

ANALYSIS OF INTERACTIONS IN A COLLABORATIVE CONTEXT OF PROFESSIONAL DEVELOPMENT

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We consider that the processes of interaction in a collaborative context of professional development have a significant influence on the degree of involvement of one of the participating teachers, and modulate the influence the context exerts on her professional development. We present an instrument for the analysis of interactions, which was developed in the course of this research and which aims to capture the dialogical nature of the discourse through three defining features distributed across six columns: the unit of information (utterance); the co-participants (the teacher and Interactant); and the contexts providing the sense of each contribution (Episodes, Action and Nature of the action). We also include a column for Content to complete the analysis with the epistemological input of each contribution to the discourse.

Keywords: analysis of interactions, collaborative context, professional development, dialogical approach, mathematics education.

INTRODUCTION

This paper is part of a longitudinal study researching the professional development, in terms of mathematics teaching, of new entrant into primary teaching participating in a collaborative research project (PIC) (Muñoz-Catalán et al., 2007).

The collaboration is composed of two experienced primary teachers, three researcher-trainers, and Julia, the subject of the study (from her first year of teaching onwards). The group meets once a fortnight for three hours, during which tasks are carried out with the aim of deepening understanding of our own classroom practice, as well as the learning and the teaching of mathematics from a problem solving perspective. Until now, this project had remained the background to our studies, constituting a privileged source for data gathering (Climent & Carrillo, 2002). In the case of Julia, however, given the relevance that this project has proved to have for understanding her professional development, the analysis of Julia's interactions within the group has emerged as a key element for understanding not just the what, but also the how of said development. We believe that in and through the interaction, Julia goes about constructing her interpretation of the suggestions, critiques and knowledge brought into play, an interpretation which moulds the formative potential of the PIC.

So as to analyse Julia's interactions in the group, we have devised an instrument which is presented in this paper, and which we refer to as IMDEP (the Spanish acronym for Instrument for the analysis of Teacher's Interaction in a context of Professional Development). It has been devised during the research process

following our methodological perspective of allowing the data to speak (Strauss & Corbin, 1998), and consonant with our dialogic perspective of the discourse (Linell, 2005).

A DIALOGIC APPROACH TO THE ANALYSIS OF THE DISCOURSE

We consider that knowing implies an interaction with the object of knowledge, through which the subject interprets and reconstructs the meanings in play in the process. Following G. H. Mead and J. Dewey (in Corbin & Strauss, 2008), knowledge is created through action and interaction, for which reason we attribute a relational nature to it. According to this perspective, we can identify cognition with communication in that the interaction is an essential requirement for each to develop. While communication necessarily requires an interpersonal exchange, cognition can occur in solitary activities such as reading, in which the interaction is with the text. Communication and cognition, then, are two aspects of the same phenomenon, and are dialogically interlinked (Linell, 2005).

Our interest in Julia's construction of meaning activities within the group led us to approach the analysis of interactions with a dialogic conception of discourse (Linell & Marková, 1993, Linell, 1998, 2005). We recognise that people's responses to others' actions depend on the meaning they attribute to them. From this perspective, human dialogue is more than the sum of individual discourse acts; it is a sequence of activities with the aim of establishing mutual understanding on the topics under discussion. In this sense it is a question of shared activities, coordinated amongst all the members and mutually interdependent (Linell & Marková, 1993; Marková & Linell, 1996). The semiotic mediation acquires a key place in the communication, which "*may be understood as some kind of abstract third party in the dialogue*" (Linell, 2005, p. 10).

The relation between discourse and its context is one of interdependence: a particular discourse derives a large part of its sense from the specific context, but at the same time "*these contexts would not be what they are in the absence of the (particular) discourse that takes place within them*" (Linell, 2005, p. 7). This interdependence is established at two levels: on one hand, the specific time and place in which the interaction takes place (situation); on the other, the sociocultural praxis governing the specific situation. This is what Linell (2005) refers to as the double dialogicality of discourse.

Following the dialogical approach (Linell, 2005), the principle features we can attribute to conversation are interaction, context and the joint construction of meaning, semiotically mediated.

THE INSTRUMENT FOR ANALYSING INTERACTIONS: IMDEP

We can understand professional development as defined by an increased awareness of the factors bearing upon educational phenomena and contributing to a better understanding of one's own practice (Krainer, 1999). Practice becomes a source for development when the teacher becomes actively involved in the process of questioning their own practice (Jaworski, 1998), and develops a critical, reflexive attitude. In this conceptualisation, reflection becomes medium and referent of the development (Climent, 2005; Llinares & Krainer, 2006).

