm, for instance. Likewise, E1 — Invite opinions/beliefs/ideas — is used to code invitations that do not specifically refer to prior contributions, although they may stimulate such references. Indeed, the common question 'What do you think?' posed after several views have been expressed could be interpreted either as referring to a recent contribution from another participant or as referring back to the original inquiry question, and this was initially a source of unreliability; such ambiguous cases are now coded as E1. We created a separate cluster, 'Express or invite ideas', including just these two CA. We also found during preliminary testing that we needed to tighten up Positioning definitions to refer only to explicit agreement/positioning in relation to another's viewpoint. Where not explicit, we coded these as E1.

Another point of systematic confusion was between G5 (Focusing) and invitational codes such as I1 (Ask for explanation) and I2 (Invite further responses using others' contributions). Teachers' contributions typically have more than one intention, often both drawing on students' contributions and looking to steer the dialogue in a desired direction — a combination at the heart of Alexander's principle of 'purposeful'. Initial testing led to refined descriptions of these codes, reducing confusion; however, considerable overlap remained. Ultimately we agreed that Focusing and Provide informative feedback (G4) could be combined with other pertinent, more specific codes in different clusters.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 2
Reliability by cluster.

	UK analysis	Mexican analysis
I	.839	.768
R	.877	.838
B	.662	.74
E	.651	.644
P	.541	.756
RD	N/A	N/A
C	.818	N/A
G	.541	.807
U	.817	.844

Finally, testing the scheme on dialogue between older students engaging through extended contributions raised issues of multiple code use and segmentation of CA. Coding is simpler where utterances are short and amenable to a single code; where students instead chain points together, decisions must be made about using the same code (e.g. R2) once or multiple times. Resolving this depends partly on researchers' use of the scheme: an interest in cumulative frequency suggests the use of multiple codes in a turn; a focus on assessing quality of dialogue is more linked with identifying highest level features. For increasing and measuring reliability, we have agreed to limit the use of codes per turn to a maximum of one for each cluster for now, but other researchers can resolve this as they see fit.

Inter-coder reliability was calculated for each cluster using Cohen's kappa (κ). Separate indexes were obtained to provide detailed information about reliability levels of cluster application, and to better understand the patterns of agreement and disagreement using the scheme (Agresti, 1992; in Warrens, 2014). A complete transcript from each country was coded independently by two members of that country's team at cluster level (including agreement for uncoded lines). Codes with minimal (<5) or null frequencies were not taken into consideration. The coefficients obtained for each cluster (see Table 2) were analysed in terms of presence (1) or absence (0) as mutually exclusive levels for each variable. Note that in some cases the coefficient is inevitably driven more by the decisions not to code than by the decisions to code. This was our first reliability trial with the version of the scheme presented here and reliability is expected to rise as coders become more familiar with its modifications from earlier versions used during its evolution.[1]

4. Illustration of applying SEDA in two settings

In this section we present illustrative examples of two different learning situations, one from each country. The Mexican transcript concerns a triad of primary school Spanish speakers (11–12 years old) carrying out a small-group natural science project using a computer, aided by their teacher. The UK one presents a whole class discussion within a secondary school history lesson using an interactive whiteboard (English speaking students, 12–13 years old). Video transcripts are formatted using the Jefferson (2004) notation protocol. The excerpts were selected to exemplify the application of SEDA for analysing dialogic interactions in these two educational contexts, which vary in the characteristics of the learning situations mentioned above. In addition, the excerpts were chosen as ones which displayed a wide range of codes being used in a relatively short segment. These excerpts are only used as illustrative examples and are not intended to be representative of diverse educational or cultural contexts, nor are the analyses attempting to generalise.

4.1. Example 1: group discussion of a discontinuous text about the prevalence of HIV in Mexico

4.1.1. Context

The excerpt in Table 3 (3 min 15 s) is from a lesson of 6th grade students (aged 11–12) who participated in an innovative educational programme called 'Learning Together',[2] supported by technology use. As part of this programme, students conducted an investigation about HIV throughout the school year in order to write an article to be published in a popular magazine. The magazine was disseminated at a cultural fair at the end of the year, with the participation of the whole learning community. In this segment, a triad of children (two male and one female), supported by an adult (Tania), are sitting around a computer interpreting a discontinuous text (bar chart) about the prevalence of HIV in Mexico by gender and age. (Previous to this segment, children had read and discussed information from several multimodal texts about the prevalence of HIV in the world.) Based on this information, they are answering two key questions from a scheme prepared by the adult, presented on the computer screen. The responses will be used to write a summary for their article. (The CS corresponds to the whole lesson — 'HIV in numbers'; this segment is composed of three CE).[3]

[1] Further information for readers is provided by the raw percentage matches between two coders applying the same clusters on each turn (excluding 'uncoded' matches); on turns where individual or multiple clusters were applied by at least one coder, frequencies of matches and mismatches were recorded. The percentages of matches were 69% across the UK dataset and 73% across the Mexican dataset.

[2] 'Learning Together' aims to promote the creation of learning communities in Mexican schools. It purports to enhance lifelong learning, and particularly social, cognitive, psycholinguistic and technological abilities in primary students, as well as to transform traditional teaching practices. This programme has been tested empirically by the research team led by Rojas-Drummond at UNAM for more than a decade (Rojas-Drummond, Littleton, Hernández, & Zúñiga, 2010). See www.psicol.unam.mx/laboratorio_de_cognicion_y_comunicacion/Apj/index.html.

[3] This transcript was translated from Spanish; names of the participants were changed for anonymity purposes.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 3
Excerpt 1 from a group discussion about the prevalence of HIV in Mexico.

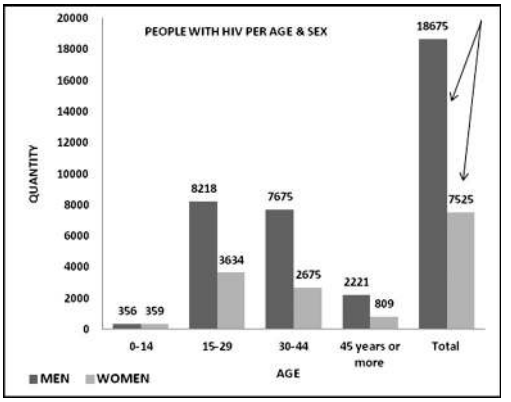
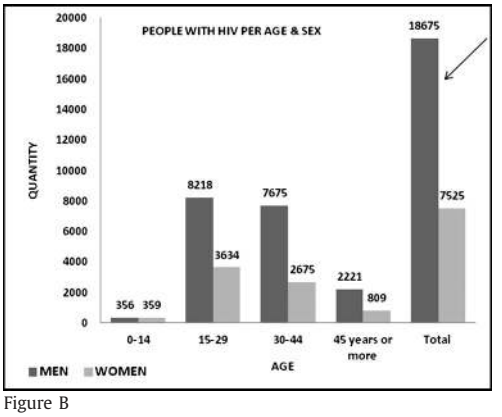
CE	Agent	Line	Discussing a discontinuous text about the prevalence of HIV in Mexico	CA		
				Code one	Code two	Code three
CE1 Discussing the total no. of cases of HIV in Mexico	Teacher	185	Now, how many people have HIV? (*reading out loud the first key question from the scheme*)	U		
	Roberto	186	Here it is (*takes the computer's mouse and places the cursor on the last bar corresponding to the men's group*) Eighteen (.) [eighteen thousand six hundred-]	E2		
	Erik	187	[We have to add up this and this, right?] (*points to the bars in the graph corresponding to the total no. of men and women with HIV*)	G2		
			 Figure A			
	Teacher	188	[What do you think?]	E1		
	Karina	189	All this? (*points at all the bars on the chart*)	E2		
	Teacher	190	No (*referring to K's answer*), E explain to K what we should add up	G1		I4
	Erik	191	Add up this and this (*points at the same bars of the chart he pointed at before*)	U		
	Teacher	192	But, why just that?	G5		I4
	Erik	193	Because it's the total of men and women (*answering and looking at T*)	R2		
	Teacher	194	[Right, K?]	U		
	Karina	195	[Oh, yes]	U		
	Erik	196	If we add it we get the whole number (*E points at the whole bar chart; K goes outside to look for a calculator*)	B2		
CE2 Analysing the total no. of men and women with HIV in the bar chart	Teacher	197	Let's see, what does this bar mean, E? (*points at the last bar corresponding to the men's group in the chart*).	G5		I4
	Erik	198	It's twenty six thousand (*starts adding and looks at T*)	U		
	Roberto	199	It's a bar of graphs that [represents-]	U		
	Erik	200	[Twenty-six thousand two hundred]	B2		
	Teacher	201	We'll write it down in a second. And this one in particular, what does it mean? The blue bar. (*points at the last bar corresponding to the men's group in the chart*)	G5		
			 Figure B			
	Erik	202	Men, all men of all ages	E2		

