

PROFESSIONAL DIALOGUES TO FOSTER DIALOGIC PEDAGOGY IN  
MATHEMATICS:  
DESIGN AND TEST OF A SCHOOL-RUN TEACHER PROFESSIONAL  
DEVELOPMENT PROGRAMME



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This dissertation is submitted for the degree of  
Doctor of Philosophy  
January 2020



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This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for the Education Degree Committee.

## Abstract

María Elisa Calcagni García

Thesis title: Professional dialogues to foster dialogic pedagogy in mathematics: Design and test of a school-run teacher professional development programme

This dissertation is a mixed-methods study on the viability and impact of teacher-facilitated, school-embedded teacher professional development [TPD] programme to promote dialogue in primary mathematics in Chilean primary schools. Educational dialogue is conceived as a kind of talk that is both challenging and inclusive, giving students space to express and explore ideas collectively. Growing evidence supports its positive relationship with attainment, attitudes and reasoning. Still, internationally classroom talk patterns are usually non-dialogic, constraining students to a passive role. TPD is considered a key lever to bridge this gap. However, previous research often involves intensive, small-scale researcher-led interventions, which are costly and hardly scalable. This study aimed to (1) design and trial a programme to promote dialogic pedagogy in mathematics (2) understand its viability, and (3) assess its impact in teachers' noticing, understanding and practices.

The programme had built-in scalable features including semi-structured materials, low operational costs and local facilitators. Facilitators took part in an induction and then led 10-13 sessions with conceptual and practical components. Four schools initiated the implementation but only two of them finished (five participants in each). Data consists of pre-post lessons, pre-post video observations, interviews and teacher session recordings.

Regarding *viability*, the programme was appreciated by participants, but two schools dropped out at different points in time. A tentative explanatory model indicated that these variations were linked to the leadership and research teams' pressure and support, and facilitators' ownership and commitment. In the meetings, facilitators' actions were distinct from expert facilitation in the importance of management activities as well as their participation as peers. The peer-led TPD design tenets should, in consequence, be reconsidered to differentiate them from researcher-led models. Focusing on *effectiveness*, in the schools where the programme was implemented it led to positive results. Participants' video observations shifted their focus towards dialogue. In the classroom and through interviews, participatory and elaborative aspects of dialogue were seen to increase, but not reasoning and challenging. Furthermore, teachers valued dialogue's potential for improving inclusion and classroom climate. These results show that, where viable, the adopted TPD approach showed promise of being effective, while posing further questions about design and implementation conditions to favour scalability.



To my grandparents María Cecilia, Elvira, Miguel and Leonel  
four educators who have inspired me and many others to teach and to learn as ways of living  
generously

And to the memory of Prof David J. Clarke, whose ideas shaped this work in many ways, and  
whose joy in understanding the world through collaborating with others I cherish

## Acknowledgements

This was a project about how dialogue and collaboration with others makes us better thinkers and better people. Its making was no exception and I have numerous people to thank for this. The project came to life thanks to the commitment of the teachers and school leaders who believed in it and sustained their involvement for over a year without incentives other than learning. This endeavour would not have been possible without the support of ANID (former CONICYT)/Becas Chile/2015 - N° 72160185 and the Cambridge Trust that generously funded my studies. The Faculty of Education and Queens' College also kindly supported my field trips and attendance to conferences.

To complete this work, I received invaluable academic support and guidance. First and foremost, I would like to express my deepest appreciation to my supervisor Sara Hennessy who agreed to work with me back in 2013, believing in this project and helping to make it better through her constant support and timely challenge. Her inspiring dedication to dialogue as a means and a goal in educational research have nurtured my own education. She has made this PhD an all-round learning experience, inviting me to join her in other exciting research endeavours. I hope that these formative years are the beginning of further collaboration and friendship. I am also truly indebted to Christine Howe who co-supervised me in the first two years and pushed me to think bigger and more rigorously. Julie Alderton was my advisor and provided insightful and supportive advice in key moments. While they supported me during my studies, Valeska Grau and David Preiss were my research mentors before commencing the PhD, encouraging me to pursue the degree and continuing to be stimulating collaborators along the way. Valeska also generously contributed to this work in vital ways for which I am forever grateful: as my field supervisor and by reading the final draft. Adam Lefstein offered support and critical views at crucial points of the project.

The Faculty of Education has offered me a nurturing learning environment. Especially, I would like to thank the students and researchers in the CEDiR group for always being inspiring and supportive. My work in the ESRC-dialogue and T-SEDA teams no doubt helped shape my dissertation and were great food for thought. In them, special thanks are due to Farah Ahmed, Ruth Kershner, Neil Mercer and Maria Vriikki.

I have received help from my peers and friends in many ways. Leo Lago has been my partner in crime during the programme and collaborating with him has no doubt enriched my work and made me happy. Aliya Khalid was a crucial support. Together we shared many days of hard work and she made each of them inspiring and pleasant. Valentina Munizaga, Florencia

Canessa and Francisco López were my tireless research assistants and made countless contributions to the project well beyond their official duties. Daniela Gómez brought her expertise in mathematics teaching and greatly improved the TPD programme. Many other friends have helped me in different tasks from proofreading to interrater reliability. In chronological order, they are: Aline Frederico, Tyler Shores, Diane Leblond, Po Tsai, Pablo Torres, Andrea Valenzuela, Amaya Lorca, Bárbara Hayes, Sebastián Rodríguez, Daniela Fantinati, Annabel Amodia-Bidakowska, Megan Ryburn, Ana Laura Trigo and Tanya Paes.

Pursuing this degree not only meant commencing new academic work. To do this, I had to move countries and leave my loved ones in Chile for some time. I have missed them terribly and without their support this PhD would not have been possible. I especially thank my parents Tita and Rodrigo for inspiring and nurturing my love for learning, giving me the confidence to go out and explore the world and my siblings Rodrigo, Catalina and Magdalena, for supporting me and giving me joy all along. Thanks for always being there and for coming to visit us in the most important time of our lives. In Cambridge I made many friends that shared my happiest and hardest days, making me feel at home again. Thanks to Chica and Pancho, the purines, the yaganes, the faction, the team en español, our “vecis” and the cabros. And to Nicolás and Sebastián, thanks for sharing a home with us and making it such a happy one.

Last but definitely not least, I would like to thank my husband Felipe who believed in this dream and left his home behind to come with me to Cambridge. Our family - now of three - makes everything possible, sweet and worthwhile. And to my little smiling Cayetano who has made working so much harder but incredibly easier and at the same time.

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# 1 INTRODUCTION

This work is situated at the crossroads between research on teacher professional development [TPD] and dialogic teaching. I found myself in this junction after a few years working as a researcher in Chile. In the early 2010s I took part in a pioneering study in the country, whereby we piloted a video-based TPD programme developed through a school-university partnership. The goal was to work on participants' noticing and teaching skills through the analysis of student thinking using videos of others and of their own classrooms. Four groups of teachers from different schools were set up and each was facilitated by a team of a teacher and an educational psychologist. I worked as the latter in two of them, focused on Spanish Language teaching (the other two were devoted to mathematics). The experience was a transformative one for many of us since it showed us that this rare form of collaboration could lead to rich learning on both ends, remarkably by seeing students from a different, enriching perspective. Another message transpired as well: working with a handful of teachers without engaging further with their schools did not suffice, making them feel like they had changed but nothing else had. Furthermore, conducting TPD in such an intensive and costly way seemed obviously prohibitive and its broader impact was doubtful. I was thus left wondering what conditions could support teacher learning without completely compromising the potential to scale and sustain it in time.

Having seen teachers get a taste of just how transforming it could be to actually listen to what students had to say, how simple and at the same time difficult it seemed, made me want to learn more about how to teach for and through dialogue. Furthermore, in the TPD groups, it seemed like the challenges faced in mathematics teaching were somewhat different to those in Spanish. Namely, the barriers teachers experienced had not only to do with classroom culture in general but also with a strong subject culture of listening for the right answer and dismissing the rest. In contrast, seeing teachers wonder what students were thinking and wanting to know why constituted a powerful experience that intrigued me and made me want to focus on the subject although it was not part of my previous expertise. With these interests in mind, I embarked on the long-term project of completing this research.

The importance of language and its use in education can hardly be overstated. Yet, its affordances have been researched in more depth only in the last decades. Focusing on learning, research has brought to the fore aspects such as who speaks, the structure, function and sequence

of what is said, how it is used to build knowledge, and how its use differs across learning activities, subjects and age groups (Cazden, 2001). At the same time, talk has been understood as the key social tool to negotiate classroom culture and participants' identities in it, with factors such as race, class and gender playing important roles (Black & Radovic, 2018; S. N. Clarke, 2015; Kim & Wilkinson, 2019; Koole, 2003; Lefstein & Snell, 2014). This research has made evident that, while there are variations in how talk is used, there is a 'traditional' pervasive way of doing it which emphasises curriculum delivery and recitation (Cazden, 2001; Myhill, 2006).

In light of this, researchers have envisioned and documented 'non-traditional' alternatives in what Sfard termed the 'discursive turn' in education (2015, p. 245). Indeed, studies focusing on dialogue are on the rise in the past decade (Song et al., 2019). These works have attempted to define, find and promote dialogic teaching (Resnick et al., 2015). Dialogue, understood as a form of interaction that is supportive and inclusive, whereby participants engage in extended and critical elaboration of their own and other's ideas, has been put forward as a relational and rational endeavour that positions all participants as co-constructors of knowledge, learning about the contents and who they are at the same time. This can be seen as a valuable component of education in its own right. Notwithstanding, a growing body of research has established its positive relationship with attainment in different subjects, attitudes and reasoning.

Still, globally documented classroom talk patterns are usually non-dialogic, constraining students to a passive role (Howe & Abedin, 2013; Mercer & Dawes, 2014). This contrasts sharply with 21<sup>st</sup> century schooling goals: educating critical and creative students to become citizens in complex environments (Alrø & Skovsmose, 2002; Sfard, 2015). This disparity is perhaps starker in mathematics teaching, where more traditional practices tend to focus on algorithms and correct responses failing to acknowledge and build on the variety of ideas that students inevitably hold (Brissenden, 1988; Cazden, 2001). The distance between school realities on the one hand, and research findings plus societal demands on the other, calls for evidence-informed solutions. In-service TPD has been considered a key lever, given its potential in promoting the necessary pedagogical changes (Khong et al., 2017). This is, however, not straightforward due to the complex nature of teacher and school change and the large scale of school systems.

Existing research on TPD to promote dialogic pedagogy usually employs models that are considered effective. However, available programmes usually work in ideal conditions (Hennessy & Davies, 2020). These include prolonged engagement of a few participants with expert facilitator-researchers and numerous resources, demonstrating reasonable success. Alas, these conditions are impossible to scale up or sustain over time, given their reliance on external resources and high costs. Thus, if promising research on dialogic pedagogy is to have impact on

school systems more widely, we need TPD models that tackle the challenges of scalability, particularly when working in underfunded educational systems.

In this dissertation, I set the context and establish the empirical grounds for the design and implementation of a TPD programme that aimed at promoting dialogic teaching in mathematics among primary school teachers in Chile. It sought to achieve this through the engagement of teachers in ‘professional dialogues’ between colleagues to learn about the approach, engage in new practices and reflect together. The programme had built-in scalable features, using an approach that has seldom been employed before, including: (a) developing extensive semi-structured materials (in Spanish); (b) low operational costs; and, (c) most importantly, being run by local teachers, not external experts. The programme was implemented during the 2017 school year (March-December). Four schools were initially involved in the project, with only two schools and ten teachers completing the intervention. Questions about the programme’s viability and effectiveness in achieving its goals were answered in four related studies employing a variety of qualitative and quantitative methods. As a novel piece of research, the work was intended to contribute to the evidence bases on peer-facilitated TPD programmes and on promoting dialogic teaching through professional development. The programme designed as part of this research and its implementation insights are valuable to a wider audience of educational policymakers and practitioners who are concerned with teaching-and-learning processes and with professional development at scale. An overview of the dissertation is presented in what follows.

Firstly, situating the research within sociocultural theory, *Chapter 2* provides an account of the relevant literature, identifying outstanding knowledge gaps. The theoretical underpinnings and applied models of dialogic pedagogy are reviewed. Despite its educational value, embracing dialogic teaching has proven challenging, underscoring the need for well-conceived TPD. The literature on teacher learning through TPD is subsequently explored, covering aspects of programme design with issues related to scalability in sight. Carrying these forward, programmes focusing on dialogue are examined. The Chilean educational context is then described as the study context with an emphasis on teachers and teaching. Finally, two research questions are introduced, focusing on viability and impact of a school-run and peer-facilitated TPD approach.

*Chapter 3* presents the research methodology, arguing that a mixed methods approach employing multiple data sources in a series of studies is best suited to answer the research questions. This, since they include qualitative aspects of the process primarily reflecting participants’ perceptions, and quantitative charting of impact. Eight forms of data collection are described in detail, and the ethical considerations are discussed. The participant selection criteria and process are then presented, introducing the schools and their teachers. Finally, while I led the research project, a team based in Chile was involved and their roles are briefly described.

The TPD programme that I designed as part of this study is presented in *Chapter 4*. The main features of the programme are first considered in light of the conclusions put forward in Chapter 2 about effective and scalable TPD with an emphasis on roles and decision making. The programme's structure and contents are then presented, exemplifying its guidelines, activities and materials that I developed building on existing international and Chilean programmes.

The four findings chapters present four related studies, each introducing their analytic approach, their findings and a discussion of the main limitations and contributions. *Chapter 5* answers in part the first research question on the programme's viability, specifically focusing on implementation drawing on fieldnotes and interviews. Different degrees of viability were identified, whereby two schools substantially implemented the programme and the other two dropped out. Key themes emerged related to implementation of the programme components and its roles. Considering variations across schools, a model explaining the observed degrees of viability is proposed. *Chapter 6* continues to focus on viability, this time focusing on peer facilitation. Videos of TPD meetings in the two completing schools were analysed. The main activity types were first identified, and the most interactive ones were selected to conduct a more detailed analysis of facilitators' actions. These include three main areas: guiding the group, establishing the learning environment and contributing as a peer. Their occurrence in different activity types and schools is analysed and illustrated to unpack the features of peer facilitation.

The second research question aims to assess the programme's effectiveness in promoting dialogic teaching in mathematics, with three sub-questions about changes in noticing, practices and understanding. *Chapter 7* focuses on participants' noticing of classroom dialogue, assessed using a pre-post written interview about classroom video excerpts. Participants' responses were analysed looking for evaluative comments and categorising their contents. Themes were then quantified, and pre-post differences identified. Results point in the intended direction, with participants focusing more on aspects of dialogic teaching. *Chapter 8* examines the sub-questions on understanding and practice. It reports on the analysis of classroom practices recorded on video and coded systematically, as well as on participants' interviews about reported changes and understanding of dialogue. The multiple techniques offer insights into the changes that teachers made and the obstacles they encountered. The main message emerging is that the TPD approach was effective in changing some of the intended aspects of practice, although not all. Furthermore, dialogue was construed by participants considering multiple aspects in a way that relates to the observed changes, and participants saw positive impact of their change in their students.

Finally, *Chapter 9* presents the conclusions of the thesis, discussing the main methodological and empirical contributions, deriving its implications for research and practice, as well as theorising about viability and peer facilitation as key concepts emerging from the results.

# 2 LITERATURE REVIEW

## 2.1 INTRODUCTION

### 2.1.1 Overview

This literature review constructs the research problem by drawing on two bodies of research. First, on classroom dialogue, with an emphasis on mathematics teaching, which is the subject area to which the work was applied (see Section 2.2). Second, on TPD focusing on in-service and in-school development, examining professional development to promote dialogue (see Section 2.3). These two sections will define key constructs and identify relevant gaps in the literature. An overview of the study context, that is, the Chilean educational system is then provided (see Section 2.4). The chapter culminates in the research questions (see Section 2.5). But before all this, the overall theoretical framework of the study is briefly discussed.

