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Authentic questions as prompts for productive and constructive sequences: A pragmatic approach to classroom dialogue and argumentation

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Abstract

Goal. *The problem of the authenticity of teacher questions has not received sufficient attention from educational researchers interested in the intersection between dialogue and argumentation. In this paper, we adopt a definition of authentic questions as dialogical units that prompt teacher-student interactions that are both productive (i.e., several students participating) and constructive (i.e., students produce arguments of high complexity). Our goal is to analyze whether and how specific types of dialogue prompts can encourage students' engagement in more sophisticated argumentative interactions, as manifested through the construction of high-complexity arguments.*

Method. *We describe the implementation of our analytical approach to a large corpus of classroom interactions from five European countries. The corpus was segmented into dialogical sequences, which were then coded according to the argumentation dialogue goal expressed in the sequence. We also coded students' arguments according to Toulmin's elements and distinguished between low- and high-complexity arguments from a structural point of view.*

Findings. *Our findings show the predominance of the so-called Discovery questions as prompts that are both productive and constructive and Inquiry questions as prompts of argumentative constructive interactions. We discuss the importance of these findings for teacher professional development purposes.*

Keywords: authenticity, dialogue, argumentation, Toulmin, Walton

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Introduction

Teacher questioning techniques have been the focus of extensive research since the last century, which showed a lack of authenticity and the predominance of a pre-defined, ready-to-use, and not an open-to-dialogue pattern, known as Initiation-Response-Evaluation, henceforth IRE (Lemke, 1990; Mehan, 1979; Sinclair & Coulthard, 1975). Although IRE has served as a basis to represent the regularities and cohesion of moves in educational contexts (Howe et al., 2019; Khong et al., 2019; Littleton & Howe, 2010a), its use in educational research and classroom interventions and, more importantly, its limitations thereof, revealed the problem of a shared definition of what counts as a dialogical interaction (Bohm, 1996; Nikulin, 2010). Can dialogues be analyzed and stimulated through discourse structures? How are participants' dialogical dispositions and values related to dialogical engagement? What are the defining features of a dialogue, and is its outcome one of them? Answers to these debated questions involve philosophical, linguistic, and pragmatic considerations that need to be woven together (Bunt, 2000; Ganesh & Holmes, 2011; Kecskes, 2017).

These complex theoretical questions underlie a very practical problem in education, namely determining the conditions that affect the quality of classroom dialogues (Howe & Abedin, 2013). The general definition of productive dialogue as a dialogue in which students actively construct understandings from the possibilities presented (Littleton & Howe, 2010b, p. 6) leaves out an important dimension of dialogicity (Hähkiöniemi et al., 2019; Linell, 1998), which is students' development of accountable thinking and reasoning (Michaels et al., 2008). On the other side of the classroom dialogue research continuum, argumentation scholars emphasize the need to look for arguments-as-products of reasoning with others as an indicator of classroom discourse quality (see, for instance, Kuhn, 2015; Reznitskaya et al., 2008). Although such approaches have often been characterized as highly instrumental (Matusov, 2009), as they consider dialogue as a means to argumentative reasoning, they are proven useful when it comes to teaching teachers how to create and maintain a productive discourse classroom environment (see for instance, Osborne et al., 2019; Webb et al., 2008). The two fields, namely dialogic pedagogies, on the one hand (aiming, in general, at the creation of norms and conditions that foster genuine interactions and inquiries between teachers and students and among students alike), and argument-based pedagogies, on the other (aiming, in general, at the reasoning by-products of a productive classroom dialogue), are complementary in view of fostering classroom interactions that are both inclusive and sophisticated.

One problem that cuts across the fields of dialogic and argument-based pedagogies is defining the type of questions-prompts that elicit high-quality student talk. The dialogic teaching efforts of performing dialogue facilitatory moves, such as uptakes, revoicing, mirroring, etc., are normally studied independently of the effect they may have on students' talk. When the two aspects (teachers' efforts and students' talk) are studied together, the focus is on students' dialogic learning outcomes, such as elaborations and queries (Hennessy et al., 2021; Howe et al., 2019; Vrikki et al., 2019). Moreover, most of the studies are dialogue-oriented, in the sense that they focus on the process of developing arguments rather than the quality thereof. However, to understand how and to what extent students' talk is of high quality – and thus whether the teachers' moves actually affect students' argumentative discourse – it is necessary to analyze the complexity of the reasoning manifested in their arguments.

This paper focuses on the interrelationship between teachers' dialogue prompts and students' reasoning outputs. More specifically, our goal is to analyze whether and how specific types of dialogue prompts can encourage students' engagement in more sophisticated argumentative interactions, as manifested through the construction of high-complexity arguments. To fulfill this goal, we propose the present exploratory study grounded on three different aspects of classroom dialogue analysis: (a) Dialogue quality of whole-class dialogical sequences, defined as productive dialogues (as defined by the number of students participating with arguments), constructive dialogues (as defined by the higher complexity of arguments produced), or both productive and constructive dialogues (Rapanta & Felton, 2022); (b) Types of dialogue prompts, based on Walton's (2010, 2022) argumentation dialogue types (explained below); and (c) Types of student arguments, analyzed in terms of their structural complexity based on Toulmin's (1958) Argument Pattern.

Our work has three basic objectives. First, we intend to provide a dialogical classification of the questions used by the teachers to interact with students, operationalizing their detection and use and empirically identifying the types of prompts that can lead to and stimulate dialogues of higher argumentative quality. This analysis aims at operationalizing the concept of "authentic questions" normally used in education. Second, from a practical point of view, this classification can become a useful tool for teachers to develop their dialogical activities in the classroom. Finally, from an academic perspective, the use of argumentation theories for addressing a crucial issue in dialogical pedagogy (the use of questions) and the relationship between questions, dialogues, and arguments can show how the two fields of dialogical pedagogy and argument-based teaching can be considered as complementary to each other in some crucial respect. Even though the former is focused on the process and the dialogical exchanges and the second on a specific product of dialogues (the arguments), the instruments and the perspectives of the two approaches are not incompatible – indeed, they can be integrated and developed for both practical and theoretical purposes.