Table 3 *(continued)*

CE	Agent	Line	Discussing a discontinuous text about the prevalence of HIV in Mexico	CA		
				Code one	Code two	Code three
	Roberto	203	Yes, men, the blue one is for men and the red one is for [women]. (*T leaves the triad alone*)	B1		
	Erik	204	[It's twenty-six thousand two hundred]. Yes, look (*takes the mouse and directs the cursor*). Because five plus five is ten, we carry one, seven plus two is nine, plus one ten, and we carry one, five plus six is eleven plus one	R2		
	Roberto	205	Oh yes, [twenty six] (*turns to see E nodding*)	U		
	Erik	206	[Twelve, twelve I mean] We leave two and carry one	B2		
	Roberto	207	How much did you say?	U		
	Erik	208	Twenty-six thousand	U		
	Roberto	209	Two hundred?	U		
	Erik	210	Right (*R directs the cursor to the scheme on the monitor and writes 26,200 as the answer to the first key question*)	U		

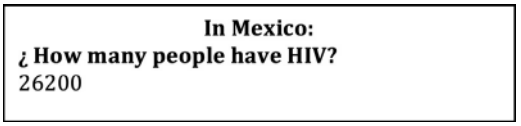


Figure C

CE3 Discussing the group of people most affected by HIV by gender and age	Roberto	211	"Which group is the most affected (.) Which group is the most affected by HIV?" (*reading the next key question in the scheme*) The boys, right? (*looks at E*) (.) Right?	R4		
	Erik	212	"Which is the group?" (.) What does group mean, age, number? (*they scroll the monitor looking for the graph*)	I6		R4
	Roberto	213	Teacher, come, again. Here, we don't understand this question (*T returns to attend the children's request*)	I6		RD2
	Erik	214	What is meant by group? Men or women? (*turns to see T*)	I6		
	Teacher	215	The most affected group of all, men and women, by age. Which one is the most [infected]?	G4		B1
	Roberto	216	[The men's group] (*scrolls the monitor looking for the graph*)	E2		
	Teacher	217	But by age, which one would it be? (*K returns with the calculator*). They have already added it up (*addressing K*). You can check it in a moment.	G5		I6
	Erik	218	The group with ages from 15 to 20	E2		
	Teacher	219	Explain that question to K, let's see, read it carefully (*E approaches K to take the calculator away, R starts reading the question again*)	G1		I4
	Roberto	220	"Which group is the most affected by this disease and how many cases has it got?" (*reads the question to K*)	U		
	Teacher	221	Of the entire graph, which group of people is the most affected? (*points at the bar chart*)	G5		
	Karina	222	This one, right? (*points at the second bar corresponding to the men's group in the chart*)	R4		

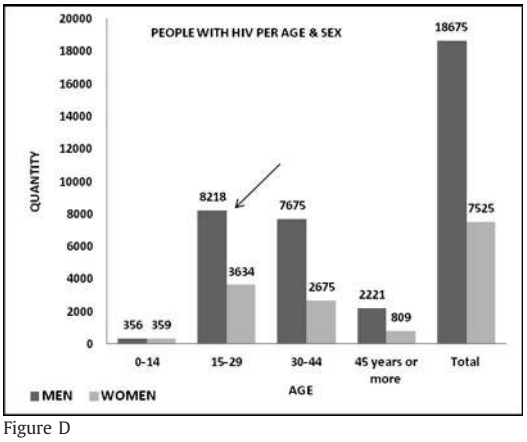


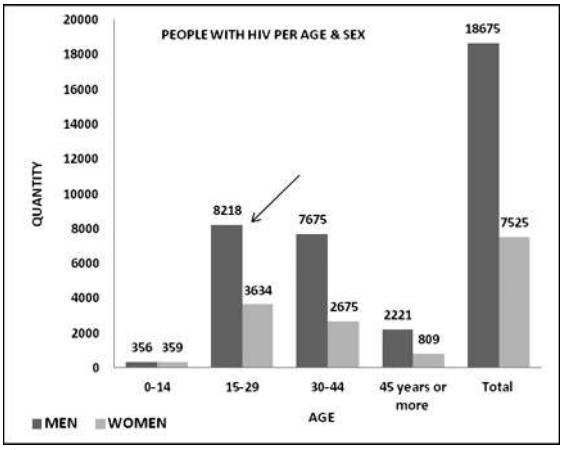
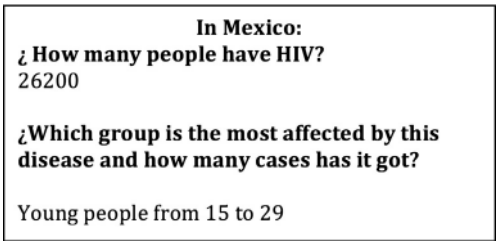
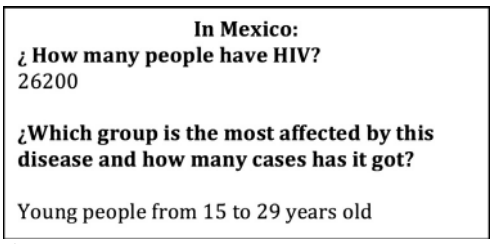
Figure D

	Roberto	223	The one from 15 to 29? (*referring to the group of people with ages from 15 to 29*)	B1		
	Teacher	224	But who?	I6		
	Karina	225	The girls and the boys (*E is using the calculator*)	E2		
	Teacher	226	Who? The question says the *most* affected	G5		I6

(continued on next page)

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 3 *(continued)*

CE	Agent	Line	Discussing a discontinuous text about the prevalence of HIV in Mexico	CA		
				Code one	Code two	Code three
	Roberto	227	The boy (*referring to the boy's group with ages from 15 to 29*)	E2		
	Teacher	228	Why?	I4		
	Roberto	229	[Because it has the highest percentage] (*pointing at the corresponding bar*)	R2		
			 Figure E			
	Karina	230	[Because it has more]	R2		
	Teacher	231	So, what would it be? From 15 to 29, what would it be, children or young people?	I6		
	Roberto	232	Children, I mean, young people, right? (*R writes 'from 15 to 29' as a response to the second key question in the scheme*)	E2		
	Teacher	233	Who, you have to say who	G5		
	Roberto	234	Yes (.) The children from fifteen to twenty nine. YOUNG PEOPLE (*correcting himself*). Young people from 15 to 29 (*talks while continues writing the response*)	B2		
			 Figure F			
	Karina	235	Write 'years old', otherwise people are not going to understand (*K adds the words 'years old' to the response to the second question directly, using the keyboard*)	R2	B1	RD2
			 Figure G			
	Erik	236	Let's check (*verifies their answer to the question using the calculator*). Yes, 26,200 (*shows the result given by the calculator to his peers*)	G2		

Note. Although we normally assign no more than two codes to each CA, in one line (235) we applied three codes that we considered equally relevant; this happens occasionally.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

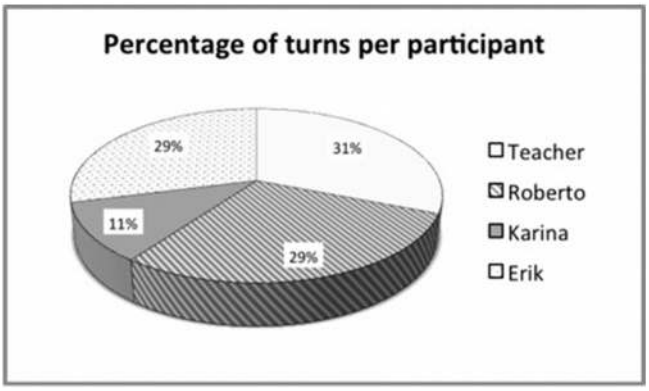


Fig. 3. Percentage of turns per participant.

4.1.1.1. Interpretation of Excerpt 1. Fig. 3 presents the percentage of turns produced by each of the four participants in the dialogue in Excerpt 1 (out of a total of 52 turns).

The pie chart illustrates that these percentages are very similar for three of the participants — Tania (teacher), Roberto and Erik (around 30%) — while Karina's percentage was lower (11%). These data show that most of the participants' turns were fairly equally distributed (except for Karina's). Likewise, the average length of words per turn was fairly equitable between Tania (9.02) and two of the participants (Roberto = 8.20; Erik = 8.13), with Karina again somewhat behind (4.17). Taken together, these data suggest that students have a voice and are participating actively, rather than only responding to teacher's questions with short utterances while the teacher dominates the floor and does most of the talking, as is common in ordinary traditional Mexican classrooms (Rojas-Drummond, 2000). Tania's style of interaction is likely to have been facilitated through students working in

Table 4
Frequency of CA coded per cluster in Excerpt 1.

Cluster	CA	Frequency	Subtotal
I	I1	0	12
	I2	0	
	I3	0	
	I4	5	
	I5	0	
	I6	7	
R	R1	0	8
	R2	5	
	R3	0	
	R4	3	
B	B1	4	8
	B2	4	
E	E1	1	9
	E2	8	
P	P1	0	0
	P2	0	
	P3	0	
	P4	0	
	P5	0	
	P6	0	
RD	RD1	0	2
	RD2	2	
	RD3	0	
C	C1	0	0
	C2	0	
	C3	0	
	C4	0	
G	G1	2	12
	G2	2	
	G3	0	
	G4	1	
	G5	7	
	G6	0	
Total of CA			51
40/52 turns were qualified with CA			77%

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

small groups (rather than participating in a whole class discussion); authentic group work is atypical in Mexican's primary school settings. The data also illustrate individual differences in levels of participation and understanding amongst peers (see below).