### 2.1.2 Sociocultural theory framing the research

This research project is framed within sociocultural theory in which ‘communication, thinking and learning [are treated] as related processes which are shaped by culture.’ (Mercer, 2004, p. 138). Whilst there is a universal dimension to these processes, sociocultural theorists have also emphasised the situated nature of cultural activity. This implies that activities are construed and determined locally through participants’ enaction and re-construction of the context, drawing on more broadly shared meanings (Gee & Green, 1998).

The impact of sociocultural theory in the study of teaching and learning is immense. In it, language is of a particular significance that stems from its dual character: as a psychological tool that structures thinking, and as a social tool that enables coordination (Mercer & Howe, 2012). In researching school learning, this translates into an interest in how interactions relate to the development of thinking, whereby varied participation formats and goals afford students opportunities to learn how to think and not just what to think about (Mercer, 1995; Wells, 1999). Schooling would thus initiate children into particular forms of social discourse – the educated discourse – and therefore, forms of thinking that are valuable to society (Mercer, 1995).

This is not a process of passive assimilation, however. In understanding the tensions between stability and change in culture and thinking, sociocultural theorists such as Sfard (2008) have delineated complementary cultural functions of transmission and social reproduction on the one hand, and individual development and transformation on the other. Although both are necessary in formal education, there is an imbalance that overemphasises reproduction (Wells & Arauz, 2006). As Wells eloquently puts it: “A vision of education derived from sociocultural theory (...) proposes a dialogic conceptualization of learning-and-teaching in which knowledge is *co-constructed* by teacher and students together as they engage in *joint activities*, which are negotiated rather than imposed” (1999, p. 227). Sociocultural theory offers relevant concepts for understanding the teaching profession as well, framing teacher activity within the tensions between transmission through full participation, and transformation anchored in reflexivity and critical engagement (Gee & Green, 1998; Jaworski, 2006; Kelly, 2006; Lave & Wenger, 1991; Perrenoud, 2004).

Building on these insights about the role of language and interactions in schooling, whole pedagogical approaches have been developed roughly fitting under the term ‘dialogic teaching’. They are the focus of this research. Furthermore, in putting forward pedagogical approaches that defy mainstream educational goals and practices, teachers’ actions and learning processes become central and form the second area of study.

## 2.2 CLASSROOM DIALOGUE: THEORY AND PRACTICE

### 2.2.1 Conceptualising dialogue in education

#### 2.2.1.1 *Vygotsky, Bakhtin and the different faces of dialogue*

The concept of dialogue in education goes back millennia but appears to be ‘in fashion’. Authors from diverse traditions such as Socrates, Bakhtin, Vygotsky, Burbules and Freire have proposed relevant theories (Lefstein & Snell, 2014). This diversity underscores the concept’s interest while demonstrating the lack of a consensual definition (Calcagni & Lago, 2018). The significance of dialogue can be understood from a theoretical standpoint, which will be discussed in what follows by briefly examining the contributions of Vygotsky and Bakhtin, whose work I have prioritised over other theorists given its great influence in current research (e.g. Kim & Wilkinson, 2019).

Lev Vygotsky (1886-1934) and Mikhail Bakhtin (1895-1975) developed pioneering work in their respective fields of psychology and literary theory. Their work became widely influential in the West in the last five decades, that is, after their deaths. Interestingly, in both cases their



original work was somewhat scattered and the available translations questionable (Matusov, 2007)<sup>1</sup>. Notwithstanding, their influence in current Western scholarship is enormous.

Vygotsky's works are considered seminal in sociocultural theory (Mercer, 2004). His great contribution is conceptualising and illustrating 'higher psychological functions' distinctive of human cognition (e.g. the use of abstract concepts) as cultural functions. This view was developed opposing the dominating behaviourist and perceptive-gestalt explanations of psychological development, but it was not until the turn of the century that his views became more widespread (Vygotsky, 1987b).

Vygotsky (1987a) pinpoints language as a tool with a double character: the cultural tool that underscores participation in (and creation of) social life, and the main psychological tool that enables thinking. What is more, he asserts that higher psychological functions occur in the inter-mental (interpersonal) plane before becoming intra-mental (psychological). Vygotsky stressed the importance of learning in accelerating development, specifically in the form of contingent support of a more knowledgeable peer or adult. A child's learning potential becomes evident in the zone of proximal development [ZPD], which exposes what a learner can do with adequate support, rather than their individual performance in assessment (Vygotsky, 1987c).

Vygotsky's insights about the relationship between the psychological and social planes posit talk as a central phenomenon when understanding teaching and learning (Larrain & Haye, 2012). Consequently, they have had a great impact in subsequent research on the quality of classroom talk (Mercer & Littleton, 2007). For instance, Sfard (2008, 2015) has come to conceptualise cognition and communication as one phenomenon that is manifested in different planes, asserting the value of both 'sides of the coin' in education.

While Vygotsky was concerned with the role of language in psychological development, Bakhtin's work in literary theory has impacted understanding of the nature of language itself. He asserted that the meaning of words and utterances is 'inherently dialogic' in that they are in relationship with other utterances, historically linked to previous discourse, and culturally situated in established patterns of communication or 'genres' (Bakhtin, 1981; Fernández-Cárdenas, 2015; Morris, 1995). All of this makes language ideological, in the sense that it requires positioning in relation to other's discourse. In this process of struggling with another's discourse: 'One's own

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<sup>1</sup> More specifically, the work of Vygotsky became widely known to the English-speaking audience through two edited volumes: *Thought and Language*, first published in 1962 (Vygotsky, 1986), and *Mind in Society* (Vygotsky, 1978). The latter is especially contentious, given that substantial editing (including deleting and compiling from different sources) went into creating its chapters. Thus, its texts do not represent the originals in Russian, but rather re-worked versions. In the late 80s, a 6-volume *Collected Works* offered new translations which reflect the originals in a better manner. However, the earlier edited works still have impact in current Western understanding of Vygotsky's theory. A deeper consideration of these issues is beyond the aims and scope of this work. For a more complete discussion see the prologues of the *Collected Works*, especially Glick's prologue to the fourth Volume (1987b). The situation with Bakhtin's writing is not dissimilar but his writing style was especially convoluted, making translation even more difficult (Matusov, 2004, 2007).

discourse and one's own voice, although born of another or dynamically stimulated by another, will sooner or later liberate themselves from the authority of the other's discourse' (Bakhtin, 1984, p. 348). This 'other' can take the form of a real and/or idealised voice, the latter being a 'superaddressee' that represents a perspective external to any exchange (Bakhtin, 1981).

Despite meaning and utterances being dialogically linked, for Bakhtin, discourse can oscillate between monologic and dialogic poles. In Matusov's interpretation, 'in monologic discourse, addressees are not expected to say anything new that is unknown to the speaker. Rather they can say the right thing – the truth known to the speaker from the beginning – or wrong things (errors).' (2009, p. 114). In turn, dialogic discourse is open-ended and embraces voices that are necessarily different.

While Bakhtin only ever wrote one, recently translated, article on education (Bakhtin, 2004), his ideas have great relevance (Howe, 2014). In theorising dialogic teaching in particular, helpful concepts include his understanding of meanings as dialogic and open-ended and the importance of other's discourse in pushing one's thinking forward. Also, the distinction between the dialogic and monologic poles in the orientation of discourse has helped conceptualise what dialogue means in ideational terms, beyond observable interaction patterns (Matusov, 2009; Wegerif, 2011, 2018).

The impact of the Russian scholars' ideas in later theoretical proposals is widely acknowledged and has helped to shape the 'discursive turn' in education<sup>2</sup> (Sfard, 2015). However, the compatibility of their perspectives in dialogic theory and teaching is a contested issue. Some authors have combined Vygotsky's insights on the relationship between the social and individual planes and Bakhtin's illuminating account of language's intrinsic dialogicity to stress the importance and character of talk in realising learning (e. g. Lefstein & Snell, 2014; Mercer, 2000; Reznitskaya & Gregory, 2013). This learning is conceptualised in a broad sense, including learning about subject knowledge but also learning how to think and about oneself and others. In turn, others consider that Vygotsky emphasised the use of language in learning an accepted body of knowledge, characterised by scientific concepts. They consider this incompatible with Bakhtin's views about the open-ended nature of dialogic discourse (e.g. Matusov, 2007, 2009, 2011; Matusov & Wegerif, 2014; Wegerif, 2011, 2018).

Solving this controversy is beyond the scope of this work. However, like the first group of authors, I consider that these two authors highlight aspects of dialogue, its functions and its nature, that are different but compatible. While Vygotsky points to the place of language and talk in psychological development, Bakhtin's ideas illuminate our understanding of the nature of such

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<sup>2</sup> For a more comprehensive review see Kim and Wilkinson (2019).

language. This work is closer to Vygotsky's ideas since it focuses on the functions of language in linking the social and individual planes in learning.

### 2.2.1.2 *Conceptualising educational dialogue*

#### 2.2.1.2.1 Dialogue versus other forms of talk

Talk is found in many forms in the classroom, ranging from a lecture-style monologue to a lively peer conversation. Its most common settings are the whole class setting and between peers arranged in groups. What does dialogue mean in this context? The word comes from classical Greek and means 'through words', thus potentially representing any verbal or written expression (Kazepides, 2012). Broad and restricted definitions of dialogue can be identified in education, with the broadest ones equating it to conversation, that is, all verbal exchanges in which at least one person is addressed and at least one responds (Howe & Abedin, 2013). Restricted definitions refer to exchanges – which can be multimodal – with specific structural and relational features and particular educational value. In this work I will use *dialogue* – and classroom dialogue – in a restricted sense, while the term *classroom talk* will correspond to the broad definition.

Through decades of research examining classroom talk, it has become apparent that a particular form of exchange dominates the landscape: The Initiation-Response-Feedback [IRF]<sup>3</sup> sequence (Howe & Abedin, 2013). It was first identified by Sinclair and Coulthard (1975) and in its most usual recitation form (see Figure 2.1), IRF has been deemed too simplistic (Lefstein & Snell, 2011a). Namely, initiations usually invite students to answer simple questions that involve 'guessing' what the teacher is thinking (Mercer & Howe, 2012); the students' role is reduced to producing such readily known Responses, or acting as the audience (Littleton & Howe, 2010); whereas Feedback tends to focus on judging the correctness of responses, portraying knowledge as a canon to be reproduced (Alrø & Skovsmose, 2002; Brissenden, 1988). While such simple and closed IRF tends to be the norm, the components and roles are sometimes enriched, opening up the script (Greeno, 2015; Rojas-Drummond et al., 2013; Wells, 1999). This provides students with better opportunities for talk (see Juan and Camila's contributions in Figure 2.1). Indeed, recent studies in England and Germany have found that such 'enriched' patterns are not uncommon (Pauli & Reusser, 2015; Vrikki, Wheatley, et al., 2019).

As a form of exchange, dialogue can thus be seen as one where students have a more central role in terms of who speaks and what they are allowed to say, so that they make substantial contributions to knowledge building. Dialogue is not only interactive but also inclusive and challenging. It can happen among teachers and students and among peers, with

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<sup>3</sup> The sequence is also conceptualised as IRE, with Evaluation replacing Feedback (Mehan, 1979).

each arrangement of participants having specific affordances for learning given the differing levels of symmetry and expertise that are present (Mercer & Howe, 2012).

*IRF - recitation pattern example*

Teacher (**I**): what is the answer to question number two?

Miguel (**R**): four dice.

Teacher (**F-I**): four, great. How about number three, Maria?

Maria (**R**): I got three.

Teacher (**F**): correct.

*IRF - enriched pattern example*

Teacher (**I**): Juan, what is your answer to question number two?

Juan (**R**): two thirds is greater than three sixths.

Teacher (**I**): and can you explain how you know this?

Juan (**R**): well, I know three sixths is a half, and looking at two thirds, it goes past the middle so it must be more.

Teacher (**I**): we'll go back to your answer in a second but first I'd like to hear from others. Would anyone like to agree or disagree with what Juan is saying? Camila

Camila (**F-R**): I disagree because three is bigger than two so it's the other way round

**Figure 2.1** IRF examples

A multiplicity of operationalisations of what dialogue may look like in practice can be found in the literature, but they all go beyond the functions in IRF to include more nuanced distinctions about the possible types of contributions (Hennessy, Rojas-Drummond, et al., 2016; Kim & Wilkinson, 2019). Indeed, important overlaps are apparent, as Howe et al. (2019, pp. 1–2) summarise in five features:

- (1) open teacher initiations
- (2) participants' extended contributions, building on their own and others' ideas
- (3) acknowledgement and probing differences in opinion, ideally offering reasons
- (4) coordination of different perspectives pursuing common lines of inquiry
- (5) adoption of a metacognitive perspective on talk

Proponents differ with respect to which components they emphasise. Also, their relevance might vary depending on the subject, learning goals and tasks (Kim & Wilkinson, 2019; Wegerif, 2018). For instance, argumentative talk emerges when opposing views on an issue are expressed and justifications are demanded, privileging features 3 and 4 (see Asterhan & Schwarz, 2016 for an extended review). Creative tasks, in turn, may be more aligned with features 1 and 2 (Rojas-Drummond et al., 2006; Wegerif, 2018).

Beyond the features of talk that can be heard in the classroom, and drawing on ideas of sociocultural theory, dialogue can be seen as a cultural practice anchored in multiple domains of teaching, involving classroom practice, teaching instruments and underlying assumptions about education (Calcagni & Lago, 2018). Since dialogue differs from the transmission-driven education that seems to be the norm, traditional practices need to be changed to some extent to make room for new roles in the classroom. The next section examines how such features are conceptualised more broadly as a form of teaching or pedagogy.

#### 2.2.1.2.2 Dialogic teaching as a form of pedagogy

In this work, I adhere to Kim and Wilkinson's (2019) view that dialogic teaching is best understood as a pedagogy that draws strategically on a repertoire of talk forms and formats to achieve educational goals. What orients this use of talk is a dialogic conception of knowledge and knowing, considering them as open-ended and co-constructed (Mortimer & Scott, 2003). This involves acknowledging that, while in many respects schooling aims for students to adhere to canonical views held in each subject, this is achieved through making them participants in such ways of thinking in critical and creative ways, rather than attempting to transmit knowledge (Wells, 1999; Wells & Arauz, 2006). This view does not preclude using non-interactive talk formats when deemed necessary (Mortimer & Scott, 2003). However, it does seek to make room for more open-ended and collaborative ones.

Dialogue is multi-dimensional, including relationships, knowledge and norms. Importantly relationships need to be supportive and more symmetrical for students to feel that they can express their views and make mistakes without being judged, and norms need to establish that all have the right to speak and be heard, and not only the teacher (Calcagni & Lago, 2018). The interplay of these dimensions gives place to dilemmas, such as the emerging tensions between the aim to be inclusive of different voices and of prioritising one view of a topic over recurrent misconceptions (Hofmann & Ruthven, 2018; Lefstein, 2010; Michaels & O'Connor, 2015). Dialogue is therefore distinguished from a mere technique or good practice, conceiving it as a pedagogy situated in the complex realities of teaching, which require sensitivity, interpretation, repertoire and judgement in responding to changing demands (Lefstein & Snell, 2014).

Beyond its character as a pedagogy (and not a best practice), the purpose of dialogic teaching has been at the centre of controversy. This has been summarised by Sfard (2015) as a dispute between ideology and utility poles. On one side dialogue is considered an end in itself, or even more so, what constitutes good thinking or education; on the other, it is equated with an interactional pattern that is helpful in achieving an ulterior purpose. If the former view is ascribed, then dialogue is worth pursuing regardless of its impact on commonly valued

educational outcomes. Some authors, especially Matusov (2009), consider this to be the case and deem the two poles incompatible, understanding them as an ‘oppositional dichotomy’ (D. Clarke, 2006). From this position, others’ work is caricaturised as reducing dialogue to interactive talk to achieve learning. Granted, analysing the interactivity of talk has often been the focus of empirical research on dialogue (Mercer, 2010). However, authors rarely reduce their conceptualisation of dialogue to this level and they tend to justify their interest in talk based on its importance for developing thinking and participation (as well as learning). In this sense, I have found Sfard’s idea of a spectrum between the two poles helpful and, since as Lefstein and Snell (2014) put it, one can be interested in promoting dialogue because it helps students learn better *and* because it is a valuable form of social and civic relationship. One’s positioning with regards to this issue also determines how compatible dialogic teaching is with existing forms of school curriculum, and a solely ideological perspective is admittedly incompatible with current forms of schooling (Lefstein, 2010; Matusov, 2009).