Literature review

Research on the relationship between dialogical activities and learning has led to the development of the broad field of dialogic pedagogy (Wegerif et al., 2020; Wilkinson et al., 2017). Different trends and currents characterize this area, as well as theoretical foundations (Baktinian, Vygotskian, Freirian, Habermasian, among others), so it is maybe more correct to speak about dialogic pedagog*ies* rather than using one definition that fits all purposes. Rather than focusing on the differences among dialogic pedagogy scholars, which is not among our goals (you may see Asterhan et al., 2020; Kim & Wilkinson, 2019, for useful insights on such diversity), we will briefly overview some commonly accepted distinctions, which will serve as the basis for outlining our approach to classroom dialogue. After that, we will focus on a central aspect of it, which is teacher questions-prompts, and the problem of defining their authenticity.

Our approach to classroom dialogue

The first distinction that characterizes research on educational dialogue is between *classroom dialogue* and *classroom interaction*. While dialogues are interactive, interactions are not necessarily dialogic: a teacher-students interaction, for example, can be authoritative (and not dialogic) when one meaning [the teacher's one] is presented as true. This interactive scenario does not allow the expression of other points of view, and the students cannot make sense of the teacher's discourse by setting their "own answering words to the words of the teacher" (Mortimer & Scott, 2003, p. 122). This distinction is successfully grasped by Mercer's (1995) distinction of three types of classroom interactions: the disputational, which is interactive but not dialogical, as participants do not share a common goal; the cumulative, which is dialogical but not interactive, as participants are not interested in interanimating their ideas; and the exploratory, which is both dialogic and interactive, as participants engage critically and constructively with each other's ideas.

A second difference is drawn between *classroom dialogue* and *classroom talk*. A talk is not necessarily a dialogue – only when it meets specific characteristics. An example is the "accountable talk," which is defined by the participants' use of certain talk moves that instantiate a culture of deliberation, therefore, a culture of dialogue (Resnick et al., 2010). This talk instantiates reasoned, socialized discourse and thus manifests a high-quality dialogue. The disputational talk mentioned above is an example of a non-dialogue, as certain dialogue norms are not respected. An example of cumulative talk is a low-quality dialogue, as the focus is not on the construction of shared meanings and their negotiation thereof, which is a key aspect of dialogue (Banathy & Jenlink, 2005).

Third, not all classroom talk/interaction events are *dialogically the same,* as authentic dialogue can be manifested in some events while in others it may not emerge or appear in lower degrees. Certain moments are more productive or constructive than others, depending on the participants' compliance with the implicit or explicit norms of discussion and reasoning. For example, participants may differently abide by discussion norms such as the conversational ground rules (Mercer & Howe, 2012), mirroring Alexander's dialogic teaching principles of collectivity, reciprocity, and supportiveness (Alexander, 2018). Also, they can apply – to different degrees – reasoning norms, such as the epistemological norms governing argumentative discourse and dialogue. These norms are gradually internalized while children and adolescents engage in dialogic argumentation. For example, students may use strategical meta-argument statements criticizing, defending, or just considering the merits of a specific argument (Zillmer & Kuhn, 2018).

To understand which moments of dialogue are more dialogic than others, it is possible to distinguish between two different perspectives. From a dialogic Vygotskian approach, certain moves are considered better than others because they result in a higher dialogue quality. In contrast, from a teleological Vygotskian approach, certain moves are considered to be more productive than others because they lead to better dialogue outcomes (for the distinction between dialogic and teleological perspectives, see Clarà, 2021). A common aspect between these two approaches is that dialogue quality/productivity is grasped by similar processes or outcomes such as the level of *interthinking* – or the development of a dialogue on previous contributions (Littleton & Mercer, 2013; Mercer, 2002); the presence of *sophisticated arguments* – namely claims supported by clear evidential support and explanations of the links between the claim and the support (McNeill, 2011); or the manifestation of *metadialogue* or *metatalk*, namely the talk about the quality of the dialogue itself (Krabbe, 2003; Newman, 2017).

In this study, we adopt a teleological Vygotskian approach to classroom dialogue, focusing on those dialogue moves that are more productive or constructive than others because of their facilitation of students' participation in the construction of arguments. We understand that other dialogue by-products, such as students' uptakes or expansions of others' contributions, are also important; however, we focus our attention on students' arguments. These are defined considering the shared and common definition used in argumentation theory as "a social and verbal means of trying to resolve, or at least to contend with, a conflict or difference that has arisen or exists between two (or more) parties" (Walton, 1990, p. 411). Argumentative moves are thus captured by considering the disputable nature of the subject matter (Labov & Fanshel, 1977), and include any expression of a justification, reason, or comparison between arguments about an issue at hand, which moves the dialogue forward (see also Hennessy et al., 2016; Macagno et al., 2022).

Moreover, we adopt a pragmatic analytical approach to educational dialogue (see, also, Rapanta & Macagno, 2022), according to which for a dialogue to exist, participants' shared goal should be manifested through discourse, so that a dialogue can be defined as a certain activity type (Levinson, 1992), such as an inquiry, a negotiation, a deliberation, a persuasion, etc. (see Walton, 2022, 2010 for a typology of argumentation dialogues). For such a decision to be taken *a posteriori*, namely what is the participants' shared goal in a classroom dialogue transcript[1], analysts may look for specific dialogue moves that initiate a micro-dialogue on a particular topic and decide which dialogical intention of all parties involved predominates in discourse. In practice, this may mean that a participant, e.g., a teacher, initiates a sequence with the goal of having students persuade each other about an issue, but the other party, in this case the students, may have difficulty understanding the task, and therefore an information-seeking dialogue may be initiated instead (for more about dialogue shifts see Walton & Krabbe, 1995).

The question of authentic questions

Although questioning is the most common teaching strategy for eliciting student responses, to be effective, they should stimulate high order thinking, such as analysis and inquiry, and encourage students' reflective and creative answers (Eadie et al., 2022; Myhill, 2006). In the educational literature, authentic questions are usually separated from non-authentic ones on the basis of whether the question invites several often conflicting answers or only one pre-defined answer, i.e., the one that is "in the teacher's head." In other words, authentic questions are considered the ones "for which the asker does not maintain interpretive authority and does not indicate a pre-scripted answer" (Levine et al., 2022, p. 194). Therefore, the use of such questions implies a non-authoritative epistemological stance (Boyd & Markarian, 2015). The question that arises is: How can such a stance be manifested in discourse and, particularly, in dialogue? This question gets even more problematic to answer if we consider the growing interest in the field of education in analyzing the questions' function rather than their semantic and syntactic form (Myhill, 2006; Schaffalitzky, 2022). From a communicative point of view, an apparently "closed" question (which semantically provides only a limited set of answers) may open the dialogue space, while an apparently "open" question (which can be answered in different ways) may close it. Moreover, the vast majority of dialogic teaching researchers have focused on how to transform "the third turn" in the IRE pattern by replacing the "evaluation" with other, more dialogic talk moves, such as revoicing, uptaking, mirroring, etc. (Edwards-Groves et al., 2014; Nystrand et al., 2003). The "first turn," namely the Initiation part of a dialogical sequence, has been much less investigated. What kind of questions may serve as authentic dialogue initiation prompts, and what are the differences between them?