Table 4 reports the frequency of occurrence of the different CA used to code the 52 turns that comprise Excerpt 1. The table shows that a high proportion of turns (40 out of 52 or 77%) were qualified with at least one category of CA from the coding scheme (30 turns were assigned 1 CA, 9 turns were assigned two and 1 was assigned three), signifying dialogic interactions. In particular, in this short segment, 13 out of the 33 available codes were applied (39%), representing 7 out of the 8 clusters in the scheme. It is important to emphasise that in this excerpt, 13 coded utterances correspond to CA related to asking for and providing information using reasoning (I4, R2 and R4), and these chained invitations and responses indicate higher-order inter-thinking amongst participants (Mercer, 2000). Another 24 coded utterances correspond to CA related to asking for and providing contributions or elaborations (I6, B1, B2, E1 and E2), which are known to contribute to moving the flow of the dialogue and/or the activity forward, as well as to co-constructing understanding and creating and maintaining intersubjectivity amongst speakers (Rojas-Drummond et al., 2006). Also, 12 coded utterances correspond to cluster G, with mostly Tania (10) but also Erik (2) guiding the direction of the dialogue/activity. Lastly, 2 utterances by Roberto and Karina were coded as RD2, showing that the children engaged in metacognitive reflections on their own learning processes and their outcomes. Taken together, these data suggest that the interactions amongst participants in Excerpt 1 are considerably dialogic in nature.

In CE1 (see Table 3), after Tania reads question 1, Erik shows sophisticated reasoning by correctly suggesting the addition of frequencies of the last two bars (all males and all females), to obtain the total (G2: Line 187). Tania takes up Erik's participation and asks the rest of the students for their opinions (E1: 188). This 'uptake' of students' answers by asking others to express opinions on Erik's contribution, has been identified as a critical factor in teaching and learning processes, since it places importance on children's contributions as much as teachers' interventions (Alexander, 2008). In Line 189 Karina proposes a different solution to Erik's (E2), which is incorrect. Then, Tania promotes student–student dialogue (G1: 190) by asking Erik to explain the procedure to Karina (I4). Tania thus allocates the responsibility of explaining and understanding the solution of the problem to the students (rather than providing the explanation herself), which suggests a strategy of 'hand-over' central to scaffolding. After Erik's contribution, Tania further guides him to focus on supporting it by asking him for a justification (G5, I4: 192), and he provides an appropriate argument (R2: 193), which he elaborates in Line 196 (B2). In addition, Tania uses Karina's answer to clarify a misunderstanding, rather than qualifying it as a 'mistake'. She thus shows responsiveness to students' level of competence, as well as well as guiding through focusing on key aspects of the activity, both central strategies of scaffolding (Rojas-Drummond et al., 2013). Overall, the chain of Tania's and students' utterances that comprise CE1 seem to contribute to moving the dialogue and the collective activity forward.

In CE2, Tania further promotes students' comprehension of the meaning of the bars by using scaffolding strategies such as focusing and asking for explanations (G5, I4: 197, 201). Erik and Roberto in turn participate actively by providing relevant contributions (E2: 202), building on what the other says (B1: 203), making their reasoning explicit via argumentation (R2: 204), and clarifying their own contributions (B2: 206).

At the beginning of CE3 children are working alone answering question 2. In Line 211, Roberto speculates a possible answer (R4). In Line 212 Erik realises they do not understand what 'group' refers to, and asks for clarification, at the same time as speculating a possible meaning, different from Roberto's (I6, R4). Then, in Line 213, Roberto explicitly acknowledges they do not understand the question and requests the teacher's help (RD2, I6). This sequence indicates children's metacognitive reflection about their lack of comprehension and a certain level of self-regulation through their initiative to ask for help when they cannot solve the problem by themselves.

In the same CE, Tania continuously uses scaffolding strategies to enhance children's understanding, including: providing informative feedback by building on Erik's question (G4, B1: 215); focusing and asking for clarification and elaboration (G5, I6: 217, 221, 224, 226, 231 and 233); encouraging student–student dialogue (G1: 219); and asking for justification (I4: 219 and 228). Children in turn participate actively by: making relevant contributions (E2: 216, 218, 225, 227 and 232); speculating (R4: 211, 212 and 222); building on other participants' contributions (B1: 215, 223 and 235); providing explanations and justifications (R2: 229, 230 and 235); elaborating their own contributions (B2: 234) and proposing courses of action (G2: 236). Lastly, they also reflect on learning processes and outcomes (RD2) by acknowledging their lack of understanding (213) and proposing to add two words to the sentence they are writing ('years old'), so that the readers can understand it (235).

This diversity of CA suggests children's high level of engagement and motivation to complete the task successfully. This is exemplified by their insistence on ensuring their response is correct by using various means (mental arithmetic and a calculator). In addition, in Line 235, Karina suggests adding the words 'years old' after 15 to 29 by arguing that 'otherwise people are not going to understand'. This indicates their intention to make their text clear to their potential audience. The wide variety of dialogic exchanges between teacher and students contributes to achieving their goal jointly: elucidating that, from the whole population in the graph, young men from 15 to 29 years old are most affected by HIV.

According to the National Institute of Evaluation in Mexico (Achugar, 2012; INEE, 2015), even high school students have difficulty in interpreting graphs (a discontinuous text) and relating this information to a continuous text. These younger 6th graders exhibit some capacity to meet this challenge with Tania's support. Children display differentiated capabilities; however, they all contribute with their own resources to achieve a common aim. In addition, throughout Excerpt 1 we can identify various dynamic inter-textual and inter-contextual relations between the oral, written and multimodal texts that participants engage in; the latter texts are afforded by digital technology (Maybin, 2003; Jewitt, 2005). It is notable that many of the oral contributions are accompanied by pointing at graphs on the computer screen (highlighting the value of using the video recording during the analysis), and they reference those digital artefacts. Lastly, the data provided illustrate the usefulness of the coding scheme to analyse, qualify and interpret dialogic interactions in a detailed, coherent and systematic fashion.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

4.2. Example 2 (UK): whole class discussion of 'is it possible for us to imagine the experience of trench warfare?'

4.2.1. Context

A very experienced secondary history teacher, Lloyd, who participated in our 'Dialogue and Interactive Whiteboards (IWBs)' study, taught three lessons (described in more detail by Mercer, Hennessy, & Warwick, 2010) to a class of boys aged 12–13, involving in-depth collaborative exploration of the open-ended question: 'Can we imagine the experience of trench warfare?' Lloyd employed a wide range of multimedia resources, including interpretation and whole class discussion of an army doctor's 1914 diary text and a graphic Wilfred Owen poem ('Dulce et Decorum est'). Further IWB resources structuring the activities included separate audio and video tracks of the same trench warfare film, a scanned textbook trench diagram, and photographs. These resources collectively embodied diverse experiences and perspectives on life in the trenches. The lesson sequence culminated in Lesson 3 in a teacher-mediated dialogue between learners which drew on their experiences of the digital resources encountered. The excerpt in Table 5 (6 min) presents a class discussion immediately following 1.5 min of talk in pairs addressing the question 'If you were answering that question, what sections would be in the answer?' Ideas were recorded on mini (nondigital) whiteboards on desks. Lloyd circulated and listened to views of two pairs, subsequently invoking two students' ideas during the class discussion below. The dialogue synthesises students' evolving views about how far historians can extrapolate from using such sources and from partial experience, and how convergent their thinking can realistically be. The topic and other contextual features of the interaction remained constant so we construe this excerpt as a single CE (hence there is no CE column).

Fig. 4 depicts the writing on the IWB screen that the teacher built up during the period covered in the excerpt (he initially displayed just the question and the list of sources in the bottom right corner). The video is freely available at http://sms.cam.ac.uk/media/1498504 (it begins during transcript Line 119).

4.2.1.1. Interpretation of excerpt 2. The teacher's central move is to pose an open and complex question, creating a scenario which demands 'possibility thinking' (Craft, 2000) or imaginative speculation (I5). The notion of 'possibility thinking' defined by Craft is characterised by imagination, curiosity and questioning. By inviting the students to think creatively in this way, the teacher draws out distinctive perspectives from students, marked by multiple instances of speculation codes R3/R4. Lloyd 'allows not-knowing' (Feito, 2007), promoting 'mutual addressivity' (Sidorkin, 1999) rather than consensus; the continuous contrasting of voices enables a genuine dialogue across difference (Bakhtin, 1981; Wegerif, 2010).

Table 6 reports the frequencies of the different CA comprising Excerpt 2. The table shows that a very large proportion (41/47 or 87%) of turns were qualified with at least one category from the coding scheme, indicating that the interaction here was highly dialogic. In particular, in this segment, 20 out of the 33 (55%) available codes were applied, representing 7 of the 8 clusters in the scheme. Turns are evenly split between teacher and students (20 by the teacher and 21 by the students), which is unusual for whole class teaching in typical classrooms, where it is estimated that teachers normally speak for at least two thirds of the time compared to one third by students (Cazden, 2001), and primary student utterances are only 4 words long on average (Myhill, 2006). After Lloyd's initial introduction to the task (185 words), the mean numbers of words per turn are 27.24 for teacher and 15.76 for students. The dialogue is inclusive of multiple voices; over one third of the class (10/27 boys present) participates during this 6-min lesson segment.