Analysing Julia's interactions in the PIC allows us to focus on her construction of meaning within the frame of shared construction. Our focus, then, is not on the result of this social construction, but rather the individual processes of construction within the said social construction. We concur with recent studies, such as Llinares & Krainer (2006) point out, in considering contextual and organisational elements as key to accounting for teachers' learning.

This analysis leads to a better understanding of how reflections deriving from the group influence individual understanding and performance. The features of Julia's contributions to the discourse provide clues to the meanings which she attributes to the joint understanding under negotiation at each stage of the conversation.

Development, structure and features

This instrument emerged during the research process in close relation with the data (Strauss & Corbin, 1998). Our focal point was Julia, and hence our analysis of interactions centred on her contributions to the discourse. In the same way that dialogical properties can be attributed to a single contribution to the discourse, without considering previous and subsequent contributions (Linell & Marková, 1993), so can they equally be applied to the set of contributions by a single member, namely Julia.

Audio recordings are made of all the PIC sessions and fully transcribed, recording the contributions of all members. The transcription does not include gestures, but provides a verbatim record of all spoken language, along with all information concerning the discourse relevant to our understanding. The presence of the researcher in the PIC sessions ensures a better interpretation of each contribution, given that the dialogue is constructed in and through the processes of interaction and in relation of interdependence with the contexts.

With respect to analysing Julia's contributions to the discourse, we were interested in recording to whom they were directed, in what moment of the session, the form in which the action was expressed, its nature and the content it conveyed. These concerns became questions which guided the close inspection of the data, and which resulted in the instrument below:

Utterance	Episodes	Julia	Action	Interactant	Nature of the action	Content

Instrument for analysing Julia's interactions in the discourse in a training context

The instrument aims to capture the dialogical nature of the discourse, and covers the three key elements felt to be intrinsic to all the interaction: the unit of information (the column labelled *Utterance*), the co-participants (*Julia* and *Interactant*), and the context which provides the meaning of each contribution (*Episodes*, *Action*, *Nature of the action*). An additional column, *Content*, was added in the interests of linking the sociological aspect of each intervention to its epistemological contribution to the dialogue.

We consider the contribution as the basic unit of interaction, equivalent to the turn with respect to dialogue (Linell, 1998). A numerical code was assigned to each of Julia's contributions, indicating the order in which each appeared in the discourse. This code is the content of the *Utterance* column.

The columns *Julia* and *Interactant* refer to the co-participants in the communicative exchange under analysis at any particular moment. Each contribution must be understood in its sequential environment (Linell & Marková, 1993) as it is dependent on previous and subsequent contributions. As a result, we understand the participant at in each turn to be both emitter of their own contribution and receiver of the previous contributions of others (including those not specifically directed at them). Nevertheless, when we broke the group interactions down into contributions during the analytical process, we identified two types of operational interlocutors for each of them: the person originating the contribution, that is Julia in all cases so far as this study is concerned, and the addressee of the contribution, whom we designate with the generic label interactant (whether the group as a whole or some member(s) of it).

The transcript for each session was also analysed from the point of view of content, with units of information being identified. The code for these units corresponding to each contribution comprises the column *Julia*. Whilst it might be observed that this column could be substituted for that of *utterance*, given that it is essentially a new way of codifying the same contribution, each column nevertheless fulfils different analytical aims: the *utterance* column focuses on each contribution from a discursive perspective; the *Julia* column locates Julia's contributions with a view to analysing their content and so serves as a bridge between analysis of the interactions and analysis of the content (both at different moments of analysis, but subsequently integrated into a joint interpretation).

We now turn our attention to the third item we have highlighted as key to the processes of interaction – the context (as reflected in the columns *Episodes*, *Action* and *Nature of the action* in the instrument).

We are aware of the variety of factors which influence and interact with each other at each moment of the interaction. Strauss & Corbin (1994) represent this influence as a

conditional matrix, formed by concentric circles corresponding to distinct aspects of the world: “*In the outer rings stand those conditional features most distant to action/interaction; while the inner rings pertain to those conditional features bearing most closely upon an action/interaction sequence*” (p. 275). Out of all the circles we are interested in those that are most germane to each session and at each moment of the interaction. This leads us, on one hand, to structure each session into *Episodes*, and on the other, to consider the sequential environment, that is, the simultaneous dependence of each utterance on the adjacent contributions (*Action* and *Nature of the action*). The activity frame (represented in *Episodes*) and the sequential environment together comprise the double contextuality of each contribution (Linell & Marková, 1993; Linell, 1998).