Based on other scholars (Boyd & Markarian, 2011; Lefstein, 2010; Levine et al., 2022) and expanding on our own work (Macagno, submitted.; Rapanta, forthcoming), we will try to look at questions as part of a dialogue, and not as isolated pieces of discourse. In other words, defining the "openness" or "authenticity" of a question only makes sense when it is situated in an authentic or genuine dialogue. In everyday contexts, "a true, meaningful dialogue requires (a) some common ground among participants (to escape dialogue-of-the-deaf), (b) some significant differences (to avoid echo-dialogue), (c) a willingness of both to be open to 'the other'" (Fishelov, 2008, p. 336), and (d) a "we intention" in dialogue, namely a shared dialogue goal among participants (Weigand, 2010). In the next section, we will argue that these four conditions are met by the so-called argumentation dialogues.

Argumentation dialogues as authentic dialogues

Argumentation theory may offer a solution to the problem of classroom dialogue authenticity, as the epistemic and communicative goals coincide: participants engage in argumentation because there is always something they need to know more, better, or differently (unless they want to impose their own ideas, therefore leading to eristic argumentation). Therefore, an argumentation dialogue is developed in classroom discourse when the participants (teacher and/or students) align to the goal of resolving an issue for which more than one perspective is necessary. In this sense, argumentation goals and dialogues are potentially authentic because the other's perspective is genuinely searched for and considered. According to Hadjioannou (2007), authentic discussions "are motivated by authentically dialogic purposes, and the participants' objective is to reach new and more sophisticated understandings" (p. 371). Therefore, when an argumentation dialogue goal is *mutually pursued* by the classroom discussion participants, we can infer that an authentic dialogue takes place.

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[1] We are aware of the trascription paradox of assigning certain intentions to participants without having direct access to them. For more about transcription as an interpretive act see Bird, 2005.

Different argumentation goals may emerge, according to participants' initial and final epistemic states, as argumentation theorist Douglas Walton (2022, 2010) suggests. Among these goals, he distinguishes information-seeking (we rename it to information-sharing to make it more appropriate for classroom contexts), inquiry, negotiation, deliberation, persuasion, and discovery. The metadialogical dialogue is also included Based on several authors (e.g., Bereiter & Scardamalia, 2016; Hennessy et al., 2016; Krabbe, 2003), which consists in negotiating the conditions for making dialogue possible. Table 1 presents a synthesis of the different argumentation dialogue goals.

Table 1. Types of dialogue goals

TYPE	INITIAL SITUATION	MAIN GOAL	PARTICIPANTS' AIMS	SIDE BENEFITS
1. Persuasion	Conflicting points of view	Resolving such conflicts by verbal means	Persuading the other(s)	• Develop and reveal positions • Build up confidence • Influence onlookers • Add to prestige
2. Negotiation	Conflict of interests & need for cooperation	Making a deal	Getting the best out of it for oneself	• Reach an agreement • Build up confidence • Reveal positions • Influence onlookers • Add to prestige
3. Inquiry	General ignorance	Increasing knowledge and reaching an agreement	Finding a "proof" or destroy one	• Add to prestige • Gain experience • Raise funds
4. Deliberation	Need for action	Reaching a decision or an evaluation	Influencing the outcome	• Reach an agreement • Develop and reveal positions • Express preferences
5. Discovery	Need to find an explanation of facts	Choose best hypothesis for testing	Find and defend a suitable hypothesis	• Develop and reveal positions • Gain experience • Reach an agreement
6. Information-sharing	Personal Ignorance	Spreading knowledge and revealing positions	Gaining, passing on, showing, or hiding personal knowledge	• Reach an agreement • Develop and reveal positions • Add to prestige
7. Meta-dialogue	Unclear or unshared meanings or unshared purpose of the interaction	Reaching an agreement concerning the interaction	Establishing a more strategic meaning or purpose	• Clarifying concepts • Acquiring knowledge • Reach an agreement about the nature of task/type of dialogue

Walton's types of dialogues were intended to describe whole dialogues or sequences. However, they have also been developed partially or fully into coding schemes that capture how interlocutors *propose* different types of dialogue through their moves (Bereiter & Scardamalia, 2016; Macagno & Bigi, 2020; Rapanta & Christodoulou, 2019). Under this latter perspective, adopted in this paper, the proposal of a dialogue type (usually by the teacher) may be manifested in an initiating question-prompt, which can be accepted and continued by the student, or rejected by ignoring it or shifting the dialogue to another type. Clearly, this latter option is possible when the dialogue mirrors a real-life conversational exchange (such as in the aforementioned dialogue types); in the context of an examination or testing, opting out or negotiating the dialogical activity is much more difficult due to the authority of one party (the teacher). In case of the aforementioned dialogues, the students' (adequate or inadequate) response to the prompt can be identified in two ways: (a) the dialogue sequence continues the dialogue and does not shift to another type (usually via a different type of prompt); and (b) as most of the dialogue types are argumentative (in the sense of promoting argument-as-process), arguments-as-products emerge within the discussion.

This pragmatic, dialogical approach to questions as invitation moves within and for a dialogue (White, 1993, p. 30) can provide a theoretically grounded alternative to the classical dichotomy between "authentic" and "inauthentic" questions (Nystrand & Gamoran, 1991). As Widdowson pointed out, a move (such as a prompt or a question) can be described according to two types of appropriateness: to the linguistic context and to the communicative situation. Questions whose answer is already known by the teacher (the so-called "unauthentic" questions) are situationally unnatural as their communicative function does not correspond to the normal, ordinary one (Widdowson, 1978, pp. 6–7). As pointed out above, "unauthentic" questions propose a dialogical activity (the examination) that is defined by a specific institutional setting (the school) and specific authoritative roles (teacher vs. student). However, this setting does not mirror real-life dialogical activities – and thus the ordinary joint verbal activities through which the interlocutors develop a shared understanding and construct their knowledge through the use of arguments.