Notable too is the explicit and high level reasoning by students, including: explaining (R1: 146; R2: 127, 136), drawing analogies (R2: 140), making distinctions (R2: 121, 140, 144, 155) speculating (R3: 159, 163; R4: 142, 148), posing counter-arguments (R2 + P6: 136; R4 + P6: 148). Indeed, about half of students' turns in the transcript (11/21) are assigned one of these three kinds of CA. The reasoning is coupled with explicit relative positioning by students (P6: 136, 146, 148; P5: 159), in response to invitations for evaluation and positioning by Lloyd (I2: 123, 133, 135, 145, 152, 156). In a further 4 turns (127, 134, 138, 155) there is implicit positioning which does not qualify for a P code as no explicit references to others' contributions are made, but the content suggests that the speakers have probably taken account of others' viewpoints and voiced their own in relation to those. Moreover, participants are highly responsive to others, with 13% (6/47) turns being coded B1—Building on others' ideas or clarifying/explaining others' perspectives (128, 141, 151, 152, 154, 164) and one teacher turn is coded P1—Synthesise ideas (149). These codes illustrate how the participants are continually evaluating and refining perspectives and moving forward the dialogue rather than stating new, unlinked ideas or merely defending their own positions. In particular, positioning includes partial (dis)agreement by students (e.g. P6: 148), often with justification, demonstrating a high level of responsiveness as another's idea is considered before articulating which part is agreed with and to what extent.

Lloyd seems to position himself as a co-learner and to engage in open-ended co-inquiry (we have seen this stance throughout all of his lessons we have observed); for example, at one point in this excerpt he demonstrates his own open-mindedness (149[4]), modelling for the class realignment of his thinking with new ideas encountered. In Line 154 he relates Felix's point to his own peer learning in project workshops, grappling with the thorny question of whether it is possible to ever achieve a common understanding or to know if we have. However, there is a great deal of teacher mediation in this lesson; the teacher calls on named individuals in 16/20 of his turns, and students rarely address each other directly without the teacher managing contributions. This might be seen as less dialogic, but we have observed that this is a *strategy* Lloyd employs; he retains control over the course of the dialogue, continually drawing out, contrasting and synthesising different ideas and perspectives and their nuances — a clear illustration of Alexander's (2008) 'purposeful' teacher behaviour. Nevertheless, students often volunteer to speak (raising

[4] P4—Acknowledge shift of position is not coded since P1—Synthesise ideas also applies and takes priority.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 5
UK Excerpt 2 from a class discussion about trench warfare.

Agent	Line	Discussion of "Is it possible for us to imagine the experience of trench warfare?"	CA		
			Code one	Code two	Code three
Teacher	119	Look (*indicating list of resources analysed that he has written on the bottom right corner of whiteboard*), I've just made a note, a quick note on the board. I think, is there anything else, is there anything I've missed? What have we got so far? To try and answer a question about trench warfare, what have we got? We know about the doctor, do you remember the doctor evidence that I gave you? 'Wow, I can't wait to get over there'. 'There's a Daily Mail for every 10 people'. And then 'things aren't as good' (*paraphrasing poem studied in first lesson*). We've used the poem, we've used the video about the poem, we've just used that bit of DVD, and we've had a lot of quite rich discussion about this. Have I missed anything? Don't think I have, have I? Right OK….	C1	I2	
	120	Tell me then Felix, you and Adill, have you got some ideas about how you would describe this (*question posed on IWB*: '*Is it possible for us to imagine the experience of trench warfare*?') and what things would be in the answer?	I5		
Felix	121	Yes, we would put it into three categories: living conditions, medical conditions and the conditions they had to fight under.	R2		
Teacher	122	Medical conditions and fighting conditions (*writing the 3 conditions on the board*). Do you know what Felix? This is funny. When I was planning this lesson, I thought about a trench as a place of (.) (*writing* '*work*, *rest*, *play*' *on the board*), and it's kind of what you've just said really, people would be working in them, resting in them, playing in them. Work, rest and play. That's what you do I suppose in your life, and you've articulated some of those there.	B2	C3	
	123	What do people think about that? (.) Are you happy with that Dillon, as a way of describing how you might talk about the experience of trench warfare and whether or not it's actually possible to do it?	I2		
Dillon	124	Yes.	U		
Teacher	125	Have you got some other points?	I6		
	126	How did you organise it?	I4		
Dillon	127	We don't actually know if that's true because it's a DVD. So because we weren't actually alive, some of that might be true, but we can't be sure.	R2	C1	
Teacher	128	All right. So now we are getting into questions about the reliability of the evidence as well? All right. Very good.	G4	B1	
	129	Marcel, what did you say (*referring to pairwork*)? So what Felix and Adill have done is they've got a nice, they've sectioned out what we could say, what things we could write about here rather well. I think they're good.	G4		
	130	What was the point you just made to me when we were discussing?	C1		
Marcel	131	I think sacrifice would be made (rest inaudible) Ok so here's the point here. Can we actually, can we really imagine what that would have been like? Is it	U		
	132	really, is it possible for us to do it?	I5		
Teacher	133	Jonathan, any thoughts on that?	I2		
Jonathan	134	We can't do it, not really.	E2		
Teacher	135	What do you think Felix, about that, because you've sectioned that out there? Marcel is actually challenging the notion that it's actually possible to imagine it. What do you think?	I2		
Felix	136	Yes, well it probably is, and there's people who lived then, and there's so much information about it. Because there's propaganda. Then there's what actually happened and we have quite a lot of sources and, back then when the DVD was made there must have been quite a lot of people that were there.	R2	P6	
Teacher	137	Very good. Robert is going to make a point in a minute that I'm going to ask him. Ricky, what do you think? [Actually imagining that?	E1		
Ricky	138	[I don't think you could imagine being there unless you've been there and done it.	R2		
Teacher	139	So is it one of those things that's just [too hard for us to imagine?	I6		
Ricky	140	[Yes, it's like when you imagine winning the lottery. You can imagine what it would be like, but it wouldn't necessarily be like what you think.	R2		
Teacher	141	Very good! I think that's quite a nice analogy. I mean it's different, but it's almost beyond our experience. Alex? (*Alex had his hand up*)	B1	G4	
Alex	142	I think there are probably bits we can imagine and bits we can't imagine. So we might be able to imagine bits of it.	R4		
Teacher	143	We might be able to imagine certain bits of it. All right. Robert, can I take the point that you made (*during preceding pair work*)? It links in with what Alex said. Listen to this. This is Robert's view.	C1		
Robert	144	You can imagine what it would look like, but you can't imagine what it would feel like or how you would be feeling.	R2		
Teacher	145	Ok. What do you think about that Owen? 'You could imagine what it would look like, but not actually what it would feel like'. I quite like that.	I2		
Owen	146	Yes, because on the DVDs or on the films and the poems and stuff, it explains and you can see what it looks like, in wasteland, and you're both in trenches, but you wouldn't know what it was like to go ages without food or water.	P6	R1	C1
Teacher	147	Can I sugge– Ok. Go on Ricky. (*Ricky raised his hand to participate*)	U		
Ricky	148	That's partially true, but you wouldn't know what it would be like to be shot by a bullet or be bombed or something. You wouldn't see what it looked like either.	R4	P6	
Teacher	149	Owen is nodding his head there in agreement with what you were saying. It's true isn't it? I like that idea. You know, this notion about it's something completely outside of our experience. Can we really imagine? I tell you what then, why not add in, let me try, or someone else help me out here. Is it possible for us to	P1		

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 5 *(continued)*

Agent	Line	Discussion of "Is it possible for us to imagine the experience of trench warfare?"	CA		
			Code one	Code two	Code three
		imagine, well (.) (*writing on board*), 'yes, what it looked like', I like that Robert and it wasn't what I'd thought of. I thought I was going to write something else on here. Yes 'what it looked like', not 'what it felt like'. You are then able to bring in all the things that Felix and Adill or Joe or whoever it was who came up with this idea (*indicates the first three categories listed on the IWB*). So yes there are some things we can describe about it, but the actual feelings are rather difficult.			
	150	Any other points to make here? Felix?	E1		
Felix	151	Well, about the feelings, every single person's experience with it would be different. You can't really say that… Everybody's got different feelings towards the war, and that.	B1		
Teacher	152	Ricky would you agree with that in view of what you said? I suppose different people would react in different ways to winning the lottery or would imagine winning the lottery in different ways. Felix?	I2	B1	
Felix	153	You can't really say… You wouldn't know what anyone would have felt like, even if we were there, you would only know what you felt like (rest inaudible).	B2	R4	
Teacher	154	Yes, can we ever achieve a common understanding of anything?! There you are. Very interesting, [that relates to] the discussions that we've had on this project so far (*looking at researcher*). Very good. Henry?	B1	C3	
Henry	155	I was thinking that we can imagine it like on a sort of factual level but not on a personal level.	R2		
Teacher	156	Factual not personal. Marcel, are you happy with this conversation because it was you who brought that up? Do you see? Are these points that you would agree with?	I2	C1	
Marcel	157	Yes.	U		
Teacher	158	Certainly. Ok, Chris?	U		
Chris	159	But then you wouldn't think of it if it happened to you though =	P5=	R3=	
Teacher	160	You wouldn't…? (*raises hand to ear, probably indicating he did not quite hear*)	U		
Chris	161	=… think of it and like feel it, if it did happen to you.	=P5	=R3	
Student (unknown who)	162	What do you mean?	I6		
Chris	163	If you won the lottery, you wouldn't come back and think about what we're thinking now.	B2	R3	
Teacher	164	Ok, so your thinking has been changed (*after winning the lottery*). It's almost too hard for us to [imagine.	B1		
Chris	165	[Some stuff, if it come down to it, you wouldn't do what you said you would do.	B2		
Teacher	166	OK. I can see that point.	E2		