## 2.2.2 Dialogue applied in the classroom: models and evidence

Some authors have proposed models of talk-intensive pedagogies that encompass these views, mostly with a generalist focus. Meanwhile, research focusing subject-specific dialogue has also produced relevant outcomes. This section reviews literature from both strands.

### 2.2.2.1 *Subject-general models of classroom dialogue*

Privileging depth over breadth, I have chosen three subject-general models based on their extensive theoretical development, their influence in the field and their use in classrooms and TPD interventions. This necessarily means omitting other relevant contributions, such as Wells’ dialogic inquiry (1999; Wells & Arauz, 2006) and Mortimer and Scott’s communicative approach (2003; Scott et al., 2006).

#### 2.2.2.1.1 Alexander’s dialogic teaching

Robin Alexander’s approach (2008, 2009) has arguably been the most prominent in the field, influencing numerous applications (e.g. Lefstein & Snell, 2014; Sedova et al., 2016; Wilkinson et al., 2017). He sees *dialogic teaching* as a pedagogy, defined as the ‘act of teaching together with its attendant discourse. It is what one needs to know, and the skills one needs to command, in order to make and justify the many different kinds of decisions of which teaching is constituted.’ (2004, p. 11). He proposes five principles for dialogic teaching (2008, p. 28):

- (1) collective: learning is social and not isolated
- (2) reciprocal: listening and sharing are key

- (3) supportive: help is provided, and ideas are shared without apprehension
- (4) cumulative: ideas are chained in coherent lines of thinking
- (5) purposeful: teachers plan and orchestrate dialogue aiming at particular goals

The principles have had a strong influence on subsequent naturalistic and intervention research, with the first three being considered the most consensual (Kim & Wilkinson, 2019). The last two point to the contents of teaching-and-learning and their orientation towards school curriculum, whereby Alexander's proposal can be thought of as approaching the 'utility' pole, and thus these principles are not widely agreed upon.

Focusing on the use of talk, his proposal is that teachers and students should learn to strategically employ a repertoire of talking and listening (Alexander, 2008). Teaching talk includes 'traditional' forms such as rote and recitation, as well as two richer and more productive forms: discussion (free-flowing exchange of ideas with an aim) and dialogue (more structured discussion with guided questioning). Beyond interactions, he sees knowledge building as a process where students and teachers position themselves. In this sense, Alexander stresses that dialogue should be promoted "with larger educational aims in view that foreground dialogue as cultural and civic imperatives, and that propose a dialogic stance on the nature and growth of human knowledge" (2018, p. 26).

#### 2.2.2.1.2 Mercer's Thinking Together

A second approach has been developed by Neil Mercer. He highlights how humans use language to *think together*, which he calls interthinking (Mercer, 2000). Opportunities to interthink should be purposefully generated in education. That way, through students' involvement in different forms of interaction that allow both for appropriation and creativity they become able participants of the 'educated discourse' (Mercer, 1995; Mercer & Littleton, 2007). Building on the concept of ZPD, he proposes an 'intermental development zone' [IDZ], which is: 'a continuing event of contextualized joint activity, whose quality is dependent on the existing knowledge, capabilities and motivations of both the learner and the teacher.' (Mercer, 2000, p. 141).

A key way in which this joint activity is contextualised is through conversational *ground rules* that regulate participation in discourse (Mercer, 2000). Mainstream classroom ground rules (which are often tacit) involve teachers controlling the conversation with scarce opportunities for students' relevant contributions. In promoting dialogue it is key to raise teachers' and students' metacognitive awareness and rehearsal of alternative talk rules through open discussion, negotiation and monitoring (Dawes et al., 2000).

Similar to Alexander, Mercer acknowledges the importance of strategically using a repertoire of talk arrangements and functions interwoven over time in long-term cumulative

knowledge building (Mercer, 1995, 2000, 2008). Particularly, in whole-class settings teachers should offer students scaffolding and model forms of collective reasoning in the IZD (Mercer & Sams, 2006). The most valuable form of dialogue, however, is *exploratory talk* between peers. This is defined as: ‘a joint, coordinated form of co-reasoning in language, with speakers sharing knowledge, challenging ideas, evaluating evidence and considering options in a reasoned and equitable way’ (Mercer & Littleton, 2007, p. 54).

### 2.2.2.1.3 Resnick and colleagues’ Accountable talk

While Alexander and Mercer developed their work in the UK, talk-intensive pedagogy is also prevalent in the USA. The most prominent model is *Accountable talk™*, developed by Lauren Resnick and colleagues (e.g. Michaels et al., 2008; Resnick et al., 2010, 2015). Michaels et al. (2008) employ the term *academically productive talk* that is subject to three interrelated types of accountability to:

(1) the learning community: respecting others, listening to them and building on each other’s contributions

(2) knowledge: explicitly basing arguments in facts or known and evaluable sources, which are to some degree discipline-specific

(3) accepted standards of reasoning: establishing logical connections and reasonable conclusions within disciplinary-accepted criteria

These requirements establish mutual obligations among participants but also towards the larger scientific community. Alexander (2010) has acknowledged the overlap with his principles.

Like the two previous models, the authors have stressed the importance of employing a repertoire of ‘talk formats’, with teacher-led whole class discussions having a central role in learning (Michaels et al., n.d.). Hence, the role of the teacher is key in orienting students towards learning goals by combining authoritative and dialogic purposes, captured in the principle ‘teacher-led but student-owned’ (Resnick et al., 2018). To characterise and promote academically productive talk, Chapin, O’Connor and Anderson (2009) built an empirically-informed battery of ‘talk moves’ linked with four goals aimed at helping students:

(1) express their ideas

(2) listen carefully to each other

(3) deepen their reasoning

(4) engage with other’s reasoning



### 2.2.2.2 *Subject-specific developments in dialogic teaching and dialogue in mathematics*

Until this point, the reviewed works are concerned with language and its meaningful use in education generally. However, from a sociocultural standpoint disciplines and their manifestations in education have subject-specific norms, genres and objects of discourse (Sfard, 2008). These shape classroom talk, for instance considering how accountability to knowledge means acknowledging an accepted body of disciplinary knowledge (Resnick et al., 2010). Research has helped to build a subject-specific understanding of how talk and dialogue look like. Concerns about the quality of talk in ‘traditional’ classrooms are widespread across disciplines like language (Applebee et al., 2003; Boyd & Markarian, 2011; Myhill, 2006; Nystrand, 1997) and science (Larrain, Freire, et al., 2014; Larrain, Howe, et al., 2014; Newton et al., 1999; Osborne, 2010; Osborne et al., 2013). However, the flavour of the learning goals that are deemed worthy and dialogue’s place in them vary.

Literacy includes diverse communicative genres and practices (Applebee et al., 2003) that are ‘embedded in a complex social world, where intertextual echoes of other voices are evident’ (Rojas-Drummond et al., 2017, p. 47). Aspects of language education where the potential of dialogue has been explored include improving reading comprehension through discussion (Lefstein & Snell, 2014; Rojas-Drummond et al., 2017; Rojas-Drummond et al., 2014), literary discussions (Cazden, 2001; García-Carrión et al., 2016; Juzwik et al., 2008; Reznitskaya, 2012), argumentation literacy including reading, speaking and writing about controversial topics (Wilkinson et al., 2017), and more open-ended creative writing tasks (Boyd et al., 2019; Lefstein & Snell, 2014; Rojas-Drummond et al., 2006).

In science, educational goals and discursive practices include learning accepted scientific knowledge and use of the relevant technical language, which requires dealing with students’ everyday understanding and naming of scientific phenomena (Cazden, 2001; Mortimer & Scott, 2003; Scott et al., 2006). In relation to how science is practised, focal points include collaborative inquiry (Wells, 1999) and argumentation to negotiate differences and arrive at reasonable, well-supported answers (Asterhan & Schwarz, 2016; Felton et al., 2009; Larrain, Freire, et al., 2014; Larrain, Howe, et al., 2014; Mercer et al., 2004; Newton et al., 1999; Osborne, 2010; Osborne et al., 2013; Sohmer et al., 2009).

Mathematics has the particularity that its teaching has traditionally been understood as an algorithm-based practice with the command of appropriate procedures to obtain correct answers as the main goal. This permeates classroom discourse in numerous ways. Importantly, teachers tend to prioritise correctness over other possible aspects of students’ contributions, such as the articulation of reasoning, the justification of positions and the negotiation of disagreements (Alrø & Skovsmose, 2002; Ball, 1991; Díez-Palomar & Olivé, 2015; Langer-Osuna & Avalos, 2015).

The types of tasks and learning goals that are prioritised are again procedural, at the expense of conceptual understanding and creative thinking (Kazak et al., 2015; Otten et al., 2015; Walshaw & Anthony, 2008).

This traditional view has faced considerable pushback in the past decades in light of new understandings of the discipline and new educational aims (Alrø & Skovsmose, 2002). In this context, researchers' and practitioners' interest in classroom talk has risen, importantly in the USA sparked by the National Council for Teachers of Mathematics [NCTM] and its New National Standards that promoted the exploration of students' thinking through classroom discourse in the early '90s (Ball, 1991; Ball & Schroeder, 1992; National Council of Teachers of Mathematics, 1991; Schonfeld, 2011). Nonetheless, these efforts have focused on specific practices and tasks more so than suggesting overarching pedagogical models. This research has developed independently from the dialogic teaching literature, with the use of terms like 'dialogic' and 'dialogue' being sparse (Bakker et al., 2015). When dialogue has been targeted explicitly, changing discursive norms has proven challenging, especially with regards to taking students' ideas into account (Hofmann & Ruthven, 2018).

Researchers in mathematics education have developed a relevant line of research disentangling subject-specific classroom norms from those that are general (Walshaw & Anthony, 2008). Namely, Cobb and colleagues distinguished between social norms and *sociomathematical* norms that are constructed by the students and the teacher, who acts as a representative of the mathematic community (Cobb et al., 2001). In classrooms that are non-traditional, norms relate to actions such as producing demonstrations and arguments to justify actions, establishing mathematical difference, and prioritising conceptual explanations over procedural ones (Cobb et al., 1992; Levenson et al., 2009; Widjaja, 2012; Wood, 1999; Wood et al., 2006; Yackel & Cobb, 1996). Indeed, the extensive empirical work of Webb and colleagues has found that in such classrooms mathematical learning is supported by students' explanations that are detailed and correct, and by their engagement with other's ideas in collaborative settings. This is in turn boosted by teachers' actions that model and encourage such contributions in whole-class and group discussions (Ing et al., 2015; Webb et al., 2014, 2019).

Put in the context of dialogic teaching, it is apparent that findings related to productive talk in mathematics can be linked with models of dialogue (e.g. with accountable talk goals such as developing one's ideas and thinking with others). However, in referring to the disciplinary objects and narratives, they bring to the fore the function of talk within the specific subject matter and its disciplinary canon. In this sense, research into classroom dialogue is likely to benefit from moving back and forth between more universal functions of talk and the nuances that emerge when these functions are enacted to achieve disciplinary aims.

### 2.2.3 Dialogue and its relationship with educational outcomes

It has been argued here that dialogue has a two-fold purpose: it is an end related to education and civic participation, and it benefits academic learning and other outcomes. This section examines evidence on the educational impact of dialogue including evidence from the dialogic models reviewed in Section 2.2.2 alongside other important studies. Research tends to examine the effects of either group work or whole-class interactions and thus the evidence is organised according to these interactional contexts.

With regards to group work, observational research has established that it is rare in classrooms, and when it occurs it is not usually of high quality (Howe & Abedin, 2013). More encouragingly, research in intervention and experimental settings – with a range of age groups, subjects and tasks – shows compelling evidence of the benefits of collaborative group discussions for problem solving and subject learning, as long as discussions are goal-directed and a range of different ideas are expressed (Howe, 2010, 2014; Howe & Abedin, 2013; Howe & Mercer, 2007; Mercer & Howe, 2012; Webb et al., 2019).

An important example of an intervention focused on group dialogue is *Thinking Together*, developed by Mercer and colleagues to promote the negotiation of ground rules and exploratory talk (e.g. Dawes et al., 2000). Their experimental studies have covered mathematics, science and language, sometimes including computer-mediated activities with samples ranging from two to seven classes (e.g. Wegerif et al., 1998). Their results show significant gains in the incidence of exploratory talk, group performance in non-verbal reasoning tests, and individual performance in subject and reasoning tests in almost all cases compared to control classes<sup>4</sup> and have been replicated in the UK and Mexico. Increased performance in reasoning tests evidences transfer to skills and test formats that were not addressed in the interventions (Fernández et al., 2002; Kazak et al., 2015; Mercer et al., 1999, 2004; Mercer & Sams, 2006; Rojas-Drummond et al., 2006; Rojas-Drummond & Mercer, 2003; Wegerif et al., 1998, 2005).

Considering teacher-student talk in the whole-class setting, Mercer and Howe review a number of studies to conclude that ‘when teachers actively engage students in reflective discussions of what they are studying, this helps them learn, develops their understanding and prepares them well for independent learning’ (2012, p. 14). This requires a balance between authoritative and dialogic forms of discourse (Mortimer & Scott, 2003). However, according to Howe’s subsequent reviews (Howe & Abedin, 2013; Howe & Mercer, 2017), research on the impact of whole-class dialogue still needs stronger large-scale evidence.

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<sup>4</sup> An exception is the *Talk, Reasoning and Computers* programme, which achieved individual reasoning gains but non-significant differences in the group reasoning tasks (Mercer et al., 1999).

Some relevant large-scale studies are available, and they find significant positive correlations between naturally-occurring variations in classroom talk and relevant educational outcomes in mathematics and English. Specifically, Pauli and Reusser (2015) studied mathematics lessons from 38 classes (13- to-15-year-olds) in Germany and Switzerland. They found a positive relationship with co-constructive talk involving justifications and higher-order thinking invitations and contributions. Focusing on English lessons in the USA, a positive relation was found with open discussion, teacher open questions, and uptake questions, examining over 160 classes with 13- to 18-year-olds (Applebee et al., 2003; Nystrand, 1997). In England, 72 classes of 10- to 11-year-old students covering lessons in two of the core subjects<sup>5</sup> were studied, finding positive relationships with English<sup>6</sup> and mathematics, but not science (Howe et al., 2019). Specifically, when students participated extensively and engaged with others' ideas, the occurrence of invitations to elaborate ideas, extended elaborative contributions and signalling of disagreements were significantly related to achievement. Meanwhile, inviting or providing reasons was not related to any of the outcomes.

Evidence from intervention settings is available as well, importantly from dialogic teaching and Accountable Talk. Alexander, Hardman and Hardman (2017) recently implemented a large-scale RCT in England providing 20 weeks of TPD to 66 teachers of 9- and 10-year-old students and local mentors<sup>7</sup>. The external evaluation showed significant but modest differences in favour of the intervention group in mathematics, English and science (Jay et al. 2017, cited in Alexander, 2018). Alexander argues that methodological issues may have resulted in underestimating gains (see Alexander, 2018, pp. 27–28)<sup>8</sup>.

Accountable talk, in turn, has been trialled in mathematics, although the approach has not been subject to controlled tests including experimental and/or large-scale designs. One large-scale study integrated Accountable Talk with mathematically challenging instruction and applied it with around 500 primary students with potential talent in an under-privileged context (O'Connor et al., 2015). Participants made substantial learning gains over and above their peers, especially after three years in the project<sup>9</sup> and this translated to higher English performance as well. However, the effects of Accountable Talk could not be isolated from other programme components. This was examined at a smaller scale by comparing the effects of the same teacher

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<sup>5</sup> Core subjects are English, mathematics and science.