We define *Episode* as any segment the session can be divided into which coincides with a change in activity or in the aim of the work being undertaken. In the case of an episode being particularly long, or involving various self-contained discussions, we then divide it into sub-episodes, consistent with Schoenfeld’s (2000) procedure for video analysis.

The *Action* column refers to the kind of response Julia makes to previous utterance, emphasising the responsive nature of each contribution. Given that the actions are defined by their contextual relations, we conceive the action as an inter-action (Linell & Marková, 1993). Four different actions emerged during the course of analysis:

<u>Respond</u>	The act of reciprocating appropriately to what has been asked, including those questions expressed in an indirect way.
<u>Ask</u>	The act of questioning another in order to ascertain their opinion or knowledge of some topic; indirect questions are also included.
<u>Answer</u>	The act of replying to statements directed specifically to her.
<u>React</u>	The act of providing a response to a statement which is not specifically directed at her. This category includes both responses which contribute to the overall communicative goal in hand and those which are autonomous.

Table1. Principle actions deriving from the analysis

Although we consider that all contributions imply an active interpretation on the part of the emitter, this latter can adopt a role which is receptive with respect to others’ turns, that is a *responsive role* (when responding or answering), or one which impulses or promotes new turns, that is an *initiator role* (when asking and reacting). Hence, these inter-actions provide an indication of the degree of initiative and the role adopted by Julia in the unfolding of the discourse.

The column *Nature of the action* seeks to capture the communicative function of each contribution to the discourse. Although we recognise the multifunctionality of these (Linell & Marková, 1993), we have generally chosen the one (or ones) which we consider best capture Julia’s role in the discourse dynamics at each specific point.

Unlike the *Action* column, here we realise an interpretative rewriting of each contribution, headed by the verb which better describes its function in the discourse. A list of the verbs which emerged during the course of the analysis was compiled, from the definitions of which we then selected the usage applicable to Julia's contributions (see appendix).

Below is an extract from the table for analysing interactions, corresponding to a PIC session in which a video of Julia's practice is analysed.

Int.	Episodes	Julia	Action	Interactant	Nature of the action	Content
62	Continuing the analysis of G7, begun in the previous session	S8. 78	Answers	Researcher-trainer (R) 1	Agrees that the activity was difficult and that the pupils were tired and did not yet have the left/right distinction fully assimilated.	Difficulties that she associates with the activity
63		S8. 79	Responds	R2	Points out the objectives of the worksheet	Objectives of the worksheet
64		S8. 80	Reacts	R1	Points out that besides taking the objectives from the book, as other teacher affirms, she also adds her own.	Objectives of the worksheet
65		S8. 81	Asks	R1	Understands what he is asking about.	
66		S8. 81	Responds	R1/Inés (experienced teacher)	Evades direct answer. Explains other occasions in previous years when she had tackled the topic.	

Example of the use of the IMDEP instrument

Given that it is an instrument for analysing interactions in a context of professional development, an analysis of the discursive dynamics of the interactions is insufficient without the addition of the epistemological contribution of each turn to the discourse. For this reason we have included the *content* column, in which we briefly outline what each contribution deals with, like a signpost for later interpretation.

THE INFLUENCE OF THE PIC IN PROFESSIONAL DEVELOPMENT THROUGH THE ANALYSIS OF INTERACTIONS

The PIC, as a collaborative environment structured according to the principles of professional development rather than training (Ponte, 1998), exerts its influence through the joint pursuit of professional activities through means of debate and reflection. In this context, Julia was not required to assimilate the knowledge and information transmitted by others, but rather to participate in the collective

construction of meanings which takes place in the interaction – a construction which is assimilated by Julia via a new personal interpretation.

Julia's processes of assigning meaning are mediated by various factors and are produced in and through the interaction. Some of these factors are inherent in Julia herself, others are characteristic of the PIC and its members, but all of them operate concomitantly with others which arise in and are determined by the interaction. It is in the interaction that the role of Julia within the group is defined, along with the degree of confidence she establishes with each member, the image she has of them and they of her, and so on, aspects which influence how Julia accepts the reflections, opinions, suggestions and critical analyses about her practice. In short, we consider that the processes of interaction determine the extent to which Julia is involved in the group and hence, mediate the role which the PIC has in her reflection and professional development.