Note. Again we have assigned three codes to one CA in one line (146). In six turns, longer utterances by the teacher with more than one distinct function are split into two or more numbered lines to clarify where codes are applied. Thus there are 41 turns but 48 lines; as above, numbers in text refer to lines rather than turns.
Note. One partially inaudible utterance in line 131 was not coded although it was probably a pertinent contribution (E2) at least.
Note. In Lines 159 and 161, "=" denotes continuation of a single utterance by Chris, ignoring the interruption in Line 160; the code applied is only counted once.

hands) before he calls on them, indicating that proactive responses are being made; for example Alex spontaneously expresses partial agreement with Ricky in Line 142 and Ricky with Owen in Line 148. The evident respectfulness and unusual level of dialogicality indicate that Lloyd's strategy is productive. Importantly, his language often depersonalises, asking 'Do you agree with that (idea)?' rather than 'Do you agree with Felix's/Robert's idea'? (apparent in all instances of I2, listed above). This technique minimises disputational talk, loss of face or defensiveness, instead promoting 'engagement with the dialogue itself' (Wegerif, 2011).

In sum, Lloyd's careful orchestration progressively broadens and deepens the dialogue (Wegerif et al., 2010). He makes timely interjections to recall specific prior contributions for juxtaposition with other perspectives, inviting commentary and evaluation (I2, as above: 119, 123, 133). There are four instances of reference back (C1—Refer back) by the teacher, including both to whole-class discussion (156) and pair work (130, 143). Both Lloyd (119) and Owen (146) also explicitly demonstrate the intertextual referencing to the rich range of digital resources encountered earlier that underpins and sustains this cumulative dialogue over its 3-lesson duration (at least). This evidence is used explicitly by them and implicitly by other participants to warrant the

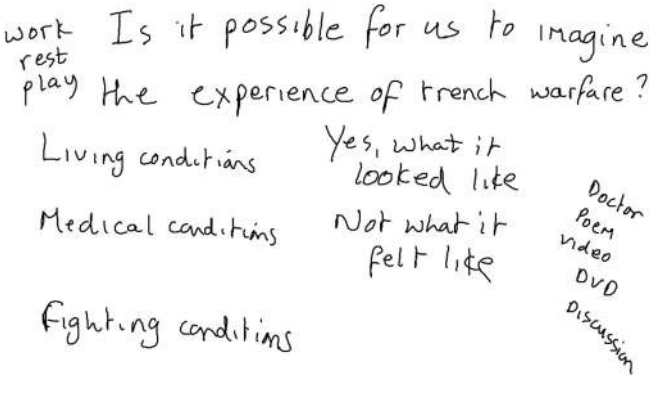


Fig. 4. Interactive whiteboard screenshot relating to history lesson excerpt in Table 5.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Table 6
Frequency of CA coded per cluster in Excerpt 2.

Cluster	CA	Frequency	Subtotal
I	I1	0	13
	I2	7	
	I3	0	
	I4	1	
	I5	2	
	I6	3	
R	R1	1	14
	R2	8	
	R3	2	
	R4	3	
B	B1	6	10
	B2	4	
E	E1	2	4
	E2	2	
P	P1	1	5
	P2	0	
	P3	0	
	P4	0	
	P5	1	
	P6	3	
RD	RD1	0	0
	RD2	0	
	RD3	0	
C	C1	6	8
	C2	0	
	C3	2	
	C4	0	
G	G1	0	3
	G2	0	
	G3	0	
	G4	3	
	G5	0	
	G6	0	
Total of CA			58
41/47 turns were qualified with CA			87.23%

arguments being made during this excerpt (described by Lloyd as the students' 'informed speculation from some of the things that they have seen'); learners are critically acknowledging limitations of those sources in answering the inquiry question (e.g. 127) and recognising that meanings are inevitably partial through their situation within given contexts (e.g. R4: 142). Participants are thus contrasting not only their own and peers' developing perspectives but also the experiences, perspectives and feelings of the creators of the artefacts previously analysed and of their subjects (soldiers). They are putting — and being asked to put — themselves into others' shoes, that is, seeing with their own eyes from another's position ('visiting': Biesta, 2001, p. 398). Use of the digital resources brings further voices into the dialogue and the contributing perspectives span almost a century in time.

4.3. Reflection on the use of SEDA to code the two lessons

This section synthesises the theoretical framework underpinning SEDA with the illustration of its application in the two contexts. Therefore, this is not a discussion of the lessons that have been coded, but rather a discussion of the process of coding them, and a consideration of the affordances and limitations of the scheme in practice.

4.3.1. Levels of granularity

Finding consensus for the most effective units of analysis has not been a simple task. Throughout theoretical discussions, as well as an iterative testing of the coding scheme, the appropriate level of granularity to conduct an analysis of dialogic interactions was found to be the CA. A major effort in the process of developing the scheme has focused on defining accurately each CA code and including its distinctive features. However, the empirical testing of the scheme has highlighted some codes where it has proved to be more challenging to reach consensus around application. In most cases this is resolved by coding at a cluster level. For instance, in the UK example at Line 148, four coders initially disagreed over whether it should be coded as P5 (challenge viewpoint) or P6 (state (dis)agreement/position). For reliability, both codes fall in the P cluster so, at this level, the dialogic move of exploring difference could be captured. A discussion at the CA level provoked consideration of the subtle differences between challenging an argument or assumption made by others, and positioning one's argument in relation to another. This more qualitative analysis and debate allowed for a deeper consideration of the dialogic process in action and enabled us to refine both codes.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Coding longer utterances raised another challenge for the application of the scheme. For some longer utterances with more than one distinct function we split those into two or more numbered lines to apply a different code (Lines 119–120 or 122–123). However, when splitting the utterance was not desirable, the challenge of which CA code to apply was sometimes difficult. This is exemplified in Line 149, a long utterance (145 words) where Lloyd is clearly synthesising previous ideas (P1) and in the middle of its utterance he acknowledges changing his mind (P4) (*I like that Robert and it wasn't what I'd thought of. I thought I was going to write something else on here*). These potential challenges were addressed through establishing a hierarchy for the codes within each cluster, opting to apply the more dialogic codes, although as previously discussed, this is contestable. In the Mexican transcript, where the turns are much shorter, these issues did not occur. Moreover, where participants used explicit language like 'why' or 'because', the coding process was clearer, and definitions were tightened up to require more explicit reasoning for coding R. This relates to Mercer's (2000) where the language of reasoning was seen to indicate 'exploratory talk'. Through keeping 33 codes and qualitatively coding the data, we have been able to make sense of the forms and functions of classroom dialogue, even if this process has involved, in some instances, the subjective judgement of coders.

Finally, whilst there were some advantages related to reliability achieved through coding at a cluster level, looking closely at the CA allowed for a richer interpretation of the data. For example, previous research conducted by Howe, Tolmie, Duchak-Tanner and Rattray (2000) has shown the importance of referring back (C1 in SEDA) to previous ideas as a crucial part of the learning process. In the UK transcript there were eight instances of Cluster C recorded. In fact six of these were C1 'refer back', including two by students. Allocating some hierarchy to the scheme positions the C1 utterances with higher dialogic value than, for example, an invitation to students to pursue their learning outside the classroom (C4). That the students also engage in this activity highlights the nature of the dialogic interaction in the sequence and by coding at a CA level, the subtleties of the dialogue propelling deeper learning engagement were exposed. However, broader consensus about the functions of the utterances could be achieved through coding at the cluster level.

4.3.2. Capturing the complexity of dialogue in a setting

The scheme allowed us to characterise in some detail these two lessons, situated in different cultural and organisational contexts. In the UK lesson the high level of dialogicality was evidenced by the fact that 23% of turns were assigned an explicit positioning/invite positioning code, 30% were coded R and 21% were coded B. 17% were coded C, with participants sustaining the dialogue over time by making links back to prior contributions or resources. The teacher took the stance of a co-learner, also contributing ideas to the discussion. In the Mexican transcript the emphasis was very much on inviting and expressing ideas, elaboration or reasoning (21/52 or 58% turns are I or E, and 16 more are R or B), within a very democratic small group context where students took the floor freely and engaged in dialogue, contributing with short utterances. The teacher used a variety of scaffolding strategies to enhance children's understanding, including, in particular, focusing on certain key aspects of the activity (G5). There is also some evidence in the Mexican excerpt of students guiding the dialogue (G2: 187, 236).