<sup>6</sup> Gains in English were only found in a spelling, grammar and punctuation test, but not in reading.

<sup>7</sup> They had 31 schools in the intervention group and 38 schools in the control group, and nearly 4,000 students in total.

<sup>8</sup> The RCT design did not include pre-test measures and the impact was assessed considering effect sizes and transforming them into months of learning progress. The found effects ranged from 0.09 (mathematics) to 0.15 (English), thus, they can be considered modest.

<sup>9</sup> The intervention showed effect sizes of over 1.1 for a subgroup of average achievers.

teaching dialogically or using direct instruction to two classes in the project, showing that students in the dialogue condition learnt significantly more about the target contents.

Beyond impact on academic achievement, an intervention programme with secondary STEM teachers in Germany focused on the quality of questions and feedback, achieving consistent effects in the latter and mixed results in the former (Gröschner et al., 2014; Pehmer et al., 2015b). The programme had positive impact on students' sense of autonomy and competence, which impacted their motivation in science and mathematics (Kiemer et al., 2015); and their perceived learning processes and cognitive engagement (Pehmer et al., 2015a), when compared to a control group (with six and four classes respectively).

To sum up, evidence showing the positive relationship between some forms of dialogue and educational outcomes has been found in naturalistic studies in whole-class dialogue as well as peer interactions, especially in English and mathematics and across grades. Intervention or experimental designs have contributed in showing that promoting dialogue can impact students. Research this far is encouraging, however, for stronger claims to be made other subjects and countries need to be studied as well (Resnick et al., 2018).

#### 2.2.4 Interim conclusions

The importance of talk in teaching-and-learning has strong theoretical grounds and is substantiated by empirical research examining educational outcomes. Research in the past decades has seen numerous models and approaches develop, suggesting that dialogue should have a prominent place in the classroom. Its key features include open invitations, extended elaboration of one's and other's ideas, critique and probing, acknowledgement of different positions and metacognitive awareness of talk (Howe et al., 2019). Moreover, dialogue is not reducible to interactivity in talk, but part of a multi-dimensional phenomenon (Calcagni & Lago, 2018). It includes relationships that are supportive and norms that promote inclusion and participation, as well as teaching instruments that create challenging and engaging learning situations. In this work (as in that of many others), classroom dialogue is therefore seen as part of a dialogic pedagogy that conceives knowledge as an open-ended rather than finite body, that is re-constructed and co-constructed in the classroom as participants learn. Drawing on the models outlined earlier (see Section 2.2.2.1), this pedagogy aims both at developing students' thinking and civic participation and at their learning of the school curriculum. Considering the latter, while dialogic teaching has features that are applicable across subjects, it also has a different flavour in each domain that comes from disciplinary genres and norms.

Such a model of dialogic teaching is prescriptive in nature, that is, it proposes desired ways of conceiving and practicing teaching and learning, which are not mainstream. It is clear that

systematic processes of teacher learning are needed to achieve the changes that this would require (Mercer & Howe, 2012). The logical next step is thus to ask how this can be accomplished, which is why TPD has become increasingly visible in the field. This work focuses precisely on how to promote such forms of teaching with practitioners. Section 2.3 deals with these problems, zooming out to consider the literature on TPD in general, and then examining available evidence on promoting dialogic teaching.

## 2.3 TEACHER PROFESSIONAL DEVELOPMENT

Teacher learning is increasingly being acknowledged as one of the most important components in educational change, if not the main one. The terms TPD or Continuing Professional Development are frequently used, although often without providing definitions (Evans, 2002). The terms sometimes refer to any activity in which teachers learn formally or informally (Desimone, 2009). In this research I employ the term TPD to refer to an intentional and systematic attempt to promote teacher learning, normally in order to influence one or more aspects of teaching. In this sense, I consider TPD as distinct from informal teacher change as a result of their everyday work activities, which can of course be an important part of their learning (Kyndt et al., 2016).

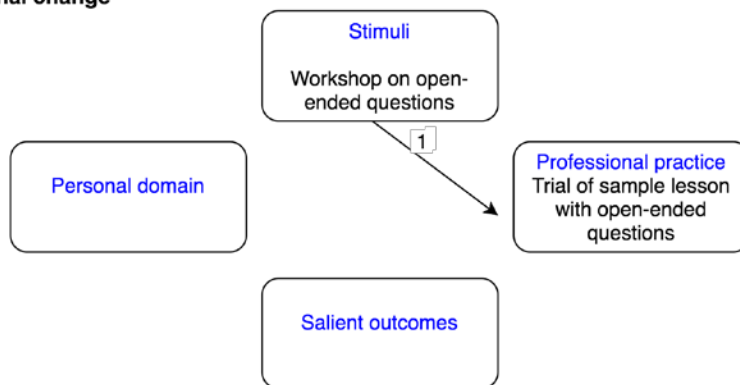
### 2.3.1 Understanding teacher learning

Naturally, how TPD is conceived and studied is linked to how teacher learning is understood (M. M. Kennedy, 2016). The definition of teacher learning is as contentious as that of learning itself, and explicit definitions are strangely absent from the dedicated literature. Nonetheless, the criticism of transmissive views of teaching discussed in the context of dialogue are echoed in the teacher learning research (Kelly, 2006). So-called ‘process-product’ views of teacher change see it as something that is done to teachers as individuals and is driven by a deficit model, rather than seeing practitioners as agents situated in historical and cultural contexts (D. Clarke & Hollingsworth, 2002; Opfer & Pedder, 2011).

From a sociocultural standpoint, teacher learning is often conceptualised through the lens of participation (Lave & Wenger, 1991). If learning is seen as participating, teachers do so when they become more competent in engaging in the ‘discourse, norms and practices’ of their community (Kelly, 2006, p. 511), with its own set of changing goals, practices and demands (Lave & Wenger, 1991). Teachers are expected and steered to adhere to the educational goals of their local school and educational system. What follows is that ‘experts’ will comply with these norms, whether that means being a deliverer of curriculum, a guardian of children’s wellbeing and/or a

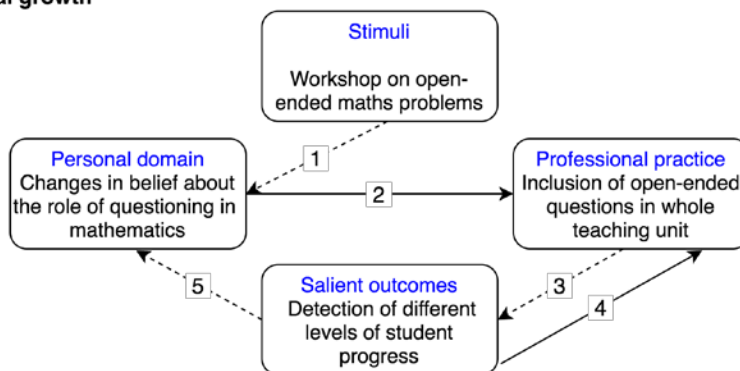
reflective practitioner (Kelly, 2006). Notwithstanding, the positioning towards these requirements can be critical and reflective (Jaworski, 2006; Kelly, 2006; Perrenoud, 2004).

**Example 1: professional change**



*In this change sequence, arrow 1 shows how, through enaction, a teacher trials a sample mathematics lesson that includes open-ended questions after attending a workshop. She then returns to her usual questioning practices.*

**Example 2: professional growth**



*In this growth sequence, arrow 1 shows how, through reflection, a teacher changes her beliefs about the importance of questioning in mathematics, specifically the role of open questions in making student reasoning visible to others. Arrow 2 shows that she decides to trial the use of open questions in a whole teaching unit. In arrow 3, this leads to her noticing and reflecting upon the fact that students have different levels of progress than she expected and she enacts changes in teaching as a result, revisiting key concepts from previous units (arrow 4). Arrow 5 shows that these outcomes also deepen her understanding about the pivotal role of open-ended questions in teaching.*

**Figure 2.2 Examples of professional change and growth**

A compatible and more operational definition has been put forward by D. Clarke and Hollingsworth (2002). ‘Teacher professional growth’ refers to ‘an inevitable and continuing process of learning’ (2002, p. 947), mapped in four domains: teachers’ *personal domain* including knowledge and beliefs; their *professional practices* and experimentation; *salient outcomes* observed in students and practice; and *stimuli*, which correspond to external resources or situations that create affordances for learning. In this model, ‘change’ is restricted to novelty that is momentary and happens in one domain (see Figure 2.2). It is distinguished from a deeper learning processes termed ‘professional growth’, which necessarily involves long-lasting changes connecting more

than one domain and can follow various pathways through reflection and/or enaction as exemplified in Figure 2.2 (D. Clarke & Hollingsworth, 2002). Following this model and seeking to characterise what changes when teachers learn, research on teachers' personal and practice domains will be explored in more detail.

### 2.3.1.1 Teachers' personal domain

The original model includes knowledge, beliefs and attitudes in the personal domain, but other constructs such as identity and motivation can be thought of belonging here too. A comprehensive account of each construct is beyond the scope of this work, but knowledge and beliefs will be briefly reviewed given their importance in TPD for dialogue (Khong et al., 2017).

Knowledge that is relevant in teaching covers numerous areas, such as knowledge of the subject matter, the educational system, of how to plan, teach and assess learning, of students and local schooling reality (Shulman, 1986). Different conceptualisations of teacher knowledge have often been linked with forms of viewing the profession more generally (Menter & McLaughlin, 2015). Cochran-Smith and Lytle (1999, 2009) outline three predominant conceptions that pose different balances between a generalised knowledge base coming from research and teachers' field experience as sources and objects of knowledge. The first conceptualisation is *Knowledge for practice*, which proposes the existence of a formal body of knowledge systematised by educators and researchers that should be brought into schools through teacher education (Shulman, 1986). *Knowledge in practice* considers practical knowledge gained as one becomes an experienced teacher to be just as valid, generated through reflecting on and during decision making in practice (Schön, 1987). Finally, the authors advocate for the concept *knowledge of practice* whereby teachers are critical to generating knowledge 'by making their classrooms and schools sites for inquiry, connecting their work in schools to larger issues, and taking a critical perspective on the theory and research of others.' (Cochran-Smith & Lytle, 1999, p. 273).

Knowledge of practice is related with continuous uncertainty, dilemmas and questions, rather than finding quick solutions. This conception of knowledge construction as open-ended and continuous resembles a view of knowledge and learning as dialogic (Kim & Wilkinson, 2019; Lefstein, 2010; Matusov, 2009; Wegerif, 2018), and sociocultural definitions of teacher learning as involving critical participation in cultural practices and dialogic inquiry (Hennessy et al., 2011; Jaworski, 2006). The multiple pathways and domains involved in teacher growth are also compatible with this view of knowledge construction.

Teachers' beliefs, in turn, are a crucial part of the personal domain. These are relatively stable and organised heuristics about the world that help people interpret (social) situations, although they can often operate subconsciously. Since beliefs affect how situations are



understood, they subsequently impact people's actions and their interpretation of the outcomes of actions. In teaching, however, such influence is best understood as situated rather than direct (Fang, 1996; Vieluf et al., 2012). An important line of research relates to personal epistemologies, that is teachers' and students' beliefs about knowing and knowledge and their degree of certainty, stability and integration (Hofer & Pintrich, 2002). It is seen as developing in levels of increasing complexity and integration (Kuhn, 1999). Epistemic cognition is a broader construct including epistemic beliefs, aims, ideals, and understanding of processes that will help realise them. It influences teaching and learning, and is thus considered an important focal point of teacher education (Brownlee et al., 2017). Brownlee et al. (2017) suggest this can be accomplished by encouraging reflexivity: thinking and action on the components of epistemic cognition. Albeit drawing on a cognitive tradition, such a proposal echoes Clarke and Hollingsworth's model (2002) and the enactive and reflective processes linking personal, practice and outcome domains.

### *2.3.1.2 Domain of practice*

This domain can refer to teachers' actions before, during and after teaching. It can involve routines, types of tasks, assessment practices and so forth (D. Clarke & Hollingsworth, 2002). To this, and with dialogic pedagogy in sight, I add teacher noticing.

Teacher noticing has been mainly researched in the field of mathematics education (Sherin et al., 2011a). It has been defined as the process of selectively focusing on and interpreting instructional situations, prioritising certain aspects of it to reduce complexity (Schonfeld, 2011; Sherin, 2001). Some authors also consider subsequent decision-making as part of noticing (Jacobs et al., 2010; Mason, 2002). Researchers differ in the level of prescriptiveness they attach to the construct (Nickerson et al., 2017), including: conceiving it as discipline of researching one's practice (Mason, 2002); focusing on describing it as it 'naturally' occurs; establishing the differences in noticing according to teaching expertise; or judging it according to external standards such as reform-driven ones.

The latter take has had considerable traction in mathematics teaching research in the USA, where teachers are expected to notice and elicit students' thinking as a precursor of orchestrating productive discussions (National Council of Teachers of Mathematics, 1991; Sherin et al., 2011b; Stein et al., 2015). This has received criticism because it poses research-driven, desirable forms of noticing opposing them to practitioners' default noticing tendencies (Lefstein & Snell, 2011b), as in the knowledge-for-practice tradition. That said, dialogic teaching arguably requires attending to and understanding aspects of classroom life that are usually in the background of teachers' perceptions, rather than the centre stage (Mercer & Dawes, 2014). Noticing pinpoints such

awareness but its consideration in literature about TPD for dialogue has thus far been very limited, with examples available in the UK (Lefstein & Snell, 2011b) and Chile (Grau et al., 2017).

Like other aspects of the profession, teaching practices have been the object of research from different theoretical standpoints, from behaviourist to sociocultural approaches (Fang, 1996). Given the richness and complexity of classroom life, multiple foci have been adopted including time use, curriculum coverage, instructional patterns, etc. Traditionally, the teaching profession (especially within the classroom) was considered teachers' reign and was scarcely observed or judged (Vieluf et al., 2012). This has changed substantially, and nowadays, they are deemed an important lever to influence educational outcomes (e.g. OECD, 2015), over and above solely changing schooling structures and resources (Menter & McLaughlin, 2015).

Research on teaching practices has partly focused on observable patterns, showing that in different countries, while teachers seem to enact similar functions, they deliver them in a variety of ways (Givvin et al., 2005; Vieluf et al., 2012). Meanwhile, efforts have been put into determining which discrete practices can be linked to valued educational outcomes and can thus be considered effective. The main ones refer to structured classroom management, supportive climate and challenging contents (Vieluf et al., 2012). This research sometimes drives local standards for the profession and accountability systems that seek to regulate the teaching profession (Martinez et al., 2016).

Unsurprisingly, there has been pushback against the effective practices approach and resulting standardisation, considering it de-professionalising. Furthermore, it fails to recognise the complexity of decisions teachers make in the moment under the pressure of numerous competing demands that are not responsive to recipe-like prescription (Lefstein & Snell, 2014).

In part because changes in teaching practices are admittedly difficult, approaches to teacher development have slowly started to acknowledge elements corresponding to the personal domain and institutional characteristics as key to succeeding. As has been discussed earlier, understanding teaching practices from a sociocultural standpoint allows for the recognition that these are situated in social and institutional contexts. Thus, targeting individual teachers' practices can only yield limited results if the school context does not afford the desired practices and the proposed changes fail to acknowledge teachers' personal domain and agency in the process. How TPD can address these challenges is considered in the next section.

### 2.3.2 Teacher Professional Development programmes: unfulfilled promises and designing for learning

Teacher participation in TPD programmes has become widespread in the last 30 years, especially in developed countries. Indeed, the Teaching and Learning International Survey

[TALIS] 2018<sup>10</sup> indicates that most teachers do so at least on a yearly basis (OECD, 2019b). As countries do not often have an overarching system or curriculum, provision and engagement can emerge in response to needs at different levels, from curricular reform to local and individual interests. This results in TPD being a disjointed aspect of the profession within and across work trajectories (Wilson & Berne, 1999).