Our instrument of analysis provides us with information on:

- At what points in the session Julia tends to contribute and the degree of involvement towards her professional development within the group.

- Whether she tends to act on her own initiative or in response to others' turns explicitly directed to her; that is, the way in which her role develops during the course of the interaction (initiatory or responsive).

- Whose critical comments she receives best and whose she seems not to accept; likewise, towards whom she shows a greater interest in knowing their thoughts or opinions. What features characterise the contributions of these members such that these reactions happen.

- After or before whom she usually contributes and why.

- Depending on the episode or activity to be done, what functions predominate in Julia's contributions; in addition, the relation between the function of her actions and the people to whom they are directed.

- The relation between the actions and the nature of the contributions and the episodes framing them. For example, whether there is a difference in Julia's contributions when a video of herself, or of the other teacher, is analysed.

- The relation between the characteristics of her contributions and the content under discussion at any moment. What kind of content would she seem to give more importance to according to the predominating function or action.

It can be seen from this perspective that the analysis of interactions allows us access to the meanings which Julia constructs and which she attributes to the various contributions at each point in the conversation, providing us with clues as to how the PIC shapes her professional development. Consequently, we feel that the interactions are the means through which Julia develops in the group and in turn the point of reference by which we as researchers gain access to how the PIC exerts its influence.

CONCLUSION

This paper presents the instrument for the analysis of Teacher's Interaction in a context of Professional Development, which has been developed in the course of the research we are conducting. The IMDEP shows itself to be a useful tool for accessing and understanding the meaning that Julia constructs at each point of the interaction, with a view to gathering clues to the role that the PIC plays in her professional development. We have explained the theoretical grounding of the instrument, both from the perspective of our epistemological position and from our dialogical conception of discourse (Linell, 1998, 2005).

The IMDEP represents a contribution in three senses: first, our interest does not lie with the communication between students working on groups or between the teacher and students as is usually the case in the research literature (Bjuland, 2004; Cobb et al., 1997), but rather it lies in the interactions between educational professionals in a context of professional development. Secondly, the adoption of dialogical approach to the analysis of interaction tends to involve an interest in the joint construction of knowledge taking place in the group, in place of the attribution of meaning of one member participating in the group, as is our case. Finally, we aim to establish a relation between the interactions arising at each point of the communicative flow of the PIC and the extent of its influence on professional development, which allows us to gain insights into how social contexts operate upon it.

We intend to continue deepening in the analysis of interactions in contexts of professional development and making improvements to our instrument. In future papers we hope to illustrate and discuss examples of how the IMDEP is helping us to understand how the PIC is having an influence in Julia's professional development.

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APPENDIX: NATURE OF THE ACTION (ORGANIZED BY ACTIONS)¹

RESPOND		
Accept	Confirm	Inform
Clarify	Disagree	Show openness
Analyse	Explain	Propose
Offer idea	Express doubt	Reaffirm
Agree	(Re)formulate	Reject
Joke	Indicate	Recognise
Express lack of knowledge		
Deny		
Evade response: Avoid an awkward question or one to which the addressee lacks a reply (assigned together with Offer idea, Agree, Explain and Reaffirm)		

ASK		
Know: Hear or obtain information about something		
Understand: comprehend		
Question	Request confirmation	Propose
Provoke		

REACT AND ANSWER

Accept	Express doubt
Clarify	Express surprise
Analyse	Reformulate: Reduce a proposition to clear and simple terms.
Offer idea	Point out: Briefly give information or an opinion.
Agree: State truth or appropriacy of previous affirmation or proposition.	Inform
Joke: Express own idea humorously, point out nonsensical aspect of some previous utterance, or respond ironically to an utterance.	Show openness: Display a favourable attitude towards carrying out a proposed or an assigned action.
Comment on	Request confirmation: Request further proof of veracity of an idea or the acceptance of a suggestion, idea or proposal.
Confirm	
Correct	Propose
Question: Challenge the basis of an affirmation, suggesting the reasons and foundations.	Reaffirm: Ratify what has been said. Explain one's own response, arguing in favour of a position which appears not to be accepted or shared by the others.
Disagree	Reject
Explain	Recognise

¹ Only the verbs with a particular nuance in the context of this paper, or which can have several meanings, are defined here.