Widdowson underscored that "unnatural" or inauthentic questions result in limited learning effects (Widdowson, 1972, 1978, p. 18), as students learn only a narrow dimension of the subject matter, ignoring other crucial aspects. The distinction is thus not between the relationship between the teacher and the information requested from the students, but among the types of dialogue that a question proposes and that can promote in different degrees specific abilities or aspects of knowledge construction (Bereiter & Scardamalia, 2016, p. 14). On this perspective, the dichotomy between authentic vs. inauthentic questions can be interpreted as a difference between simulated (or testing) exchanges, and dialogues that mirror real-life learning situations, namely in which the participants are confronted with a problem, doubt, or lack of information, and they need to overcome it through the use of arguments.

The present study

In this study, we focus on teacher questions emerging in a large, multi-country and multi-age classroom discourse corpus (see Data collection about details), and in particular, the questions-prompts that mark the beginning of a teacher-student argumentative interaction (therefore on initiation, rather than follow-up questions). In particular, our goal is to identify what types of teachers' questions engage students in developing dialogues mirroring real-life learning and dialogical experiences and encouraging the co-construction of knowledge (Segal & Lefstein, 2016), represented in the aforementioned argumentative dialogue types. Our research question is: What types of teacher questions may function as prompts initiating argumentative whole-class dialogues that encourage more complex types of arguments? We follow a microanalytic approach such as the one used by O'Connor et al. (2015) to research the use of "academically productive talk" in classrooms. In addition, we define dialogue quality in terms of argument construction, identifying three different types of whole-class discussion instances, namely: (a) teacher-mediated productive (at least three students producing arguments) but not constructive (Level 1 arguments only, see Data analysis below) sequences; (b) teacher-student constructive exchanges (at least two subsequent argument moves by same or different students on the same issue with the latter being of higher complexity than the former); (c) teacher-mediated both productive and constructive sequences (at least three students producing arguments, with at least one argument being of a higher complexity).

Data collection and analysis

The data analyzed in this paper come from a large-scale educational study as part of a European project aiming at the development of cultural literacy learning skills among students from 5 to 15 years old. In particular, we focus on a corpus[2] of transcribed interactions from 111 lessons distributed across five countries (UK, Portugal, Spain, Cyprus and Germany) and three age groups (preprimary, primary, and secondary). All lessons focused on cultural literacy discussions, defined as discussions around cultural literacy themes and dispositions such as tolerance, empathy and inclusion, essential as part of any civic education curriculum (see also Rapanta et al., 2021). Also, all lessons used a cultural text (pre-selected short animated film or picturebook) as a springboard for discussion.

Our micro-analysis took into consideration two types of moves: (a) teachers' questioning prompts at the beginning of a dialogical sequence or exchange[3]; and (b) students' reasoning moves emerging as part of the same sequence or exchange. We only considered sequences in which at least three different students participated with arguments, and exchanges in which teacher's mediation resulted in an argument with a higher complexity (see below) than the one previously stated. As mentioned previously, our goal of analysis was to define the types of teacher initiating dialogue prompts – herein defined as *proposals of dialogues* – that can encourage students' engagement in authentic dialogue, manifested in (a) students' active participation in the sequence, and (b) students' construction of arguments.

Coding of dialogue prompts

We define initiating questions as dialogue prompts; therefore, we consider them not as isolated constructs but as *intentional units* manifesting a shared dialogue goal such as the ones presented in Table 1. The following prompts initiating productive and constructive sequences and exchanges emerged in our corpus: (a) information-sharing prompts, aimed at promoting the expression of personal viewpoints and information but without establishing interpretative connections with the cultural text at hand; (b) inquiry prompts, aimed at encouraging the identification of textual information that can be used as evidence to support a pre-defined viewpoint; (c) discovery prompts, intended to elicit interpretations about certain aspects of the text; (d) persuasion prompts, aimed at encouraging students to adopt a perspective and justify it with evidence (either personal or found in the texts); (e) deliberation prompts, consisting in requesting taking up a stance as part of a dichotomous issue and justifying it with evidence (either personal or found in the texts); and (f) metadialogical prompts, encouraging a discussion on the nature and goals of dialogue itself. Table 2 shows an example of each.

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[2] The corpus is available at Rapanta, Gonçalves, et al., 2021.

[3] The corpus was segmented into sequences according to the topic and goal shift criteria described by Schegloff, 2007. The identification of exchanges, as parts of sequences, was only done when a higher complexity reasoning structure was elicited at one-to-one level as part of teacher-student interaction.

Table 2. Types of questions as dialogue prompts.

Type of dialogue prompt	**Example**	
Information-sharing	*T*	*And [the father] thought [boxing] was for girls ... and what's your opinion on the fact the father thought it was for girls?*
	S	*I think it doesn't matter whether dancing is for girls or for boys, it's all the same, like football or rugby, they are all sports and hobbies are for everybody, there's not for boys or girls because we are all equal.*
Inquiry	*T*	*He felt very sad. So how did you know he was so sad? S11. How did you understand it?*
	S11	*From the expression on the face.*
	T	*From the expression on his face. Very nice. S1?*
	S1	*From the eyes.*
	T	*What did the ey-*
	S	*From the posture of his body.*
	T	*And from the posture of his body. Yes, but what did his eyes have?*
	S1	*Drops were falling.*
	T	*Drops were falling. What were these drops S1?*
	S1	*His tears.*
Discovery	*T2*	*The movie was showing the baboon on the Moon. Why did the SOUNDS of the forest appear before the Earth was shown?*
	S23	*Because he wanted to go to the Planet Earth and could not…*
Persuasion	*T*	*Shhh. Let's have a look, Ok? The boy was…different. Why did we say that he was different?*
	S11	*Because he liked a specific thing, and the father wanted that he liked a different thing.*
	T	*And why is he different if he likes – I can also like bananas and dislike apples, and I am not diff-*
	T	*AND WHY IS HE THE ONE who is different, and not his father?*
	S6	*Because the father was a champion and … […]*
	S1	*For the father, it the son who is different, but for the son, the father is different! […]*
	T	*And for society? […] What do you think?*
	S7	*Nobody is different. Because everyone does what they like, and for someone a specific thing is normal, for someone else it is not; someone likes it and others do not like it…*
Deliberation	*T*	*What would you do if you were the Baboon [left alone on the moon]?*
	S1	*Morse code.*
	S3	*Morse code.*
	T	*Explain that.*
	S3	*Well, since he can turn on and off the Moon, then we'd do Morse Code to communicate with humans.*
Metadialogical	*T*	*What is home?*
	S	*[I think home means {unclear} really nice people].*
	S5	*That you live in.*