TPD aims to achieve learning at different levels, mainly proximal outcomes related to teachers, and more distal student-level outcomes that are directly related to the TPD or even transferred to other topics or subjects (Guskey, 2002; Wayne et al., 2008). Traditionally, TPD consisted of one-off courses and workshops, which have been widely discredited as ineffective in linking generic content with school realities and producing the expected outcomes (Wilson & Berne, 1999). Thus, TPD is often labelled as rather ineffective, considering the efforts and resources invested in it (Wayne et al., 2008).

Admittedly, there is more to TPD than workshops and over time, classifications have emerged, usually revolving around its format. For instance, A. Kennedy (2005) distinguishes no less than nine models of TPD (e.g. transmission of contents, mentoring, action research), and places them on a continuum from low to high promotion of professional autonomy. Consequently, making generalised judgements on TPD's failures is hardly helpful and only knowing what is ineffective does not suffice. In the past decades, researchers have considered how learning in this context can be understood and enhanced through programme design, as will be described in the next section.

### *2.3.2.1 Research on TPD design*

#### *2.3.2.1.1 Change mechanisms at play in TPD*

Seeking to understand how TPD could lead to change, Guskey (2002) stressed the need to understand it as a process and not an event. He proposed a model that questioned the common wisdom that teachers' beliefs and attitudes need to change first for practices to be impacted. Instead, he suggested that when TPD is effective, the sequence goes from changing practice to improving student learning (or other valued aspect) and as a result teachers' attitudes and beliefs change. This model has been criticised for following a process-product logic without pointing to the mechanisms or isolating the programme components that underlie change. D. Clarke and Hollingsworth (2002) re-worked these components suggesting that rather than a defined set of steps, multiple paths can lead to growth linking two or more domains (as outlined earlier in

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<sup>10</sup> TALIS has been implemented every five years since 2008. 24 countries took part in the first round, growing to 36 in the 2013 round and 48 in 2018. Most participating countries are OECD members, that is, mostly developed Western countries but also including some Asian and Latin American countries (Chile as well). Additionally, some other, usually less developed countries take part, making the sample less skewed towards wealthy countries.

Section 2.3.1). Furthermore, they indicate that reflection and enaction are the main change mechanisms. Opfer and Pedder (2011) add that the dissonance between components is an additional mechanism of change (e.g. discrepancies between salient outcomes and beliefs).

While reflection, enaction and dissonance can be thought to drive professional growth in general, it is necessary to understand how these can be promoted more concretely. As M. M. Kennedy (2016) points out, not all TPD designs rely on the same theories of change. Such theories comprise a targeted problem of practice and a chosen pedagogy. Reviewing the literature, she distinguishes four such ‘pedagogies’ employed specifically in TPD design:

- (1) prescribing contents or practices that teachers ought to replicate
- (2) promoting specific strategies by depicting them and unveiling their rationale
- (3) examining practices to promote insight and reflection
- (4) instructing of a body of knowledge.

Reviewing studies that provide evidence of student outcomes, she shows that programmes with different aims can have effects, but that strategies and insight appear to be more effective pedagogies, especially if sustained over time. It can be hypothesised that these strategies are more likely to trigger the identified mechanisms than prescription or lecturing.

#### 2.3.2.1.2 Core programme design features

In a different attempt to complement Guskey’s approach, Desimone (2009) reshuffles Guskey’s steps, suggesting that TPD is usually followed by a change in teacher beliefs (and/or skills and knowledge), changes in instruction and then impact on student learning. To this she adds the need to consider core TPD features that make programmes effective. She deems these features consensual and advocates for their systematic use and testing to provide further empirical validation. The caveats that apply to studying effective features of teaching also hold for TPD, and equating TPD design to a checklist of features can be reductionistic (Opfer & Pedder, 2011). But this need not be the case, especially if processes and mechanisms are considered as well. Thus, given Desimone’s influence in subsequent TPD research, the proposed features are discussed in what follows.

*Collective participation.* That is, learning among colleagues, would allow for fruitful interaction and discussion. Put simply, this feature indicates that TPD should not consist of solitary learning. This is reaffirmed by teachers’ perceptions of the benefits of collaboration in TALIS (OECD, 2014b, 2019b). Beyond this generic understanding, collective participation has been studied in the context of professional learning communities (Jaworski, 2006; Lave & Wenger, 1991; Little, 2002; Robutti et al., 2016; Vangrieken et al., 2017; Vescio et al., 2008).

These communities are characterised by a trusting environment that energizes and supports the critical examination and transformation of practices (Butler et al., 2004). Drawing on a dialogic tradition, the multi-voiced character of discourse in such communities has been emphasised (Segal, Lefstein, & Vedder-Weiss, 2018). Thus, developing conversational routines where disagreements are part of the norms is considered key if the community is to go beyond superficially sharing experiences and normalising established practices (Dobie & Anderson, 2015; Horn & Little, 2010). Looking to systematise features of productive discussions in learning communities Asterhan and Babichenko (2019) outline three evidence-based dimensions: Participation, inquiry into each other's ideas, and content focused on teachers, students, subject matter and their interactions.

*Active learning.* This refers to the need to engage teachers as learners rather than delivering something to them (Desimone, 2009; Wilson & Berne, 1999). More specifically, teachers would benefit from TPD that involves reflection on problems of practice, ideally using materials that provide rich representations such as students' work or lesson transcripts (Horn & Little, 2010; Levine & Marcus, 2010; Segal et al., 2018). Especially, classroom videos have been appreciated for providing exceptionally rich representations of practice and discourse (Borko et al., 2011; Gröschner et al., 2014; Hennessy & Deaney, 2009; Major & Watson, 2018; Sherin & Han, 2004). They have been employed for diverse purposes including developing noticing skills (van Es & Sherin, 2009), making pedagogical reasoning explicit (Hennessy, 2014), stimulating reflection on own and others' practices, with a view to supporting change and innovation (Borko et al., 2008).

*Duration of activities.* Common wisdom and substantial evidence suggest that teachers need sustained engagement in trialling and refining practices for them to become embedded and have noticeable classroom impact. Although there is no gold standard, evidence reported by Desimone (2009) points to a minimum of one semester of involvement, while others claim the need for at least 30 contact hours, and even no less than two years (Osborne et al., 2013). However, contact hours and/or overall duration do not appear to be directly related to TPD's success but instead they interact with other design features and context factors (M. M. Kennedy, 2016).

*Content focus.* Desimone (2009) reports that TPD focused on specific subject matter contents impacts teachers' skills in teaching them as well as students' understanding, albeit transference to other aspects of academic achievement is weaker. This is perhaps the most contentious of her proposals. Indeed, a later review by M. M. Kennedy (2016) showed that TPD focused on curricular contents did not always produce impact, and that other TPD foci can indeed have positive effects. Namely, exposing student thinking and enlisting their engagement could also be effective, especially when coupled with active learning. Furthermore, not all of teachers' needs or interests correspond to curricular content, and not all expected impact of TPD

on students is reduced to academic achievement, since there are other desirable cognitive and non-cognitive benefits (Kiemer et al., 2015).

*Coherence.* This refers to the alignment between TPD aims and the beliefs and concerns of teachers (Desimone, 2009). The changes and innovations that teachers are asked to make will necessarily replace an aspect of professional practice that is already in place, which can be very demanding (Guskey, 2002; M. M. Kennedy, 2016; Ruthven et al., 2017). Some degree of coherence can help sustain the process. In this sense, teachers can benefit from TPD activities that are school-based and integrated with their practices (Opfer & Pedder, 2011). On the other hand, TPD is nested within larger social systems. Thus, the degree to which it is considered as competing or aligned with wider reform efforts might boost or hinder its outcomes (Wayne et al., 2008). In a way, this is the hardest feature to achieve, considering innovations usually seek change rather than continuity with at least some aspect of the existing situation. However, TPD designed away from schools can easily become a solution looking for a problem, and thus considering the fit between the TPD goals and local needs and beliefs is important although often overlooked (Coburn, 2003; Fullan, 2016).

#### 2.3.2.1.3 TPD providers and implementers: the missing piece of the puzzle

Researchers reporting TPD findings have usually been the designers and implementers of the programmes at hand, especially when studies are small scale (Borko, 2004). Both are no doubt key actors in the TPD process, although their work and characteristics are not always visible in published research (Borko et al., 2014; O'Connor & Michaels, 2019). In the context of TPD that uses collective participation to promote learning, implementers are usually called facilitators, emphasising that their role is to enable and support teacher learning. Borko and colleagues assert that 'Without closer attention to facilitation, PD programs, although designed in accordance with general criteria of effectiveness, may, when enacted, fail to produce increases in student achievement' (2014, p. 150).

Learning communities are the context where facilitators have been studied more often. The role has been undertaken by different actors such as professionals from external or government agencies (Borko, 2004); peers or peer-researchers that participated in previous TPD (Hennessy, Haßler, et al., 2016); or peers without such TPD experience (Osborne et al., 2013; Segal et al., 2018). Usually, however, facilitators are researchers with expert knowledge about the TPD topic and previous facilitating experiences (van Es et al., 2014).

Facilitating TPD has been considered very challenging, requiring pedagogical and disciplinary knowledge as well as facilitation skills (van Es et al., 2014). Its effectiveness has usually been studied by examining TPD sessions after-the-fact and characterising expert

facilitators' actions, especially identifying their role in (theoretically) productive discussions. These are in many ways akin to dialogic teaching, including establishing a trusting learning environment, focusing participants' attention on important topics (often problems of practice), managing transitions between topics, and enabling different perspectives to come forward and sustain productive disagreements (Borko et al., 2014; Coles, 2012; Dobie & Anderson, 2015; Fang, 1996; Segal et al., 2018; van Es, 2010; van Es et al., 2014; Zhang et al., 2011).

While they may be more prepared to deal with some aspects of this complexity, employing external experts as facilitators is not without challenges. It is not rare for facilitators to lack classroom experience (or at least recent experience), which would arguably be valuable knowledge. Most importantly, their presence in a group of peers raises issues of asymmetry, different professional judgements and ownership that are hard to balance. This has in part been linked with teachers' inexperience in engaging in such conversations. Following this argument, symmetry could increase with time (Sherin & Han, 2004). Others interpret these differences as coming from the power (im)balances between disciplines, in this case academic research in education and teaching (Lefstein & Snell, 2011b). Aside from the outlined issues, TPD designs that rely on expert facilitators are, by definition, hard to scale up beyond research-funded initiatives, thus posing restrictions on the wider impact of TPD.

In response to this, some have proposed to work with teachers or educators who are non-experts usually by providing initial and/or sustained support (or TPD) for selected local teachers or leaders (Borko et al., 2014; Osborne et al., 2013; Segal et al., 2018). In promoting such skills with previously inexperienced facilitators, it has been found that establishing a learning atmosphere is readily achieved, whereas other aspects such as focusing the conversation on relevant problems of practice or questioning participants are more difficult (Borko et al., 2014; Segal et al., 2018). The topic remains, however, scarcely explored. Moreover, previous studies tend to assume that practitioner facilitation could or should try to emulate that of researchers, but the fact is that this is an unanswered question that requires further research.

#### *2.3.2.2 Challenges of cumulativeness and scalability in TPD*

Despite considerable efforts, TPD research, like other empirical strands in education, has been criticised for its lack of cumulativeness and connection between studies that result in an outstanding need for better evidence of how to promote teacher learning (Hargreaves, 1996; Opfer & Pedder, 2011). Indeed, much of the available research has relied on single iterations of programmes implemented on one site (Borko, 2004). Importantly, this brings their ability to be scaled up and generate educational impact into question (Hennesy & Davies, 2020).

One way of addressing cumulateness is through TPD design, trialling core features like the ones outlined by Desimone (2009). While this has in part been achieved, the effects of each feature are hard to isolate (Hill et al., 2013), and the approach has also received criticism for neglecting learning mechanisms, prompting calls to conceptualise and measure teacher learning in more complex ways to better understand and explain the phenomena (M. M. Kennedy, 2016; Opfer & Pedder, 2011). Another way forward relates to research design (Hill et al., 2013). In an influential article, Borko (2004) proposed three phases of TPD research that point the way towards more cumulateness, while also flagging up issues of scalability.

*Phase 1* studies focus on single-site programmes hoping to prove that a form of TPD can be successfully implemented, providing rich accounts of teacher learning (Borko, 2004). Back then, Phase 1 studies were predominant and this is probably still the case (Osborne, 2015). Albeit lacking controlled conditions and large samples, Phase 1 studies offer valuable examples of what can be achieved, informing subsequent phases. *Phase 2* studies involve scaling up, with multiple facilitators applying with integrity a TPD programme in multiple sites, ‘exploring the relationships among facilitators, the professional development programme, and teachers as learners’ (Borko, 2004, p 4). This kind of study is still scarce, and its realisation could arguably generate cumulative evidence on learning as well as answer questions about facilitation posed earlier. Finally, *Phase 3* research involves implementing and comparing multiple TPD programmes in multiple sites establishing their relative advantages (Borko, 2004). I have found no instances of Phase 3 research, but M. M. Kennedy’s (2016) review provides an informative comparison of single implementations of multiple programmes. It is worth noting that the scarcity of research in Phases 2 and 3 might be partly restricted by their higher costs and duration.

With regards to the challenges of scaling to achieve educational impact, the abundance of Phase 1 studies is an indication that many of the TPD programmes that are part of research are not conceived with scale in sight (Asterhan & Babichenko, 2019). This is reflected in a reliance on external expertise and resources, without considerations of long-term fading of support due to lack of funding (M. M. Kennedy, 2016) or of how the efforts might continue once these resources are removed (Hegedus et al., 2014). This means that TPD’s potential may be hindered by abrupt programme ending, and that programmes that are carefully designed and researched will hardly be implemented more than once. Indeed, considerations of how programmes could be applied and adapted in other settings, are also largely missing in the literature.

Scalability is usually expressed in terms of the ability of an externally-generated programme to reach a large number of teachers, schools or districts (Stringfield and Datnow, 1998, cited in Coburn, 2003). Coburn (2003) proposed an alternative definition that goes beyond quantities and is in line with an understanding of educational change as a complex, embedded process. She



proposes four dimensions: *depth*, *sustainability*, *spread* and *ownership*. *Depth* refers to the extent of teachers' change, reflecting on the need for teachers' beliefs, knowledge and practices to be involved, meaningfully altering pedagogical principles and classroom norms. This view of 'deep change' echoes the models of learning and professional growth reviewed earlier, applying a lens of scale. *Sustainability* refers to the changes being maintained beyond the duration of direct support, especially when the reform is conceived and/or initiated outside the school. *Spread* means that innovations go beyond the initial targeted practices. This can involve teachers transferring practices beyond the original domains of impact, but also local advocates getting further practitioners on board (Hegedus et al., 2014). Finally, *ownership* of the reform, or programme's knowledge and agency, should become internal to the system to involve local decision-making and capacities of leaders and teachers.

This conceptualisation can be helpful in researching what happens after implementation, however, the proposed dimensions also suggest aspects that could be targeted through TPD design. They point to questions of what design features can be incorporated from the onset to maximise the possibility of wider application and impact, for instance, reconsidering traditional decisions about key identified elements such as providers, implementers and costs. Some existing programmes (e.g. Haßler et al., 2018, Segal et al. 2018) address these constraints of scale, offering promising alternatives. In Coburn's terms, they attempt to increase schools' control of the implementation and even the design process, seeking to maximise local sustainability and ownership, while incorporating effective TPD features to promote depth and spread of the changes. Importantly, they started as or became school-run and locally-facilitated.