Ironically, though, more dialogic CE often proved to be more difficult to code, as the subtleties of a carefully orchestrated discussion might rely on a glance, gesture or one-worded invitation. Similarly, a communicative act might have several different purposes as described above. A good illustration of this comes from the UK transcript where Lloyd is inviting and encouraging the views of his students. For example, in Line 147 he starts to make a point, then seeing a student with his hand raised invites the student to speak: 'Can I sugge– Ok. Go on Ricky.' After responding to Ricky, and inviting Felix to share his thinking, Lloyd returns to Ricky to bring him back into the discussion and to invite him to compare his view (I2), building on previous contributions (B1). The complexity of Lloyd's orchestration throughout the excerpt is captured at the I cluster level (13 codes) and his invitation to build on and elaborate views via the use of I2 (7 uses) is particularly notable. The content of the talk itself indicates how Lloyd is achieving this goal of including and encouraging participation. This, of course, is a reminder that the context of the discussion is a classroom where the students are commonly used to engaging with each other. The communicative situation of the lesson thus sits within a broader group of lessons, and the relationship between teacher and students is well established. At this point, we are reminded that the CA are 'nested' (Rojas-Drummond et al., 2006) within the global context. The ethos of the dialogic classroom (Alexander, 2008) permeates the discussion, and the whole episode involves comparison and evaluation of perspectives. Currently within the scheme a global descriptor, such as 'Co-constructive talk,' (Rojas-Drummond et al., 2006) is the only way to indicate that a highly complex dialogic interaction is being orchestrated by the teacher, other than the frequency of codes from the I, R and B clusters.

A similar issue was found when coding a highly complex interaction where 'inter-thinking' (Littleton & Mercer, 2013) was apparent. SEDA includes clusters for making reasoning explicit (R), building on one's or others' ideas (B) and positioning (P). However, unless very explicit language is used, it is difficult to attribute the originality of an idea to an individual. For example, in the Mexican transcript (202, 203), Roberto builds on Erik's comment about what the bar graph shows; he does not explicitly say he is adding to Erik's comment, but this is clear from the repetition of the language as he develops the point. Considering the dialogicality of the interaction means great emphasis is placed on the inter-subjectivity of ideas, but in one Bakhtinian sense, all ideas are products of those that have gone before. Attributing ownership of ideas is problematic once these are explored at length, and taken within the context of the discussion as a whole, or indeed the communicative situation in which the discussion sits. In attempting to capture the essentially dialogic elements of the interaction, shorter, less explicit comments are left uncoded, yet still may contribute to the overall discussion, as seen for example in the Mexican transcript (207–210).

Some of this thinking might be of a higher order as students synthesise and attempt to evaluate their own thinking and that of others. At times, this might mean inarticulately expressed comments as the students 'think aloud,' formulating their ideas through their contribution, not composing them beforehand. In the UK transcript this can be seen through the slightly clumsy analogy of a

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

lottery win being difficult to imagine (first expressed by Ricky: 140), which is nonetheless picked up by others and refined. As the students tussle with the concept of imagination and reality, they attempt to formulate their thoughts, but these may not be clearly expressed. The scheme partly allows for this by capturing the function of the CA rather than the utterances as clearly articulated expression of ideas. However, there are often occasions when participants' meanings are not sufficiently explicit to warrant assigning a code. For example, in two turns in the UK transcript (142, 144) there are perceived challenges by students that we deemed too implicit to code P5. In deciding whether or not to code, therefore, inference and over-interpretation need to be monitored.

As highlighted in the theoretical framework section, dialogue is never socially and culturally context-free, and this applies equally to the dialogue between the coders and the transcripts and videos they were coding. Many of the researchers involved in the project have direct experience of teaching and could relate to the dialogic interactions that the teachers and students were engaged in, making inevitable inferences about the goals and intentions of the speakers. Much discussion within the team centred on the degree of inference that was being applied to ensure that the evidence for coding lay within the data, not the coders' own experiences.

4.3.3. The value of the process of coding and interthinking with coders

The discussion above highlights an important affordance of the process of coding using SEDA, in addition to the scheme itself. As we sought agreement and consistency, our own cultural understandings and expectations about dialogic classrooms were emphasised. As we looked in detail at the definitions of the codes, through our application of them to different segments of dialogic interaction, we became aware of the nuances of meaning in our language, in addition to our own co-construction of knowledge as a dialogic interaction — or sometimes not. An opportunity which was proposed but not yet realised, was to record and code our own discussions around the scheme to investigate our own dialogicality.

We discovered that the process of discussing the coding and trying to seek agreement between coders where we had assigned different codes, and sometimes different clusters, was an important part of the project. Familiarity with the coding scheme and the iterative process of moving between video, transcript and the scheme, led us to more profound discussion. A diversity of theoretical and methodological perspectives, research histories and cultural understandings amongst our large international team led us to a more critical reflection on the very nature of dialogic interaction. Our in-depth and extended inter-thinking afforded a genuine synthesis — rather than compromise — across these various perspectives and experiences. We believe this indicates that the tool might gain traction with a broad range of researchers in the field. Furthermore, we hope the project demonstrates the possibility of convergence of perspectives amongst the wider community researching classroom dialogue in order to work towards a more unified message for researchers, practitioners and policymakers concerning the nature of productive classroom dialogue, its value and how to promote it. However, we recognise too that a monologic representation of dialogue is undesirable and we encourage others to critique and adapt the scheme as they see fit.

5. Further avenues

As part of present and future avenues, we are seeking a deeper understanding of dialogue through wider application of the Cam-UNAM SEDA in different social and cultural contexts. In particular, the Mexican team is testing it in contexts that include: preschool children's solving of mathematical problems; primary school children's learning of written communication; high-school students' learning of biological concepts; collaboration and problem solving in adults undergoing professional training; the development of social and communicative abilities in students with special needs; tutoring interactions between higher education students and elementary school children with specific academic and social problems and the promotion of observation skills in university students. The UK team plans to draw on SEDA in an ESRC-funded project (led by Howe, Mercer & Hennessy)[5] investigating the relationship between dialogicality of primary school practice and student learning outcomes and attitudes to school. One of the authors used a preliminary version of the scheme on databases from England, Mexico and Chile to explore cultural differences in the implementation of dialogic teaching in primary classrooms (Barrera-Olmedo, 2015). Researchers in other countries are beginning to use SEDA too. A previous version of the scheme was tested by Chilean researchers in their context; Grau, Calcagni, and Preiss (2015) measured change in teacher practices over a year in response to professional development concerning dialogic teaching. We remain open to further development of the scheme to cope with new cultural contexts of application.

In addition, we are collaboratively developing sub-schemes to address specific educational contexts such as: peer interactions, learning of specific knowledge domains, and uses of digital technology (interactive display boards, computers, tablets) that might support multimodal forms of dialogue. In the technology version of the scheme we offer examples of practice that draw on our earlier research describing how collective knowledge building can be mediated in particular through jointly constructing, critiquing and manipulating digital texts and other artefacts ('improvable objects': Wells, 1999), especially in whole class contexts (Hennessy, 2011; Mercer et al., 2010; Warwick, Mercer, Kershner, & Kleine Staarman, 2010).

The coding scheme also has clear implications for professional development. We are creating a version adapted for practitioners, who can use it as guidance to develop dialogic styles of interactions with their students so as to enrich their teaching-and-learning everyday practices. This version can additionally allow teacher–researchers to chart changes in dialogic styles of interactions over time as well as their impact on students' learning and achievement. Sub-schemes will be available on the project website at http://

[5] *Classroom dialogue: Does it really make a difference for student learning*? Funded 2015-17 by Economic and Social Research Council (ref. ES/M007103/1).

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

tinyurl.com/BAdialogue when finalised. We also intend to develop an accessible, interactive online version of the tool to aid data collection and comparison, to increase reliability and to facilitate use of the scheme by other researchers and practitioners.

While our scheme supports qualitative analysis, quantification of CA may also be desirable; researchers may wish to count frequencies or examine patterns of CA identified or co-occurring. This potentially includes lag sequential analysis measuring probabilities and significance of specific sequential patterns (2 or 3 moves) within large datasets that critically shape the meaning and effect of discourse moves (Lefstein et al., 2015). Researchers might explore how particular CA relate to global descriptors, which can in principle be applied either as present/absent (e.g. 'Manage turns inclusively by shared routines') or via a rating scale, wherever they lend themselves to this. Examples might include 'To what extent is everyone's perspective valued?' or 'To what extent is reasoning visible?' Quantitative data analysis using global descriptors could be applied to all sequences to which a particular descriptor is deemed to apply, regardless of length, or to CE, or to chunks of lesson time equal in length (arbitrarily defined). As with other aspects of scheme application, we leave it to individual researchers to decide how to proceed, including defining their own global descriptors to suit particular theoretical perspectives or research questions. Finally, many researchers are interested in examining the broader picture of dialogue that is being cumulatively developed and maintained across a sequence of observed lessons, and some of the above procedures may assist them with this. SEDA will inevitably develop further over time. We encourage other researchers to try it out in their own contexts and we look forward to dialogue with them.