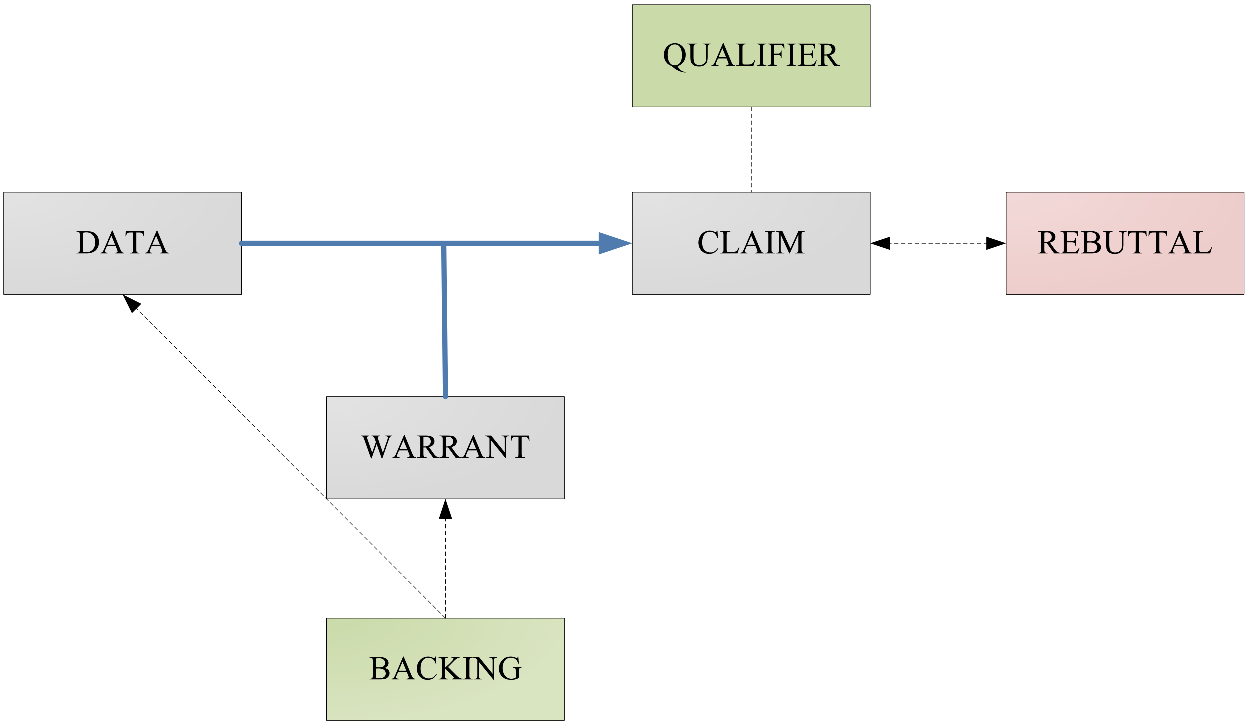
	T	*What is home? Somewhere you live? OK. I'll write that in here. (Writing) Some [...] where you live. S33.*
	S33	*It's somewhere safe.*
	S23	*It's where we sleep.*
	S19	*It's somewhere you buy it.*

Coding of students' arguments

Students' arguments were first identified using a pre-constructed coding scheme that aimed at grasping dialogical discourse units. The "dialogicity" coding scheme is explained in detail in Macagno et al. (2022). Here, we only focus on students' Reasoning moves, defined as moves providing justifications in support of a viewpoint or advancing arguments against others' positions, or synthesizing/comparing ideas. For simplicity, we call these Reasoning moves 'arguments.' In order to grasp the quality of students' arguments, we further identified their level of complexity, as explained below.

Arguments' complexity. In Toulmin's (1958) model, the core structure of an argument (or "skeleton pattern," as Toulmin puts it) is represented by the triad Data-Claim-Warrant, as they are the necessary parts of an argument. Claim is the statement put forward by the arguer, Data is the necessary premise supporting the Claim, and Warrant is the inferential rule through which Data connects to the Claim. Toulmin further distinguishes three elements that increase the complexity of an argument, namely the Qualifier, the Backing, and the Rebuttal. The first two concern the strength of one's argument, which is protected against possible criticisms by limiting the generalizability of the conclusion or its certainty (Qualifier) or defending it by providing evidence supporting either the warrant or the data (Backing). The Rebuttal is the anticipation of the possible conditions under which the argument is no longer acceptable. This model, also known as Toulmin's Argument Pattern, is represented in Figure 1.

Figure 1. Toulmin's Argument Pattern (Toulmin, 1958), divided into levels of complexity.



The use of the distinct elements that are an extension of the skeleton pattern reveals different argumentative skills and, therefore, different levels of complexity. The use of Backings and Qualifiers mirrors the speaker's awareness that his or her arguments are defeasible, and their premises can be questioned or attacked. In particular, the use of evidence as a Backing to support a claim reveals students' epistemological awareness (Sandoval & Millwood, 2005). Similarly, the use of Qualifiers (e.g., "most probably," "to a certain degree," etc.), largely corresponding to the epistemic modals (Rocci, 2019), indicates an advanced knowledge of the epistemological norms guiding argumentation and in particular the defeasible nature of the conclusions that can be supported by natural arguments (Walton, 1990, 2006). Therefore, the presence of Backings and Qualifiers can be considered a higher level of complexity than the mere use of the core structure (Claim, Data, and Warrant). The use of Rebuttals is an even more complex capacity (Foong & Daniel, 2010), as it implies the anticipation and thus acknowledgment and representation of a possible or actual different perspective. The presence of this element manifests two distinct kinds of sophisticated argumentative skills, namely 1) a dual perspective – in which another's opposing point of view concerning the subject matter under discussion is taken into account – or 2) an integrative perspective – i.e., the weighting of pro and con arguments in the presentation of a viewpoint (Felton & Kuhn, 2001; Kuhn & Crowell, 2011; Kuhn & Udell, 2007; Nussbaum, 2021). For this reason, the use of Rebuttals corresponds to the highest level of complexity. The increased complexity of arguments identified by the appearance of Backings, Qualifiers, or Rebuttals was used as a criterion of the constructiveness of the argumentative interaction.

The coding process

The coding of the whole corpus, publicly available at (Macagno et al., 2022; Rapanta, Gonçalves, et al., 2021), was carried out by the second author, while 20% of the coded data was double-coded by the first author for inter-rater agreement purposes. For the coding of teachers' questioning prompts, the percentage of agreement between the coders was 82.5%, while for the coding of Toulmin's elements, upon which the arguments' complexity was decided, the agreement was 90%. All discrepancies were resolved through discussion, and the second author's coding was maintained in all instances.