Phase 2 studies are an ideal frame for such scaling-up attempts, given their consideration of facilitators, sites and programmes in less tightly controlled settings, although Borko did not necessarily conceive them as locally run. Even in externally-run Phase 2 programmes, Borko (2004) suggests that designers will face dilemmas between adaptation and fidelity, since they will have multiple implementers. These concepts are central to implementation science that studies social interventions. It distinguishes implementation components that influence programme outcomes, importantly fidelity, adaptation, dosage, quality of delivery and participants' responsiveness (Berkel et al. 2011, Durlak & DuPre, 2008). Of these, the first two are the focal point of long-standing debates (Ogden & Fixen, 2014). Fidelity refers to the degree of integrity with which the programme is delivered, and adaptations are alterations made in implementation sites. The former is usually considered desirable, however Durlak and DuPre (2008)'s systematic literature review indicates that both aspects usually co-occur and indeed adaptations are almost certain to happen. This is in line with Borko's (2004) proposal that in Phase 2, integrity with the designer's intentions (but not rigid implementation) should be sought, clarifying what aspects of

TPD need to be preserved. This becomes even more pivotal in locally-run programmes, where the sought ownership can be at odds with fidelity (Segal et al, 2018).

Since programmes that are implemented in multiple sites and include scalable features in their design remain rare, there is a need to not only establish their effectiveness, but before this, to explore different built-in scalable features considering if and how it is possible for schools to apply them. As Borko (2004) points out, understanding how the programme interacts with local conditions is crucial. In this sense, to go beyond the fidelity and adaptation tension, viability can be put forward as a working concept, understood as the degree to which it is feasible to implement a design in different settings. This would include considerations of integrity and adaptations but also of how activities and roles are enacted and locally owned, and how they interact with emerging constraints.

### 2.3.3 TPD for dialogue and dialogic teaching

In what follows, the main approaches to TPD for dialogue and their impact will be reviewed, and key challenges will be identified. Since dialogic teaching is considered desirable but rare, researchers have put important efforts to promote it through TPD (Khong et al., 2017; Vrikki, Wheatley, et al., 2019). Programmes have been developed mostly in the USA and Europe and they cover all core subjects, with a special focus in primary rather than secondary years (Hennesy & Davies, 2020). Interestingly, many of these examples were developed or implemented after the design of this project began in 2015, showing the growing centrality of this aspect of the field.

As has been argued in Section 2.2.1.2, dialogic teaching is multidimensional and involves many dilemmas. Thus practitioner growth can be challenging and takes time (O'Connor & Michaels, 2019). Furthermore, dialogic teaching is not necessarily coherent with established practices or the demands of educational systems, posing another set of difficulties (Osborne, 2015). Still, leading researchers in the field argue that the benefits for students and teachers are such that the goal is worth pursuing (Resnick et al., 2018).

#### 2.3.3.1 Programmes promoting dialogic teaching

The majority of studies in this area consists of what Borko (2004) terms Phase 1 studies, that is, small-scale designs working in one site. Broadly speaking, programmes can be seen to adhere to effective TPD features as discussed above (Desimone, 2009). In terms of the interconnected model (D. Clarke & Hollingsworth, 2002), they tend to target both teachers' personal domain (their knowledge, beliefs and stance) and the domain of practice (forms of classroom interaction and teaching strategies), with the latter component and enaction usually

being emphasised. To synthesise the main characteristics of the wealth of available programmes, they can be classified according to their preferred ‘pedagogy’ as described in Section 2.3.2.1.1 in prescription-based, strategy-based and insight-based (M. M. Kennedy, 2016)<sup>11</sup>.

Prescription-based programmes tend to focus on application in the classroom and thus they provide teachers with structured materials covering the importance of dialogue and curriculum-based teaching units that practitioners should implement with their students. This is usually preceded by or accompanied with researcher-led workshops focused on theory and examples of dialogic teaching. In a way, these programmes tend to focus directly on students by attempting to expose them to practices of interest and measuring their impact (Khong et al., 2017). The advantage of such designs is that they provide lesson plans with embedded target practices and promote uniformity in implementation that is perhaps more suitable for experimental designs. Furthermore, their readiness can allow for replication and spread. Disadvantages include the labour-intensive initial requirement of designing curricular units for different contents and grade levels, the fact that teachers can sometimes deliver the scripts without really embracing their purpose (O’Connor & Michaels, 2019), and that the depth and spread of these changes is likely to require support, which is not usually built in (Coburn, 2003).

Examples of prescription-based programmes are ‘Thinking Together with its applications in reasoning, mathematics, science, literacy and computer-based activities in primary schools in the UK and Mexico (Mercer et al., 1999, 2004; Mercer & Sams, 2006; Rojas-Drummond et al., 2006; Wegerif et al., 2005), and epiSTEMe, employing similar ideas and principles but developing sets of lessons in lower secondary science and mathematics in the UK (Ruthven et al., 2017). Larrain’s work on argumentative dialogue in primary science lessons in Chile, in turn, draws on epiSTEMe (Larrain et al., 2017; Larrain, Freire, et al., 2018; Larrain, Howe, et al., 2018). These programmes do not always assess systematically their impact on teachers or classroom dialogue, as they tend to focus on students’ outcomes (e.g. Mercer & Sams, 2006). epiSTEMe (Ruthven et al., 2017) had limited impact on classroom dialogue, with higher-level invitations and pupils’ extended responses being common, but other dialogue features like discussing a student’s idea only appeared in one curricular module.

Strategy-based programmes focus on goals that teachers should pursue and provide guidelines accordingly (M. M. Kennedy, 2016). This approach is indeed quite common in dialogue-focused TPD, whereby programmes define a core set of principles or goals (e.g. Alexander’s principles and goals for productive talk). Typically, they develop strategies and

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<sup>11</sup> The fourth of M. M. Kennedy’s categories is ‘instructing a body of knowledge’ through lectures. It is sometimes offered to promote dialogic teaching, but its theory of change is very much at odds with evidence about effectiveness and change mechanisms and thus will not be characterised here. See Khong et al. (2017) for a review.

practical tools (e.g. lists of talk moves, rubrics) to facilitate understanding and application (O'Connor & Michaels, 2019). In terms of design, they tend to include some form of introductory workshops featuring examples, followed (or accompanied) by cycles of implementation of progressively more complex aspects of dialogue. On the whole, strategy-based programmes have the advantage of aiming for deeper understanding and appropriation by integrating strategies and their rationale (M. M. Kennedy, 2016). A challenging aspect is deciding on the specific strategies and the relationship between them, considering possible sequencing or 'chunking' of changes. Spread can be an issue too, requiring teachers to develop their judgement about the relevance of strategies in different settings (Michaels & O'Connor, 2015). The high initial costs of generating strategies, examples and materials are also present, although their materials are usually more general and thus widely applicable.

This approach can be found in two formats: intensive face-to-face and blended. Intensive formats diverge in whether they are based on workshops only or they offer individual coaching as well. They use video or other records of practice to provide feedback, sometimes using well-specified criteria to examine implementation. Workshop-only programmes include the Dialogic Video Cycles in Germany, led by researcher-facilitators, obtaining partial success by improving participants' feedback but not their open-ended questions (Gröschner et al., 2014; Kiemer et al., 2015). A variant is Osborne et al.'s (2013) intervention to promote argumentation in science in the UK, working with local leaders who then implemented workshops for their peers, but its classroom impact has not been established, and it had no effect on students. Intensive coaching-based programmes include a large-scale RCT to promote dialogic teaching in the UK led by local teachers acting as coaches in a 20-week intervention (Hardman, 2019). Two recent programmes employing expert coaches are Sedova and colleagues' work in the Czech Republic that builds on Alexander's dialogic teaching (Sedova et al., 2016) and Reznitskaya and Wilkinson's work on dialogic inquiry and argumentation in the USA (Reznitskaya & Wilkinson, 2017; Wilkinson et al., 2017). Overall, initiatives employing coaches have been successful in increasing target dialogic practices (although with small groups in the latter two cases), whereas epistemic beliefs proved more resistant to change (Hardman, 2019; Wilkinson et al., 2017). Nonetheless, their structured and continuous support can be costly and hard to scale.

Blended programmes offer online materials to support teachers in leading their own TPD efforts, seeking to address scalability issues. Examples include two programmes drawing on Accountable Talk in the USA in mathematics and science (Michaels & O'Connor, 2015). They provide materials for teachers' meetings and guidance for local facilitators, as well as curriculum-based examples. The science programme was piloted, and target dialogue goals related to developing students' reasoning and thinking with others (goals 3 and 4) were achieved, but not

with regards to listening. Other examples come from the work of Hennessy and colleagues in Zambia and the UK. OER4Schools was developed to promote interactive teaching including dialogic elements. Its open-source materials were first used with an expert facilitator and were then scaled by a local teacher, with reports of teachers' increased implementation of interactive teaching strategies (Haßler et al., 2018; Hennessy, Haßler, et al., 2014, 2016). In turn, Hennessy, Dragovic and Warwick (2018) implemented two face-to-face workshops with 80 teachers, led by researchers alongside local 'ambassadors' to promote dialogic teaching using Interactive Whiteboards. In between the workshops, teachers developed and shared their own resources electronically and at the end of the programme participants exhibited a better understanding and new teaching practices, although evidence was not available for all participants.

The third theory of change is insight-based TPD. In it, new or challenging questions help teachers re-examine their practices in the hope of provoking changes in teachers' in-the-moment decision making (M. M. Kennedy, 2016). Such mechanism can be thought of as underlying inquiry-based TPD that is focused on examining teaching practices in a community-based setting (Little, 2002). This has often been employed to promote dialogic teaching by supporting teachers' analysis and questioning of established practices, frequently using videos.

This even less prescriptive approach can allow for powerful realisations about one's situated use of talk. Furthermore, when taking place in the context of learning communities, such realisations can be harnessed by questioning the shared 'common sense' (Rainio & Hofmann, 2015). Another advantage is that this model can be more adequate for considering the tensions and challenges involved in dialogic teaching, which is important specially according to authors that do not adhere to a best practice conceptualisation of dialogue (Lefstein, 2010; Lefstein & Snell, 2014). Similar to the intensive strategy-based programmes, the most common form of such TPD takes place in learning communities led by researchers, which can be hard to scale up and replicate. Perhaps a further disadvantage, especially from the standpoint of more prescriptive approaches, is that it involves less scaffolding and steering towards certain practices, which can result in slower or less straightforward change pathways.

There are numerous examples of insight-based TPD for dialogic teaching. Some build on the concept of teacher inquiry, like Wells and Arauz's (2006) eight-year project working with teachers to trial and research classroom dialogic inquiry across subjects in Canada. In the UK, Hennessy and colleagues worked in collaborative inquiry with teachers from different subjects seeking to develop 'intermediate knowledge' and teachers' dialogic practices using Interactive Whiteboards (Hennessy et al., 2011; Hennessy, 2014; Mercer et al., 2019). Other programmes function like video clubs fostering video-based noticing (Sherin & Han, 2004). Examples include Lefstein and Snell's literacy TPD in the UK (Lefstein et al., 2015; 2011b, 2014) and our work in

Chile with four groups in mathematics and Spanish (Grau et al., 2015, 2017). In terms of their results, these programmes have tended to show moderate success, in that they impact some but not all of their goals, usually succeeding more with regards to opening up dialogue and getting students involved, but not on aspects related to critique and reasoning.

A rather different approach that can help address the issues of scale and cost is T-SEDA, an open resource we have developed to promote reflective inquiry using a research-informed coding scheme focusing on the turn and lesson levels and including tools to observe whole class and group dialogue across subjects and ages (Hennessy et al., 2019; Vrikki, Kershner, et al., 2019). The TPD approach relies on practitioners' or schools' initiative with little external support. It is currently being trialled in seven countries and our preliminary results point to teachers' uptake of the flexible approach and reported changes in classroom practices.

#### *2.3.3.2 Challenges in promoting and assessing change in TPD for dialogue*

Obstacles for dialogic teaching have been identified at different levels and should be considered when conceiving programmes and gauging their success. At the system level, teachers and researchers alike argue that dialogic teaching with its open-ended view of knowledge and time requirements clashes with current educational trends, which prioritise high-stakes testing and populated curricula that can make fast-paced teaching appear necessary (Alexander, 2015; Myhill, 2006; Newton et al., 1999; Osborne, 2015; Scott et al., 2006; Segal et al., 2017). Aside from international trends, local educational traditions and culture are also likely to shape how actors make sense of talk, its value and possibilities. Furthermore, the meaning of apparently similar forms of talk is likely to vary in different cultures (D. Clarke, 2006). This aspect is under-researched, but existing studies pinpoint relevant aspects such as the willingness to engage in public dissensus or the different levels of authority and agency of teachers and students (Lefstein, Israeli, Pollak, & Bozo-Schwartz, 2013; Preiss, 2010; Sedova, Salamounova, & Svaricek, 2014).

With regards to teachers' personal domain, given the relative novelty of this approach it is likely that teachers lack systematic knowledge about dialogue to begin with, limiting their use of discursive features even when they are willing to do so (Baines et al., 2007; Mercer et al., 2009; Newton et al., 1999; Sedova et al., 2014). Their beliefs come to play too, with epistemological beliefs about learning and knowledge tinging 'new' practices with meanings and intentions that can be dialogic or adhere to more transmissive ways of viewing learning (Khong et al., 2017; Kim & Wilkinson, 2019; Wilkinson et al., 2017).

Beyond this, teachers' beliefs and expectations about students' ability to engage in dialogue appear to affect interaction patterns. Higher-achieving students, high- and middle-class students and boys are more likely to experience higher-level teacher-student interactions (Applebee et al.,

2003; Black & Radovic, 2018; S. N. Clarke, 2015; A. M. Espinoza & Taut, 2016; Fisher & Larkin, 2008; Howe & Abedin, 2013; Michaels & O'Connor, 2015; Myhill, 2006; Nystrand, 1997; O'Connor et al., 2015; Pauli & Reusser, 2015; Resnick et al., 2010). These findings echo those about students' beliefs and expectations about who should take part in class discussions, which can be interpreted as reserved for those who know what to say and how to say it (S. N. Clarke, 2015; Walshaw & Anthony, 2008). Subject cultures play a role in these expectations too. For instance, 'doing mathematics' is often linked to providing right answers, limiting public risk taking (Hofmann & Ruthven, 2018; Langer-Osuna & Avalos, 2015).

In the domain of practice, teachers can struggle in designing tasks that are adequately challenging to spark an authentic conversation, yet dialogue's openness and uncertainty can seem risky and hard to manage, and strategies can be applied in a formulaic way (Calcagni & Lago, 2018; Chazan & Ball, 1999; Hofmann & Ruthven, 2018; Michaels & O'Connor, 2015; O'Connor & Michaels, 2019; Osborne et al., 2013; Scott et al., 2006; Sohmer et al., 2009). Balancing more and less interactive formats and stances towards knowledge, as well as social and power dynamics that dialogue triggers poses important dilemmas (Lefstein, 2010; Scott et al., 2006). In this sense, a further challenge is the reflective connection between the personal and practice domains, so that teachers and students can go beyond 'talking the talk' to build an understanding of dialogic teaching as a pedagogy (Hennesy & Davies, 2020).

Considering this long list of obstacles, TPD should be carefully designed taking into account the multiple dimensions and demands at play. Available TPD programmes share the difficulties identified for TPD more generally. In terms of cumulateness, the way of conceptualising dialogic teaching and assessing teacher change varies across programmes and it is rare for studies to employ existing measures (Hennesy, 2020). While some variation is desirable to fit the goals, subject, age group and local context at hand, it makes overarching conclusions harder to obtain. Nonetheless, accumulating evidence shows that some practices are more readily taken up (Hennesy & Davies, 2020). These are questioning practices that open up dialogue inviting elaboration and/or reasoning, as well as students' reasoning and elaborated contributions. While these are positive results, focusing merely on features of the interaction by coding dialogue is only a proxy for other changes that are important, for instance, in classroom culture (Hennesy, 2020; Mercer, 2010). Researchers are increasingly including different variables within and across domains of change, making assertions of learning more robust and valid with regards to the task at hand (e.g. Wilkinson et al., 2017).