Open access statement

Acknowledgements

This collaborative work was carried out for a project entitled "A Tool for Analysing Dialogic Interactions in Classrooms" (http://tinyurl.com/BAdialogue) funded through the British Academy International Partnership and Mobility Scheme (ref. RG66509), between January 2013 and December 2015. We are most grateful to colleagues on the project teams who made significant contributions and helpful input during development and testing of the scheme and preparation of the manuscript, including Farah Ahmed, Riikka Hofmann, Christine Howe, Ruth Kershner, Fiona Jackson, Karen Littleton, Neil Mercer, Paul Warwick (UK team); Mariana Alarcón, Nube Estrada, Erika Gil, Kissy Guzmán, Flora Hernández, José Hernández, Haydeé Pedraza, Ana Luisa Rubio, Brenda Itzel Sánchez, Ana Laura Trigo, Maricela Velez (Mexico team). We also thank all of the teachers (especially Lloyd and Tania) and students who participated in our previous research from which examples were taken. We appreciate the support of the Economic and Social Research Council (RES063270081; RES000230825), sponsor of most of the UK team's work in this area over the years.

The Mexican work reported in this paper was supported by the Dirección General de Asuntos del Personal Académico of the National Autonomous University of Mexico (DGAPA-UNAM) (PAPIIT Project Number: IN303313 and PAPIME Number: PE305814) for the years 2013–2015. The authors wish to express their gratitude for this generous support. We would also like to thank the Ministry of Education in Mexico for allowing us to carry out research in several schools for many years. In addition, Professor Sylvia Rojas-Drummond would like to thank the Faculty of Education at the University of Cambridge, UK for hosting her as Visiting Scholar whilst the British Academy project bid was being prepared. Her visiting Scholarship was funded by the National Council of Science and Technology in Mexico (CONACYT Project Number: 160873).

Finally, we are grateful to the two anonymous reviewers whose insightful feedback helped us to improve our draft manuscript.

References

Achugar, E. (2012). *Los textos discontinuos: ¿Cómo se leen? La competencia lectora desde PISA.* México: INEE (Retrieved from http://publicaciones.inee.edu.mx/buscadorPub/P1/D/413/P1D413.pdf).

Agresti, A. (1992). Modelling patterns of agreement and disagreement. *Statistical Methods in Medical Research, 1*(2), 201–218.

Alexander, R. J. (2001). *Culture and pedagogy: International comparisons in primary education.* Oxford: Blackwell.

Alexander, R. J. (2008). *Towards dialogic teaching: Rethinking classroom talk* (4th ed.). York: Dialogos.

Bakhtin, M. M. (1981). *The dialogic imagination: Four essays by M. M. Bakhtin.* Austin, TX: University of Texas Press.

Barrera-Olmedo, M. J. (2015). Cultural differences in the study of dialogic interactions in classroom settings: A comparison of Mexico, Chile and England. (Unpublished Masters thesis) University of Cambridge, Cambridge, United Kingdom.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Biesta, G. J. J. (2001). How difficult should education be? *Educational Theory*, *51*(4), 385–4000.
Bruner, J. (1996). *The culture of education.* Cambridge MA: Harvard University Press, 56–60.
Cazden, C. (2001). *Classroom discourse: The language of teaching and learning.* Portsmouth, NH: Heinmann.
Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.
Craft, A. (2000). *Creativity across the curriculum: Framing and developing practice.* London: Routledge.
Elbers, E. (1996). Cooperation and social context in adult–child interaction. *Learning and Instruction*, *6*(4), 281–286. http://dx.doi.org/10.1016/s0959-4752(96)00016-3.
Feito, J. A. (2007). Allowing not-knowing in a dialogic discussion. *International Journal for the Scholarship of Teaching and Learning*, *1*(1) (Article 5. Retrieved from http://academics.georgiasouthern.edu/ijsotl/v1n1/feito/ij_feito.htm).
Fernández, J. (2014). El dialogismo: secuencialidad, posicionamiento, pluralidad e historicidad en el análisis de la práctica educativa. *Sinéctica Revista Electrónica de Educación*, *43*, 1–21 (Retrieved from http://sinectica.iteso.mx/assets/files/articulos/43_el_dialogismo_secuencialidad_posicionamiento_pluralidad_e_historicidad_en_el_analisis_de_la_practica_educativa.pdf).
Fernández, M., Wegerif, R., Mercer, N., & Rojas-Drummond, S. M. (2001). Reconceptualising "scaffolding" and the zone of proximal development in the context of symmetrical collaborative learning. *Journal of Classroom Interaction*, *36*, 40–54.
Fisher, R. (2007). Dialogic teaching: Developing thinking and metacognition through philosophical discussion. *Early Child Development and Care*, *177*(6-7), 615–631. http://dx.doi.org/10.1080/03004430701378985.
Flavell, J. (1979). Metacognition and cognitive monitoring. A new area of cognitive-developmental inquiry. *American Psychologist*, *34*(10), 906–911.
Freire, P. (1996). *Pedagogy of the oppressed.* London: Penguin.
Gee, J. P., & Green, J. (1998). Discourse analysis, learning and social practice. *Review of Research in Education*, *23*, 119–169.
Grau, V., Calcagni, E., & Preiss, D. (2015). Teacher professional development using classroom videos: effects on dialogic practices. *Paper presented at Biennial conference of the European Association for Research in Learning and Instruction (EARLI), Limassol, Cyprus.*
Hennessy, S. (2011). The role of digital artefacts on the interactive whiteboard in mediating dialogic teaching and learning. *Journal of Computer Assisted Learning*, *27*(6), 463–586. http://dx.doi.org/10.1111/j.1365-2729.2011.00416.x.
Hennessy, S., Mercer, N., & Warwick, P. (2011). A dialogic inquiry approach to working with teachers in developing classroom dialogue. *Teachers College Record*, *113*(9), 1906–1959. http://dx.doi.org/10.1080/13540602.2011.554704.
Higham, R. J. E., Brindley, S., & Van de Pol, J. (2014). Shifting the primary focus: Assessing the case for dialogic education in secondary classrooms. *Language and Education*, *28*(1), 86–99. http://dx.doi.org/10.1080/09500782.2013.771655.
Howe, C. (2010). *Peer groups and children's development.* Oxford: Blackwell. http://dx.doi.org/10.1002/9781444318098.
Howe, C., & Abedin, M. (2013). Classroom dialogue: A systematic review across four decades of research. *Cambridge Journal of Education*, *43*, 325–356. http://dx.doi.org/10.1080/0305764X.2013.786024.
Howe, C. J., Tolmie, A., Duchak-Tanner, V., & Rattray, C. (2000). Hypothesis testing in science: Group consensus and the acquisition of conceptual and procedural knowledge. *Learning and Instruction*, *10*, 361–391.
Hymes, D. (1972). Models of interaction in language and social life. In J. J. Gumperz, & D. Hymes (Eds.), *Directions in sociolinguistics: The ethnography of communication* (pp. 35–71). London: Basil Blackwell. http://dx.doi.org/10.1002/9780470758434.ch1.
Iiskala, T., Vauras, M., Lehtinen, E., & Salonen, P. (2011). Socially shared metacognition of dyads of pupils in collaborative mathematical problem-solving processes. *Learning and Instruction*, *21*, 379–393.
INEE. Instituto Nacional para la Evaluación de la Educación (2015n). *Desempeño de los estudiantes al final de la Educación Medio Superior en PISA 2012.* México: INEE (Retrieved from http://publicaciones.inee.edu.mx/buscadorPub/P1/D/313/P1D313.pdf).
Jefferson, G. (2004). Glossary of transcript symbols with an introduction. In G. H. Lerner (Ed.), *Conversation analysis: Studies from the first generation* (pp. 13–23). Philadelphia: John Benjamins.
Jewitt, C. (2005). Multimodality, "reading" and "writing" for the twenty-first century. *Discourse: Studies in the Cultural Politics of Education*, *26*, 315–331. http://dx.doi.org/10.1080/01596300500200011.
Kazepides, T. (2012). Education as dialogue. *Educational Philosophy and Theory*, *44*(9), 913–925.
Kumpulainen, K., & Lipponen, L. (2010). Productive interaction as agentic participation in dialogic enquiry. In K. Littleton, & C. Howe (Eds.), *Educational dialogues. Understanding and promoting productive interaction* (pp. 48–63). London: Routledge. http://dx.doi.org/10.4324/9780203863510.
Larkin, S. (2009). Socially mediated metacognition and learning to write. *Thinking Skills and Creativity*, *4*(3), 149–159.
Lefstein, A., Snell, J., & Israeli, M. (2015). From moves to sequences: Expanding the unit of analysis in the study of classroom discourse. *British Educational Research Journal.* http://dx.doi.org/10.1002/berj.3164.
Littleton, K., & Mercer, N. (2013). *Interthinking: Putting talk to work.* Abingdon: Routledge.
Maine, F. (2015). *Dialogic readers: Children talking and thinking together about visual texts.* London: Routledge.
Maybin, J. (2003). Voices, intertextuality and induction into schooling. In S. Goodman, S. Lillis, J. Maybin, & N. Mercer (Eds.), *Language, literacy and education: A reader.* Staffordshire, UK: Trentham Books.
Mercer, N. (2000). *Words and minds: How we use language to think together.* London: Routledge. http://dx.doi.org/10.4324/9780203464984.
Mercer, N., & Howe, C. (2012). Explaining the dialogic processes of teaching and learning: The value and potential of sociocultural theory. *Learning, Culture and Social Interaction*, *1*, 12–21. http://dx.doi.org/10.1016/j.lcsi.2012.03.001.
Mercer, N., & Littleton, K. (2007). *Dialogue and the development of children's thinking: A socio-cultural approach.* London: Routledge. http://dx.doi.org/10.4324/9780203946657.
Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, *30*(3), 367–385.
Mercer, N., Hennessy, S., & Warwick, P. (2010). Using interactive whiteboards to orchestrate classroom dialogue. *Technology, Pedagogy and Education*, *19*(2), 195–209. http://dx.doi.org/10.1080/1475939x.2010.491230.
Merleau-Ponty, M. (1968). *The visible and the invisible.* Evanston, IL: Northwestern University Press.
Michaels, S. (2012). Checklist: Goals for Productive Discussions and Nine Talk Moves. *TERC Talk Science Primer* http://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf.
Michaels, S. & O'Connor M. C. (2011). Coding guide for teacher talk moves. [Coding manual]. Unpublished Instrument. Pittsburgh Science of Learning Center, PA.
Michaels, S., & O'Connor, C. (2013). Conceptualizing talk moves as tools: Professional development approaches for academically productive discussion. *Socializing intelligence through talk and dialogue.* Washington DC: American Educational Research Association.
Michaels, S., O'Connor, C., & Resnick, L. B. (2008). Deliberative discourse idealized and realized: Accountable talk in the classroom and civic life. *Studies in Philosophy and Education*, *27*(4), 283–297.
Mortimer, E. F. (2005). *Dialogic and authoritative discourse: A constitutive tension of science classroom.* Universidade Federal de Minas Gerais. ICAR–CNRS–Université Lumière Lyon 2 (Retrieved from http://icar.univ-lyon2.fr/ecole_thematique/analyse_video/documents/Dialogic_and_authoritative_discourse.pdf).
Müller-Mirza, N., & Perret-Clermont, A. N. (Eds.). (2009). *Argumentation and education: Theoretical foundations and practices.* Dordrecht, Heidelberg, London, NewYork: Springer.
Myhill, D. (2006). Talk, talk, talk: Teaching and learning in whole class discourse. *Research Papers in Education*, *21*(1), 19–41. http://dx.doi.org/10.1080/02671520500445425.
Nystrand, M., Wu, A., Gamoran, A., Zeiser, S., & Long, D. A. (2003). Questions in time: Investigating the structure and dynamics of unfolding classroom discourse. *Discourse Processes*, *35*(3), 135–198. http://dx.doi.org/10.1207/s15326950dp3502_3.
Osborne, J., Berson, E., Borko, H., Busch, K. C., Zaccarelli, F. G., Million, S., & Tseng, A. (2015, Aug 25–29,). Assessing the quality of classroom discourse in science classrooms. *16th biennial conference of the European Association for Research in Learning and Instruction, Limassol, Cyprus (751).*
Pianta, R. C., & La Paro, K. M. (2003). *Classroom assessment scoring system: Guide and training manual.* Charlottesville: University of Virginia.
Renshaw, P., & Brown, R. (1999). Relating everyday and scientific discourse in the classroom: Interweaving, replacement, or pastiche? *8th biennial conference of the European Association for Research on Learning and Instruction, Goteborg, Sweden, (413–415). 24–28 Aug, 1999.*