Findings

As previously mentioned, we segmented our corpus in sequences according to the productivity and constructiveness criteria, and we looked at the types of teachers' prompts initiating each sequence (although we acknowledge that a student may also initiate a classroom discourse sequence, this was not the case for productive and constructive sequences). Table 3 shows the distribution of types of prompts across types of sequences (N = 189)[4].

Table 3. Types of teacher prompts distributed across productive and constructive sequences.

	Information sharing	*Inquiry*	*Persuasion*	*Discovery*	*Deliberation*	*Metadialogical*
Productive & constructive	*24*	*12*	*23*	***43***	*5*	*5*
Only productive	*12*	*3*	*6*	***26***	*1*	*3*
Only constructive	*0*	***19***	*5*	*0*	*0*	*2*

As shown in Table 3, the productivity of teacher-student interactions relates to a type of prompt that we defined above as Discovery because of the discovery dialogue goal it promotes. Discovery moves involve a request and provision of a reason of a specific type – namely, the best possible explanation of a fact, a text, an action, or an element that is at present unexplained. This type of reason is not simply an explanation of a personal perspective (information-sharing): in discovery moves, the speakers ask and provide an interpretation of an objective and external state of affairs, not of a personal perspective. While information-sharing moves cannot be objected to (I cannot reject the reason why my interlocutor came to hold a certain belief), discovery moves are open to discussion, as they concern an observable phenomenon.

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[4] This number refers to number of sequences, consisting of several turns each, occurring in whole-class discussion activities. The total corpus also included small-group activities, not considered here.

Discovery moves are also different from persuasion moves. The difference lies in two aspects, namely, the overall dialogical goal and the subject matter. The goal of the participants in a persuasion dialogue is to change the opinion of the interlocutor – so that one view "prevails" over the other. Discovery moves are intended to assess the force of a hypothesis and test the best possible explanation. Moreover, while persuasion moves normally concern opinions – and thus they involve values, preferences, and decisions propositions that are generally accepted and not necessarily true (Aristotle, *Rhetoric*, 1357a 30-32; Walton 1990) – discovery moves address an observable state of affairs, which cannot be denied by the interlocutors. The interlocutors engage in finding the best possible (causal) relation that can explain it in a sort of "retroduction." In discovery dialogues, it is expected that several students participate expressing their personal theories and interpretations about a specific concept or phenomenon at hand (note that personal opinions and viewpoints about general topics cannot be considered "theories"). An example of a Discovery dialogical sequence is presented in Table 4.

Table 4. An example of a dialogical sequence initiated by a Discovery prompt (in bold).

Line	*Speaker*	*Speech*	*Argument complexity*
12022	*T*	*Who's catching my attention {unclear}? Right, any - I want to bring this back to whole class now. So anybody who would like to share a thought about* ***where they THINK the baboon belongs****, and you can if you would like to make a connection where you think home is FOR the baboon and then to finish, we need to just unpack this idea of home a little bit more, like what it means for somewhere to be home.*	
12023	*S22*	*Well what I was thinking, that I think his home is on EARTH because he might have been of - like long ago, I don't know, like 60s or something, NASA used to send animals to space like cats and dogs and monkeys and things like that. He may [...] he may have actually been on earth but he's been TAKEN and tested to be put on a rocket, SENT to the moon and then he may have lost power or something so he's lost signals with uhm earth, and then he may have just crash-landed onto the moon. And he's used the resources used from the rocket to build a home there and things like that.*	*CDB*
12024	*T*	*So you said to build a HOME on the moon. Just leaving that out there a little bit. Thank you, S22. And S7 had made that connection as well to kind of some of the NASA investigations using animals in doing so. So S7, can we come to you if you've got something to add?*	
12025	*S7*	*I'm going to add on someone else on this. I agree with S22 and I'm thinking about something that S16 said 'cos uhm I think that [...] I think that his like home is the moon - no no, his home is the earth and he's done something with like NASA to come from somewhere. He's done kind of like - sent him up there and then his things like exploded or like shut down and that, like nobody knows how, and it goes - crash-land onto the moon, and then he uses all of like his savings and I don't {unclear}, what he's got to help him survive.*	

12026	*T*	*So in your view although he's LIVING there, his home is somewhere else. So home's not so much necessarily to do with where you physically are.*	
12027	*S7*	*Like I could go and live in Australia for a month, but that wouldn't be my home. My home is back here.*	*B*
12028	*T*	*OK. S18.*	
12029	*S18*	*I'm adding onto S22's, because that - well, I didn't know 60 years ago that NASA did do that or if it didn't, but if he does crash-land into space with the rocket, then he would use like the rocket parts. But then I'm also challenging S22 because I don't think that a rocket would have or would be made of like wood and have like paint in it like have like the square windows that you would normally have on like a house or [a door].*	*RB*
12030	*S12*	*[Yeah, he could use the] glass or something [from the rocket].*	*R*
12031	*S18*	*[I know but there]- but normally if you saw like a rocket, it would be like circles, not squares or lines.*	*R*
12032	*T*	*So you're saying that [although there's]-*	
12033	*S12*	*[This is all them years ago].*	
12034	*T*	*this theory with some of you that it's a rocket that's crash-landed, you think from the visual we've had that that's not - not a possibility based on what you know about what a rocket might have on it and look like, yeah? S25?*	
12035	*S18*	*Maybe.*	
12036	*S25*	*I think that his home is on the moon and he was born on the moon, but his his mum and dad raised him, but they realised he got too old for them to stay with him so maybe they went back to earth and just left him there.*	*CD*
12037	*T*	*So they were initially from earth, but he was born on the moon and they've gone back again?*	
12038	*S25*	*Yeah.*	
12039	*T*	*So home home being home to him meant 'cos that's where he was born.*	
12040	*S25*	*Yeah.*	

The excerpt above is from a primary school classroom in the UK. The class discusses a short animated film, ‘Baboon on the moon’ (Duriez, 2002), and the teacher’s initiating question is about where the Baboon belongs to. Five different students participate in the discussion, and all formulated arguments at some point. S22[5] starts with a medium complexity argument, composed of Claim (C), Data (D), and Backing (B), which is then extended by S7 on line 12027. Then S18 challenges S22 with an evidence-based Rebuttal (RB), S12 adds to the challenge, and S22 replies back. Finally, on line 12036, S25 expresses a different theory regarding where the Baboon is from. In all these instances, the teacher is supportive, revoicing students’ contributions and making reformulations when necessary. This was considered a sequence that was both productive (as at least three students participated with arguments) and constructive (as there was at least one argument with a higher complexity).