With regards to assessing change, a challenge is that the timescale of research tends to limit longitudinal data beyond programme implementation (Hennesy & Davies, 2020). This implies that identified effects could later fade or, more optimistically, that research may be

underestimating change because final measures are taken too soon (Guskey, 2002; Osborne et al., 2013). A further issue relates to if and when academic achievement or other kinds of outcomes should be measured. Excluding them may respond to available resources but also be due to conceptual objections. Namely, some consider that dialogue is not expected to produce such outcomes, and others consider that dialogue is an end in itself and should therefore not be assessed by its products. In any case, if such measures are included their timing is critical, since some of the benefits of talk are delayed, but inclusion of delayed post-tests is rare (Howe et al., 2005; Larrain, Freire, et al., 2018). Sometimes, when measures are included, changes in the classroom are not, so that they are hard to link (Mercer et al., 2004; Osborne et al., 2013).

Importantly, programmes in the field tend to be hardly scalable and sustainable due to their reliance on highly-resourced and expert-facilitated models (Hennesy & Davies, 2020). Some progress has been made in this front, with programmes like O'Connor's and Michaels' science TPD and the T-SEDA pack proposing more scalable alternatives. However, there is still little available evidence of their impact.

In sum, teacher professional growth is a complex endeavour and the promises of TPD programmes are oftentimes unfulfilled. It appears that promoting dialogic pedagogy through TPD faces a number of challenges that are common to professional development initiatives, such as the identification of key features and change mechanisms, as well as the need for scalable solutions that are viable. Available programmes have employed diverse change mechanisms including prescription, strategies and insight with different degrees of success. The literature has also shown difficulties that emerge specifically when dialogic teaching is being promoted and assessed. The available evidence therefore indicates some of the outstanding challenges and ways forward, which will be considered in the research questions. But before introducing them, the study context will be described.

## 2.4 STUDY CONTEXT: EDUCATION AND TEACHERS IN CHILE

Chile is a 17-million inhabitant country in the far south of South America. The main language is Spanish and there are four recognised indigenous languages. Historically, the country's population was relatively homogenous with mixed indigenous and European heritages. In the past decade, economical and socio-political turmoil has increased migration from other Latin American and the demographic landscape is beginning to change. The country has a GDP



per capita of U\$22,788 in 2016 as reported by OECD (n.d.)<sup>12</sup>. However, income distribution is severely unequal, with the richest 10% earning 26.5 times the average earnings of the poorest 10% (the OECD average being 9.1 times) (OECD, 2017).

Chile's recent history is marked by the 1973-1990 military dictatorship, which imposed neoliberal reforms including privatisation, deregulation and marketisation of social goods and rights, from ownership of water streams to healthcare. This has remained largely unaltered since democracy was regained. The educational system is no exception. When this research was designed and implemented, the country was considered prosperous and stable relative to the region. However, in the last months of 2019, mass protests began sparked by a raise in the metro fare and grew to include millions of demonstrators demanding greater social justice and guaranteed rights to education, healthcare and pensions. The protests have been violently repressed, but the movement has already resulted in a forthcoming referendum to decide if a new constitution will be drafted. Nonetheless, demonstrations continue at the time of writing and the end of the political crisis is not in sight.

#### 2.4.1 The Chilean educational system

The country has 14 years of compulsory schooling from ages 4-5 to 17-18, organised in cycles: two years of preschool, eight years of primary school (with two 4-year sub-cycles) and four years of secondary school, with humanistic-scientific and vocational streams. Schools often comprise only one of these cycles. Student enrolment has reached 100% for primary and is almost universal for secondary (Centro de Estudios MINEDUC, 2015). A defining feature of the system is the existence of a compulsory national curriculum which is assessed through a standardised census test in multiple subjects and grades called SIMCE.

The current structure of the system was shaped during the dictatorship. The free market organising principle dictated that parents would freely choose schools based on their SIMCE results and demand would be subsidised. Schools would compete for enrolment, which would elevate their quality and lead 'bad schools' out of business (Pinkney, 2007). Schooling provision was organised in three main types of schools (see Table 2.1). Given that voucher and private schools were allowed to charge tuition fees and reject students, school placement has been largely determined by parents' payment capacity and students' achievement and needs. This has concentrated the most vulnerable students in municipal schools (Centro de Estudios MINEDUC, 2012a). Student achievement is strongly correlated with schools' composite socio-economic status, which tends to coincide with the school type. However, when controlling for

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<sup>12</sup> For reference, the UK's GDP per capita in 2016 was U\$42,943.

this variable, achievement differences between school types tend to disappear (Manzi et al., 2008; Mizala & Torche, 2012).

**Table 2.1. Types of schools in Chile**

School type*	Municipal	Voucher	Private
<b>Administrator</b>	Municipalities	Private entities	Private entities
<b>Funding</b>	Public	Public and tuition fees with a cap	Tuition fees without cap
<b>Student selection</b>	No (some exceptions at secondary level)	Yes	Yes
<b>Typical SES of families</b>	Low to mid-low	Mid-low to mid-high	High
<b>Typical SIMCE performance (without controlling for SES)</b>	Below average	Average	Above average
<b>Primary education enrolment (2015)**</b>	38.9%	53.2%	7.9%
<b>Secondary education enrolment (2015)**</b>	35.9%	50.8%	8.2%
<b>20-year enrolment trend</b>	Decrease	Increase	Stable

\* Some characteristics of municipal and voucher schools are changing in the present, as will be described in this section. This table reflects their characteristics in 2017, when the study was conducted

\*\* *Source:* adapted from OECD (2017) Reviews of national policies for education: education in Chile

Since democracy was re-established, policies have aimed to modernise Chilean education by increasing funding in general and focalised ways, reforming the curriculum and improving teachers' working conditions (Bellei et al., 2010; Raczynski & Salinas, 2008). In response to this, students' achievement in international tests has improved substantially over time and is strong compared to the region (Hanushek et al., 2012; OECD, 2017; OREALC/UNESCO, 2013b). Nonetheless, Chile remains the lowest-performing country in the OECD, and in mathematics this results in a 2-year-lag from the average, worsened by educational inequality (OECD, 2017).

Indeed, since 2006 dissatisfaction with quality and inequality in education have led to years of highly consequential grassroots mobilisation in the country demanding that the educational system becomes public, free-access and of high quality at all levels<sup>13</sup> (Bellei et al., 2008; Segovia &

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<sup>13</sup> The issues and main debates around higher education exceed the scope of this work. To summarise, higher education institutions in the country are mostly privately owned and highly de-regulated, which has resulted in rapid expansion of enrolment and excessive student debt without appropriate quality warrants. The reforms in this area in response to the social movement, instead of moving towards strengthening public higher education, have created a system of scholarships and continued with the logic of subsidising the demand instead of the offer.

Gamboa, 2012). There have been two reforms since, and major legislative efforts have resulted in a new curriculum and structural changes to promote inclusion and strengthen public education<sup>14</sup>.

Changes in the curriculum have progressively replaced the previous content-driven frameworks with bases which propose central skills, content axes and attitudes that remain consistent across all grades, with further specifications for each level (O. Espinoza, 2014). In mathematics the central skills are problem solving, arguing and communicating, modelling and representing; examples of the axes are numbers and operations and geometry; and attitudes include showing curiosity, creative problem-solving and respectfully expressing and listening to ideas (Ministerio de Educación, 2012). With regards the promotion of inclusion, voucher schools have lost their ability to segregate by selecting students, charging fees and making profits. The administration of municipal schools, in turn, will be taken over by new local services comprising larger territorial units with technical and administrative decision power, seeking to remediate inequalities between municipalities (Bellei et al., 2018). Teacher education and teaching have been signalled as an important barrier to educational quality (OECD, 2017; OREALC/UNESCO, 2013a) and are subject to another set of reforms that will be addressed in what follows.

## 2.4.2 Teachers and teaching in Chile

### 2.4.2.1 *The teaching profession*

Teachers in Chile have a long tradition of civic involvement and civil service. This changed dramatically during the dictatorship that diminished their status and working conditions through municipalisation and deregulation of the profession (Cox et al., 2011; Donoso, 2008). Currently, teaching requires an undergraduate degree, which is generalist for primary and specialist for secondary<sup>15</sup>. Nearly 80% of teachers hold bachelor's degrees and around 15% have postgraduate degrees (OECD, 2019b). The quality of pre-service teacher education, however, has been a cause of concern especially with regards to didactics and disciplinary knowledge in mathematics (Varas et al., 2008), Spanish (Sotomayor et al., 2011) and science (Cofré et al., 2010; González-Weil et al., 2012). Focal policies have revolved around recruiting better candidates, auditing the quality of programmes and establishing a voluntary exit test (Cox et al., 2011; Domínguez et al., 2012).

Practitioners spend 78% of their contract hours teaching, which is an improvement from 90% of time in 2013, while still substantially higher than the OECD average of 53% (OECD, 2014a, 2019b). In practice, this means that they either work numerous unpaid hours on planning and marking or they do not have time to comply properly with these tasks. The practice is

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<sup>14</sup> These reforms have left private education untouched, giving the country's elite a differential treatment.

<sup>15</sup> Both generalist and specialist teaching degrees are taught in Faculties of Education and typically last 4-5 years. Thus, pre-service education does not involve specialising in the target subject(s).

oriented by the Framework for Good Teaching, which comprises: preparation of teaching, creation of an appropriate learning environment, teaching for all students' learning and professional responsibilities (CPEIP, 2008). These standards are only enforced in municipal schools through the National Teaching Evaluation System, [hereon NTES] established in 2003 (Manzi et al., 2011). NTES includes a video-based portfolio and peer- and self-evaluations and has consequences in teachers' TPD, salaries and job security. While technically sound, it has served mainly a summative purpose, whereas its formative intentions remain unrealised (Valverde, 2011). An important recent innovation is the reporting of teachers' professional peer collaboration as a form of TPD (Treviño, 2018).

Without an overarching TPD policy in the country, this is extremely disparate across school types. The Ministry only oversees some programmes for municipal schools, whereas involvement from voucher and private schools lacks regulation (Donoso, 2008; OREALC/UNESCO, 2013a; Sotomayor & Walker, 2009). Historically, TPD has consisted of off-site courses and seminars, with scarce opportunities for professional collaboration. This remains the case today, according to the latest TALIS (OECD, 2019a), where teachers report high participation and satisfaction, but these are mostly off-site workshops (57% versus 38% collaborative on-site TPD). In turn, the assessment of TPD's impact on practice and students outcomes is rare (Cardemil, 2002; Cisternas, 2011; Montecinos, 2003; Treviño, 2018).

The current reform of TPD addresses the central historical concerns regarding teacher education, many of which echo the conclusions about productive TPD features discussed in Section 2.3.2. In a rather radical shift, it proposes a unified professional career for teachers in state-funded schools (municipal and voucher) to tackle existing disparities and insufficiencies in teachers' wages and working conditions (Treviño, 2018)<sup>16</sup>. The teaching career starts with pre-service education and advancement through five stages results in differential status, salary and development requirements and opportunities (Ministerio de Educación, n.d.). Progress in the teaching career will be determined by an appraisal system (replacing the NTES) that assigns teachers to career stages based on repeated evaluations of knowledge and a portfolio of professional practices including the aforementioned professional collaboration module. A National System of Professional Development will be created, comprising three lines: on-site induction and mentoring, on-site collaborative TPD, and off-site courses and degrees offered by the Ministry, universities and non-for-profit providers. The introduction of on-site TPD will require the development of the leadership competencies of teachers and leading teams, as well as structured support. This responds to international calls for this kind of TPD in the context of stronger directive competencies in schools (OECD, 2019b; Treviño, 2018).

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<sup>16</sup> Again, private schools are not subject to this national reform.

#### 2.4.2.2 *Teaching practices*

Evidence of teaching practices comes largely from the NSTE, which has produced tens of thousands of classroom videos. An analysis of 2003-2010 portfolios shows that around a third of teachers do not meet the minimum competence standards. Of the assessed areas, the strongest is establishing an adequate classroom climate for teaching, whereas teaching interactions and professional reflection are weaker (Sun et al., 2011). The performance of mathematics teachers in the teaching interaction variables is especially worrisome, with 40% of teachers or less achieving the minimum expected. More recently, TALIS results, which include all three types of schools, indicate that teachers spend on average as much as 30% of classroom time managing disruptive behaviour and in administrative tasks (OECD, 2019b). Interestingly, teachers themselves report high frequency of effective practices such as promoting clarity of instruction, cognitive activation and assessment of student progress (OECD, 2019a).

Given the abundance of NTES classroom videos, numerous naturalistic studies of classroom practices have been conducted, many of which have focused on talk. Overall, these results tend to reflect international concerns. Preiss and colleagues (Preiss, 2009, 2010; Preiss, Larrain, et al., 2011; Preiss, San Martín, et al., 2011; Preiss et al., 2016; Radovic & Preiss, 2010) have studied thousands of videos in mathematics and language in primary level showing that the main activity formats are teacher-led whole-class teaching and private student work. In mathematics, complex problems and extended student contributions are rare. Interaction is dominated by IRF sequences for transmitting and recalling information, or procedural practise, with few challenging questions and elaborated follow-ups. Studies conducted with NTES videos by other researchers in mathematics (Araya & Dartnell, 2009), Spanish (A. M. Espinoza, 2014; Iturra, 2013) and science (Larrain, Freire, et al., 2014) depict similar patterns. These are also confirmed in a study by Preiss et al. (2013) employing videoed lessons from voucher and private schools, indicating the representativeness of practices captured by the NTES.

Two further studies of teachers rated in the highest categories of the NTES aimed to identify if they engaged in higher-quality discursive practices (Preiss et al., 2014, 2018)<sup>17</sup>. We found strengths with regards to fostering student participation and making teachers' own reasoning processes explicit. On the other hand, teaching strategies that promote the expression of a variety of ideas or explore students' mistakes remain rare, indicating that students' ideas are seldom showcased and discussed in depth.

To sum up, Chile is in an interesting moment with regards to educational research and policy. In the past decade substantial evidence about classroom practices has been produced and

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<sup>17</sup> The 2014 study included the two highest NTES categories (competent and outstanding) out of four, whereas the 2018 study considered only teachers rated outstanding.

we have now an informed view of teaching practices and competences that indicates areas in which teaching could improve (Preiss, Calcagni, et al., 2015). At the same time, the curriculum and TPD reforms point to strengthening classroom talk and in-school collaborative professional development, coinciding to an important degree with international findings reviewed here. Thus, research should now move in the direction of generating and trialling relevant programmes to support the transition towards school-based TPD.

## 2.5 RESEARCH QUESTIONS

Throughout this chapter, it has been shown that dialogic pedagogy – seen as the act of teaching with its intentions, ideas, knowledge and values (Alexander, 2020) – has gathered theoretical and empirical support while remaining rare in schools across subjects in primary and secondary contexts and in Chile. The working concept of dialogic pedagogy in this research frames it as a general pedagogic approach that strives to build a classroom culture whereby knowledge is understood as collectively built and (re)constructed, and relationships are supportive and reciprocal. This is nurtured through the teacher’s strategic attention towards, use and modelling of talk-related norms and a repertoire of classroom talk forms privileging discussions where multiple students can express, explore and contrast their ideas to learn together. Classroom culture and talk-related practices are mutually influential and aim to achieve pedagogical goals and develop thinking. This concept builds on existing approaches, following Alexander (2018), Mercer (2000), Resnick et al. (2015, 2018) and Kim and Wilkinson (2019).

The need for suitable TPD programmes to promote such pedagogy was established, and literature on professional development and teacher learning in general and specific to dialogic teaching was reviewed. More than 15 years ago Hilda Borko called for TPD studies to implement programmes in multiple sites by different facilitators to illuminate the relationship between schools, programmes and facilitators, exploring the tensions that arise between fidelity and adaptability to local conditions. Such research is still rare and necessary in the quest for system-wide impact of TPD. Dialogic teaching is no exception, and identified programmes tend to rely heavily on external resources and implementers and have been usually small scale and intensive, thus restricting school ownership and limiting wider impact.