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001

Resnick, L. B., Michaels, S., & O'Connor, C. (2010). How (well structured) talk builds the mind. In D. Preiss, & R. Sternberg (Eds.), *Innovations in educational psychology* (pp. 163–194). New York, NY: Springer.
Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* Oxford: Oxford University Press.
Rojas-Drummond, S. M. (2000). Guided participation, discourse and the construction of knowledge in Mexican classrooms. In H. Cowie, D. van der Aalsvoort, & N. Mercer (Eds.), *Social interaction in learning and instruction: The meaning of discourse for the construction of knowledge* (pp. 193–213). Exeter: Pergamon Press.
Rojas-Drummond, S. M., & Mercer, N. (2003). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research*, *39*(1-2), 99–111. http://dx.doi.org/10.1016/S0883-0355(03)00075-2.
Rojas-Drummond, S. M., Mazón, N., Fernández, M., & Wegerif, R. (2006). Explicit reasoning, creativity and co-construction in primary school children's collaborative activities. *Journal of Thinking Skills and Creativity*, *1*(2), 84–94.
Rojas-Drummond, S. M., Pérez, V., Vélez, M., Gómez, L., & Mendoza, A. (2003). Talking for reasoning among Mexican primary school children. *Learning and Instruction*, *13*(6), 653–670. http://dx.doi.org/10.1016/S0959-4752(03)00003-3.
Rojas-Drummond, S., Littleton, K., Hernández, F., & Zúñiga, M. (2010). Dialogical interactions among peers in collaborative writing contexts. In K. Littleton, & C. Howe (Eds.), *Educational dialogues: Understanding and promoting productive interaction* (pp. 128–148). Abingdon, Roxon: Routledge.
Rojas-Drummond, S., Torreblanca, O., Pedraza, H., Vélez, M., & Guzmán, K. (2013). 'Dialogic scaffolding': Enhancing learning and understanding in collaborative contexts. *Learning, Culture and Social Interaction*, *2*(1), 11–21. http://dx.doi.org/10.1016/j.lcsi.2012.12.003.
Saville-Troike, M. (2003). *The ethnography of communication: An introduction* (3rd ed.). Oxford: Blackwell Publishing Ltd.
Sedova, K., Salamounova, Z., & Svaricek, R. (2014). Troubles with dialogic teaching. *Learning, Culture and Social Interaction*, *3*(4), 274–285.
Sidorkin, A. (1999). The fine art of sitting on two stools: Multicultural education between postmodernism and critical theory. *Studies in Philosophy and Education*, *18*(3), 143–156.
Soter, A. O., Wilkinson, I. A., Murphy, P. K., Rudge, L., Rennger, K., & Edwards, M. (2008). What the discourse tells us: Talk and indicators of high-level comprehension. *International Journal of Educational Research*, *47*(6), 372–391.
Van de Pol, J., Volman, M., & Beishuizen, K. (2010). Scaffolding in teacher–student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296.
Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.
Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.
Warrens, M. J. (2014). New interpretation of Cohen's kappa. *Journal of Mathematics*, 203907. http://dx.doi.org/10.1155/2014/203907.
Warwick, P., Mercer, N., Kershner, R., & Kleine Staarman, J. (2010). In the mind and in the technology: The vicarious presence of the teacher in pupils' learning of science in collaborative group activity at the interactive whiteboard. *Computers & Education*, *55*(1), 350–362. http://dx.doi.org/10.1016/j.compedu.2010.02.001.
Wegerif, R. (2007). *Dialogic, education and technology: Expanding the space of learning.* New York: Springer. http://dx.doi.org/10.1007/978-0-387-71142-3.
Wegerif, R. (2010). Dialogue and teaching thinking with technology: Opening, expanding and deepening the 'inter-face'. In K. Littleton, & C. Howe (Eds.), *Educational dialogues: Understanding and promoting productive interaction.* Abingdon, Oxon: Routledge.
Wegerif, R. (2011). Towards a dialogic theory of how children learn to think. *Thinking Skills and Creativity*, *6*(3), 179–190.
Wegerif, R., McLaren, B. M., Chamrada, M., Scheuer, O., Mansour, N., Mikšátko, J., et al. (2010). Exploring creative thinking in graphically mediated synchronous dialogues. *Computers & Education*, *54*(3), 613–621.
Wells, G. (1999). *Dialogic inquiry: Toward a sociocultural practice and theory of education.* Cambridge: Cambridge University Press.
Wells, G., & Arauz, R. M. (2006). Dialogue in the classroom. *The Journal of the Learning Sciences*, *15*(3), 379–428. http://dx.doi.org/10.1207/s15327809jls1503_3.
Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.
Wertsch, J. V. (1991). *Voices of the mind: A socio-cultural approach to mediated action.* Cambridge, MA: Harvard University Press.
Wolfe, S. (2006). Teaching and learning through dialogue in primary classrooms in England. Unpublished PhD thesis, University of Cambridge.
Wood, D. J., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *The Journal of Child Psychology and Psychiatry*, *17*(2), 89–100.

Please cite this article as: Hennessy, S., et al., Developing a coding scheme for analysing classroom dialogue across educational contexts, *Learning, Culture and Social Interaction* (2016), http://dx.doi.org/10.1016/j.lcsi.2015.12.001