In our corpus we also had a relatively high number of Discovery whole-class discussion sequences that were productive, but the level of students’ arguments remained low, meaning that the participant students did not feel motivated to go further in their theories’ construction and justification. An example of a low-argument (productive but not constructive, in the terms we used above) Discovery dialogical sequence is presented in Table 5.

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[5] All students were given codes for anonymity reasons; no pseudonyms were used due to the large size of the corpus.

Table 5. An example of a low-argument dialogical sequence initiated by a Discovery prompt (in bold).

Line	*Speaker*	*Speech*	*Argument complexity*
7036	*T*	*(…) Now, I'm going to say this again uhm is the babOON AT home? Now, let's turn this around and look at our - earlier earlier on, I asked you about what is HOME or what is a home. This is what you said. (uncovers the board) Now,* ***IS the baboon at home?***	
7037	*S*	*No.*	
7038	*T*	*Put your hand up if you think yes. Put your hand up if you think no (several hands raised). Wow! Noone thinks yes? Goodness me. Right, everyone thinks the baboon is NOT at home?*	
7039	*Ss*	*No.*	
7040	*T*	*Interesting.*	
7041	*S12*	*No, I think he is at home.*	
7042	*T*	*Because?*	
7043	*S12*	*Because uhm his home was there and I think […] his […] house got on - was being rolled onto a rocket and taken to the moon.*	*CD*
7044	*S6*	*I agree with S12 because, actually, the moon might be his home if - 'cos he might have lived on earth but then he might have moved house and he wanted to go to the moon and that is where he might've wanted to live. But then he might've wanted to go back to earth and he might have wished he didn't move to the moon.*	*CD*
7045	*T*	*Right. Interesting. I'm coming to you in a minute (pointing to S11).*	
7046	*S8*	*I agree with S12 'cos – cos the {tornado} might've picked up the house and moved it to the moon*	
7047	*T*	*Right. So, we've got two different theories here. He may have accidentally ended up on the moon or he may have moved to the moon and realised, 'Actually, I'm not sure if I like the moon anymore. I'd like to go home.' Do you want - what would you like to say (indicating to S11)?*	
7048	*S11*	*Well his ACTUAL home was ACTUALLY over here, where earth is (indicating on floor).*	
7049	*T*	*Right.*	
7050	*S11*	*And then he probably got cut down 'cos someone might have took him from his normal house to the moon.*	*CD*
7051	*T*	*What got cut down?*	
7052	*S11*	*Cut down so he can't be with his family again.*	
7053	*T*	*So, what, what got cut down?*	
7054	*S11*	*That they could never be together again.*	
7055	*T*	*What so like his HOUSE or?*	

7056	*S11*	*Well that - well […] he probably didn't WANT to be cut down from earth all the way to the moon, which is over HERE (indicating on floor), but then he actually realised that his actual family wasn't on the moon. It's actually back where - on the earth.*	
7057	*T*	*Right. I'm gonna open this up ONE more time. So, I'm gonna let you talk when you like but try not to speak over other people, using that sentence stem (pointing to board) one last time.*	
7058	*T*	*So, who - do you agree with S6, S12, S11? And then I'm gonna let you guys go {unclear} for a couple of minutes, OK?*	
7059	*S24*	*I agree with […] S2 because a tornado could only be in one place.*	*CW*
7060	*S5*	*[I agree with S8 it's because uhm if a tornado would suck up a person, it would maybe send him up into space and he would maybe [{unclear}].*	
7061	*S11*	*I disagree with S5 because […] a tornado - a tornado can't fly and it can't barely fly.*	*CD*
7062	*T*	*I wonder if anyone's got any viewpoints that are not about tornados.*	
7063	*S*	*[I disagree with S8 because] you do know that tornadoes can only spin on land.*	*CW*
7064	*T*	*We have - we've, we've talked about that, yeah.*	
7065	*S*	*They can't fly in the - from the space - from the moon to the earth.*	
7066	*T*	*We, we have - I think we've established that. So, [as I said]-*	
7067	*T*	*Guys? We're thinking about whether the babOON feels he BELONGS on the MOON or whether the baboon IS at HOME or not.*	
7068	*S*	*I - I disagree with S6 because, if tornadoes can go - reach high and they can go up to the moon. I think S8's correct because tornadoes can go very high.*	*CD*
7069	*T*	*Right.*	

The excerpt above is about the same film (*Baboon on the moon*), and the teacher's initiating question ("Is the Baboon at home?") is similar to the teacher's question in Table 4. The goal of the dialogue is for students to discover the most plausible theory regarding whether or not the Moon is Baboon's home. At least six students participated (in some instances, it was difficult to identify which student was speaking, which is why the code S), formulating their theories. However, the level of argumentative reasoning remains low (at a "skeleton" pattern). No evidence from the film was used to support one theory or another, and no evidence-based rebuttals were made. Moreover, it seems that students were "stuck" on one theory (the idea that Baboon was moved to the Moon by a tornado), which was not constructive as there was no evidence to support or rebut it. The teacher asks students to change to a different theory (Line 7062), but with no success.

Both dialogues in Tables 4 and 5 were prompted as Discovery dialogues; however, only in the first one were students genuinely absorbed in the task of discovering the best explanation based on evidence. This difference was possibly due to different task interpretations and expectations by different participants (see, for example, Richards & Pilcher, 2015, for dialogical differences in what counts as "discussion"). Clearly, other conditions that affect students' reasoning quality may apply, for example, age. Actually, the second, low-argument-quality excerpt presented above is from a younger age group than the first one. Still, the problem remains about what the teacher in the second dialogue could have done to further prompt students' argumentative reasoning. Our further analysis reveals a possible answer: Almost all teacher prompts leading to a higher level of argument complexity as part of teacher-student dialogical exchanges were Inquiry prompts, i.e., relating to the dialogue goal of identifying proofs to support a theory. This implies that a possible effective teaching strategy to use throughout a sequence is the use of inquiry prompts to expand on students' reasoning. Table 6 presents some examples of these prompts.

Table 6. Examples of constructive exchanges with the use of Inquiry prompts (in bold).*

Line	*Speaker*	*Speech*	*Argument complexity*
6395	*T*	*Why was he playing the trumpet?*	
6396	*S23*	*So his family knew where he was.*	*D*
6397	*T*	*Do you think his family might have been able to hear him?* ***How do you know his family weren't on the moon?***	
6398	*S23*	*Because there was only one.*	*B*
7635	*T*	*Is he - is he dying?*	
7636	*S28*	*No, he's just missing his family.*	*D*
7637	*T*	*Can you build a bit more on that, S28?* ***How do you know he's missing his family, when thinking [about him]?***	
7638	*S28*	*[Because] he was crying in the film.*	*B*
8238	*S2*	*I think he wanted to go go back to earth because his family lives there.*	*CD*
8239	*T*	*You think he wanted to go back to earth because his FAMILY lives there. That's right****. He wasn't with his family on the moon, was he?***	
8240	*S11*	*He was [all alone].*	*B*

**The examples are from different classes using the same lesson plan.*

All three examples of constructive teacher-student exchanges presented above show the passage from a low-complexity argument element (C, D) to a higher one (B). To achieve this, the three teachers use Inquiry prompts, i.e., asking students to search for proof of what they say in the film, therefore substantiating their interpretations. Moreover, in the third example, the higher-complexity argument (use of Backing) comes from a different student, further adding to the dialogicity of the class discussion.

In summary, our qualitative analysis of the corpus shows that the types of prompts can be related to the quality of the argumentative interaction. When teachers ask questions prompting a Discovery dialogue, it is more likely that the following interaction is both productive (several students participating with arguments) and constructive (high-level arguments appear). However, for this to occur, students must understand what Discovery is about (their theories need to coordinate with evidence that is available to all), and teachers need to recognize and intervene when students' theories tend to be grounded on personal assumptions rather than on evidence-based reasoning. When the justifications used by students cannot be put under discussion because they remain at a hypothetical level, as in the example of Table 5, then a low-argument sequence may emerge instead. The teacher, in that case, may opt for shifting the dialogue to a different type, for instance, an Inquiry dialogue, which would remind the students to search for disputable evidence available to everyone, in that case, from the film they were shown, as in the examples of Table 6.

Discussion

The way teachers enact their questioning strategies is central to effective instruction (Buchanan Hill, 2016; Eadie et al., 2022; Wilen & Clegg Jr, 1986). As a consequence, examining how teachers actually formulate their questions, even in "dialogic" classrooms, is key to understanding how teacher-student communicative relations can be improved. In this paper, we looked at teacher questions as goal-oriented pragmatic units, which are aimed at proposing a specific dialogical activity. We classified these dialogue prompts based on Walton's dialogue type categories, summarized in Table 1. Then, we identified the prompts leading to more complex student arguments and promoting students' participation and reasoning (namely, productive and constructive prompts).

Our analysis was based on a large (approximately 53.000 turns) multi-country dataset (Rapanta, Gonçalves, et al., 2021) and revealed that the type of teacher prompt that is more productive and constructive is the so-called Discovery prompt. Discovery prompts are used when teachers invite students to interpret a specific concept or idea, formulating their own theories with the view of discovering the theory that best matches the available data. In addition, to scaffold students' arguments at an exchange level, teachers in our corpus also effectively used Inquiry prompts, explicitly asking students to use available evidence as a support to their theories. Together, these two strategies were shown to be effective in terms of classroom dialogue quality. Moreover, we concluded that shifting from one dialogue type to another can be an effective strategy for achieving classroom discourse sequences that are both productive and constructive. These findings can be used for teacher professional development purposes, as they root teacher questions' authenticity in concrete dialogue functions rather than abstract or irrealistic ideas such as teachers' genuine ignorance (Long, 2018) or epistemological stance (Lefstein, 2009).

From a theoretical point of view, the paper contributes to a pragmatic operationalization of what authentic questions may look like in whole-class discussions, drawing on a multi-country and multi-age corpus (which adds to the generalizability of our findings). We defined authentic questions as prompts for authentic dialogues and authentic dialogues as verbal interactions characterized by joint goals that promote the development of knowledge through arguments. Clearly, authentic dialogue is an activity that is negotiated among the participants, and for this reason, when an argumentation dialogue goal is initiated but not mutually pursued by the interlocutors and shifts to non-argumentative dialogues (such as in the example in Table 5), then its productivity and constructiveness decrease. In these cases, the speaker may have missed opportunities for developing his or her dialogue prompt into an authentic dialogue.

The difference between a prompt and the following dialogical sequences can be considered as a key difference between an "authentic" and an unauthentic dialogue. A prompt in authentic dialogue is not an imposition but a mere proposal extended to interlocutors equally responsible for the interaction. Such an authentic prompt can be thus taken up, ignored, or rejected by the interlocutors in a negotiation of dialogical goals between free agents (Kecskes, 2008). Thus, the authenticity of a prompt needs to be distinguished from the authentic dialogue that follows, which can only be determined by looking at the dialogue sequence as a whole. In this sense, while in "unauthentic" dialogues – characterized by the request of recollection and repetition – the teacher can impose the dialogical goal without leaving room for negotiation (the authority can test the students, and students need to comply with the authority), authentic dialogues depend only in part on the teacher's prompts. A prompt can be accepted when it is meaningful to students, who are invited to act as parties equally responsible for the success of the interaction.

This characteristic of authentic dialogues can also explain the fact that in our analysis we have found no student-initiated authentic dialogue sequences, despite the presence of prompts thereof. This finding leads to the problem of determining to what extent teachers are able to grant dialogical agency to students: while they have been shown to grant them the agency to accept, continue, or reject a dialogue proposal – enabling them to be active co-constructors of an interaction –, it seems that granting the agency to propose a dialogue is more complex. Future research may look at the proposals of authentic dialogues made by students and why/how those potential dialogues were dismissed by the teacher.

The study also has some limitations that can suggest future work. For instance, we only focused on teacher prompts, leaving out prompts made by students. A comparison between teacher-guided whole-class discussions and teacher-free small-group discussions is to be addressed in future research.

Moreover, we looked at students' reasoning as only being moderated by teacher talk, leaving out other conditions, such as age. A cross-sectional analysis of students' arguments is also part of our future projects. Finally, this approach is grounded on a specific definition of (educational) dialogue as a goal-directed activity whose purpose – at the macro, meso, or micro level – can be identified through discourse analysis. This view is not shared by other researchers who view dialogue as 'unfinalizable' (Nikulin, 2010) and 'potentially endless' (Matusov et al., 2019).

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