An outstanding knowledge gap thus remains regarding how this kind of teaching can be promoted through programmes that “explicitly focus on scaling and sustaining, while maintaining effectiveness” (Haßler et al., 2018, p. 72). It is therefore necessary to propose novel TPD designs that allow us to understand which programme features are adequate to tackle the challenges of

scale, to report if and under which conditions their implementation is viable, and to assess if they can be effective in transforming teachers' understanding and practices with regards to dialogue.

To address these knowledge gaps, in this study I aimed to design and trial a TPD programme to promote dialogic pedagogy in mathematics in primary schools in Chile, that relied on evidence of effective design features and learning mechanisms. The design aimed to increase its scalability potential through low implementation costs and external support, and more importantly, a high degree of local ownership, being school-run and peer-facilitated. The main learning activity were sessions led by facilitators where teachers got together to engage in dialogue and jointly learn about the topic. Furthermore, I aimed to trial the programme in multiple sites to gain insights on the interaction between the programme design and local conditions.

In this context, the following research questions [RQ] guided the research:

*RQ1: To what extent is the implementation of the proposed school-run and peer-facilitated teacher professional development programme viable?*

To answer this research question, the following subsidiary questions were proposed:

*1.1 How is the programme implemented in different schools?*

*1.2 How does peer facilitation unfold in the TPD sessions?*

*RQ2: How effective is the proposed design in promoting dialogic pedagogy in mathematics?*

Effectiveness comprised different aspects of teacher professional growth, as summarised in the following subsidiary questions:

*2.1 Does the programme have an impact on teachers' noticing of classroom dialogue?*

*2.2 Does the programme have an impact on participants' teaching practices with regards to dialogue?*

*2.3 What are teachers' understandings of dialogue after taking part in the programme?*

In documenting and understanding the implementation of the programme in different settings, RQ1 will be informative of the potential of the aforementioned scalable TPD features to be implemented, especially considering peer facilitation. More broadly, the question affords the exploration of viability as a key concept to navigating the space between fidelity and adaptability that is created in school-run TPD. In turn, answering RQ2 will indicate to what extent the approach was fruitful in promoting dialogic pedagogy, feeding into the growing body of literature that deals with this challenge.

# 3 METHODOLOGY

## 3.1 INTRODUCTION

The research questions introduced at the end of the literature review seek to characterise and understand the implementation of a TPD programme and assess its impact. This chapter outlines the research methodology including the design of four related studies, data sets, procedures and participants. Sociocultural theory that informed this research is often linked with an interpretive research paradigm, whereby methods tend to be naturalistic (Gee & Green, 1998). However, educational research focused on change and innovation requires a broader set of tools. Contemporary researchers in the field have developed such mixed approaches to explore teachers' and students' learning processes (e.g. Borko, 2004; Mercer, 2004). Along these lines, this research is framed within a pragmatic approach that ascribes to the beliefs in: '(...) the value-ladenness of inquiry, (...) the theory-ladenness of facts, (...) reality is multiple and constructed, (...) the fallibility of knowledge, and (...) the underdetermination of theory by fact.' (Tashakkori & Teddlie, 1998, p. 13). In this tradition, research questions drive design and methods, drawing from normative and interpretive approaches and emphasising triangulation, corroboration, and understanding of social phenomena (Tashakkori & Teddlie, 1998).

Tashakkori and Teddlie (1998) have proposed the umbrella term 'mixed model studies' that can include combinations of quantitative and/or qualitative approaches in three dimensions: (1) the type of investigation, either exploratory or confirmatory; (2) data collection and operations; and (3) analysis and inference. Applying their categories, this research can be classified as a *Fully Integrated Mixed Design* (Teddlie & Tashakkori, 2008), since all dimensions incorporate qualitative and quantitative approaches. Indeed, the research questions combine a more exploratory aspect focusing on viability, implementation and growth processes, with a confirmatory approach employing pre-post comparisons to assess change. That way, I sought to take advantage of complementary methods to capture different facets of a complex phenomenon.



## 3.2 RESEARCH DESIGN AND DATA COLLECTION

### 3.2.1 Research design

A *Fully Integrated Mixed Design* (Teddle & Tashakkori, 2008) was employed, comprising multiple research questions, studies and forms of data collection as depicted on Figure 3.1.

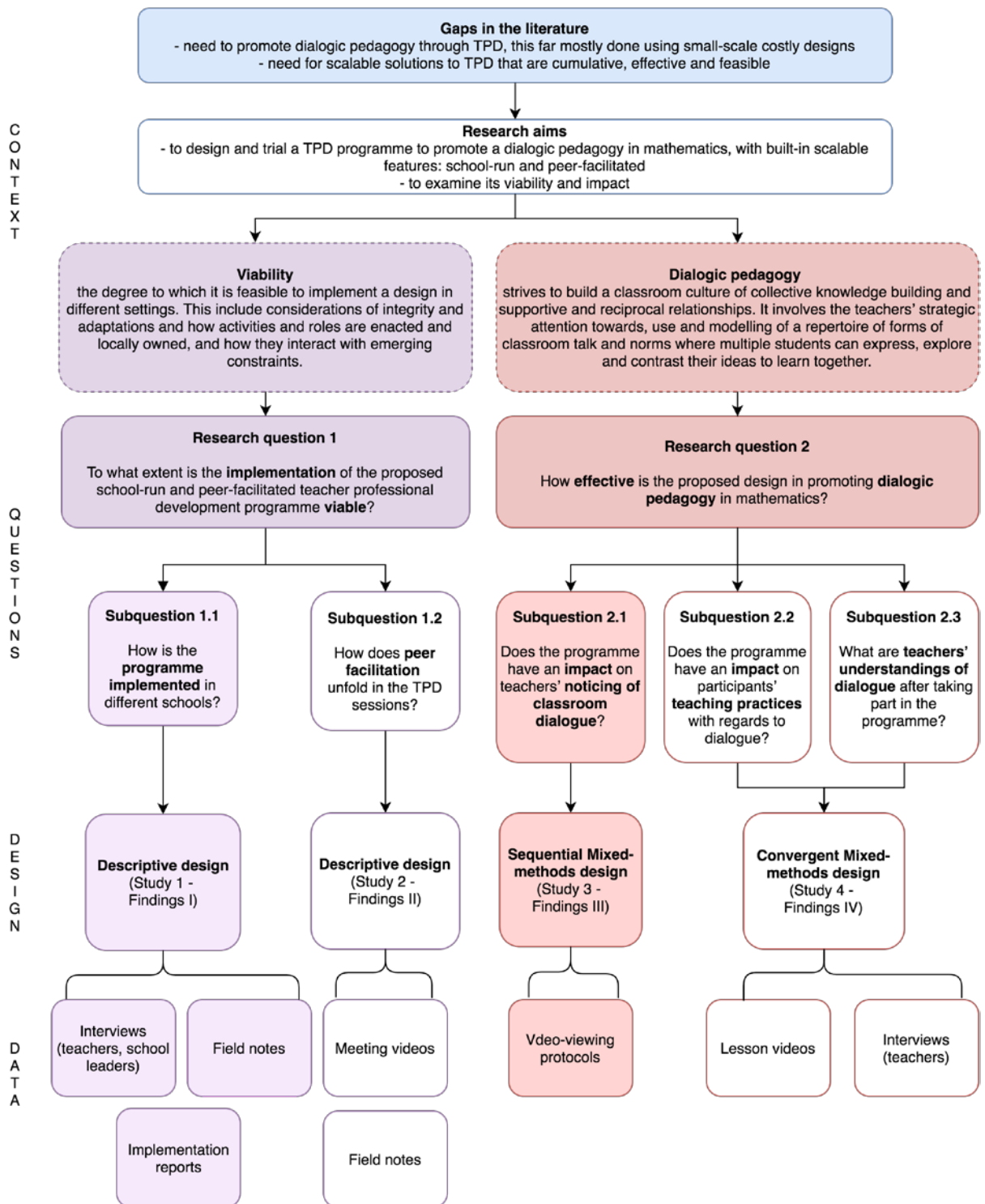


Figure 3.1 Overview of the research

The fieldwork was conducted from November 2016 to March 2018 in Santiago, Chile (see Table 3.1), whereas the TPD programme was implemented throughout 2017. During that period, I took two field trips and spent the months in between in the UK. It is worth noting that four schools – School Araucaria (A), School Boldo (B), School Canelo (C) and School D – were initially recruited<sup>18</sup>. The first two were involved in the project for the intended one-year period, whereas School D dropped out after the facilitators’ induction, and School C withdrew halfway through the programme.

**Table 3.1 Fieldwork activities**

Activity	2016		2017												2018		
	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
First field trip																	
Recruitment																	
Facilitators induction																	
On-site TPD sessions																	
Second field trip																	
Data collection																	

*3.2.1.1 Study 1: TPD viability and implementation*

This qualitative study answered RQ1: *To what extent is the implementation of the proposed school-run and peer-facilitated teacher professional development programme viable?* Specifically, on sub-question 1.1 *How is the programme implemented in different schools?* It focused on the TPD design, initiation and implementation processes (Fullan, 2016), considering schools that dropped out as well as those that remained in the project. It sought to account for the implementation and reflect participants’ views on it. To answer the research question, the data consisted of 14 interviews conducted with facilitators from three schools, participating teachers and leadership teams from the two schools that completed the programme, and field notes taken throughout fieldwork.

Located in the domain of in-service professional development, the study responded to issues of implementation and scale that, although outlined more than a decade ago (Borko, 2004), are still pervasive and have been highlighted in the context of promoting classroom dialogue in particular (Khong et al., 2017). This study allowed for an adequate account of the TPD process, examining viability in this multi-site TPD study facing fidelity-adaptation tensions (Borko, 2004). Furthermore, it served as the context for interpreting the effectiveness results. Although its

<sup>18</sup> All names are pseudonyms to preserve the schools’ anonymity.

sample was relatively small, the inclusion of multiple schools afforded comparisons that are rare in the field, given that much of the research is conducted in a single site (e.g. Lefstein & Snell, 2014) or bringing together teachers from different schools and thus excluding the institutional level as a focus (e.g. Gröschner et al., 2014).

#### *3.2.1.2 Study 2: Peer facilitation in the TPD programme*

The study addressed RQ1 (see above), sub-question *1.2 How does peer facilitation unfold in the TPD sessions?* It explored implementation in more detail focusing on the programme sessions and the viability and characteristics of the proposed peer facilitator role. Examining the TPD sessions was crucial to open the ‘black box’ of TPD learning activities. Such activities are often taken as a given in the procedure section of TPD research reports.

The design was qualitative and descriptive, and analysed video recordings of the TPD sessions in School A and B. The implementation of the TPD sessions in relation to the original TPD design was first analysed to understand how the programme came to life in participating schools, considering fidelity and adaptations as important aspects (Hennessy & Davies, 2020). Second, the study examined what the sessions could tell us about peer-facilitated learning in this context, considering that it is still rare for facilitators to be the mediators of their peers’ professional discussions (Borko et al., 2014). This analysis was anchored in a tradition of research on professional development in interaction with peers – under the umbrella term teacher communities – that has shed light on professional dialogues that favour engagement and understanding of practice (Little, 2002; Vangrieken et al., 2017).

#### *3.2.1.3 Study 3: Changes in noticing*

This study addressed RQ2 *How effective is the proposed design in promoting dialogic pedagogy in mathematics?* Specifically, it focused on *2.1 Does the programme have an impact on teachers’ noticing of classroom dialogue?* Video observation and reflection on teaching practices played a fundamental role in the programme and were scaffolded throughout. Therefore, changes in teachers’ ability to distinguish relevant aspects of classroom talk (i.e. noticing) were an important area of impact. Teacher noticing has been widely studied in mathematics education (Sherin et al., 2011a), but its application in the field of dialogic teaching remains rare (Lefstein & Snell, 2011b being an exception) and, to my knowledge, the assessment of noticing regarding dialogue is new.

Responding to the novelty of the analysis, a pre-post sequential mixed methods design was employed, starting with thematic analysis to build a coding scheme, followed by pre-post statistical comparisons (Tashakkori & Teddlie, 1998). The data consisted of a pre-post video

observation task whereby teachers observed two video clips and produced written accounts. Nine teachers from Schools A and B completed the assessment.

#### 3.2.1.4 Study 4: Impact on teachers' practice and understanding of dialogue

This study focuses on RQ2, sub-questions 2.2 *Does the programme have an impact on participants' teaching practices with regards to dialogue?* And 2.3 *What are teachers' understandings of dialogue after taking part in the programme?* The study employed a convergent mixed methods design (Guetterman et al., 2017) to assess pre-post changes through systematic video analysis and document teachers' reports of learning and its resulting effects in the classroom in Schools A and B. Video recordings of nine teachers that completed the programme in two schools were analysed. Ten teacher interviews addressed teachers' reflections on their understanding of dialogue, their learning and their students' progress. Both strands of data were collected and analysed in parallel, later integrating and triangulating the results (Creswell & Miller, 2000). This impact study linked back to the literature about TPD for dialogue where effectiveness remains elusive, foregrounding the need for studies that conduct thorough examinations of impact on teachers and their students (Vrikki, Wheatley, et al., 2019).

### 3.3 DATA AND PROCEDURES

#### 3.3.1 Overview of the data

Various data production techniques were employed, as depicted in Figure 3.1 Table 3.2 shows the data collection timeline, except for field notes, produced throughout the fieldwork.

**Table 3.2. Data collection timeline**

	2017												2018		
Data	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Surveys															
Video observation protocol															
Teacher interviews															
School leader interviews															
Pre, during and post videos															
TPD meeting videos															
Implementation reports															

### 3.3.2 Data sets and procedures

#### 3.3.2.1 Surveys

Initial written surveys (see Appendix 1) focused on teachers' and facilitators' demographic information as well as previous professional and educational experience that were employed to describe participants (see Section 3.4.3.2).

#### 3.3.2.2 Video observation protocols

The inclusion of this pre-post measure responded to assessing TPD impact on teacher noticing of classroom talk (Study 3). Noticing is an intra-mental phenomenon, henceforth its measurement demands its elicitation followed by analysis that requires a level of researcher inference. Typical study designs include “(a) teachers engage with researcher-selected artefacts of practice from other teachers' classrooms, (b) teachers engage with artefacts from their own classrooms after having taught a lesson, and (c) researchers infer teacher noticing from instructional episodes.” (Jacobs, 2017, p. 275). The former two are more common and raise a number of methodological challenges. These relate to selection of artefacts – usually classroom videos – that are perceived as authentic, the authenticity of the noticing and recording processes, as well as the level of inference required in data analysis (Jacobs, 2017). In this case, I decided to employ design (a) using videos. This technique has been used in numerous studies as means to assess teacher noticing, sometimes as a result of TPD (Santagata & Angelici, 2010; Seidel et al., 2011; van Es & Sherin, 2008).

Given that the goal of the TPD was to promote dialogic pedagogy, it was important for the videos to contain instances of talk that could be considered from this standpoint. Furthermore, it was expected for teachers to notice differences with regards to dialogic teaching in classrooms, considering the use of talk and other aspects such as a conducive classroom climate and classroom ground rules. To that extent, I decided to select two examples of practice varying in their dialogicality so that teachers' noticing and reactions to both could be gauged before and after the programme. To make responses comparable across teachers and measurement instances, I decided to work with videos from teachers who were unknown to participants. The caveat was that some authenticity was lost, given that teachers did not have contextual knowledge about the classroom, which is characteristic of noticing in their own practice (Nickerson et al., 2017). Notwithstanding, given the use of unknown teachers' videos in the TPD sessions, noticing in that context was of interest as well.

I selected the two videoclips from a book and online platform seeking to promote video-based pre-service teacher learning providing rich classroom videos and activities (Martínez et al., 2016). The platform offers videos filmed in all kinds of schools in Chile, potentially increasing the

sense of authenticity, key in teachers' perceptions of classroom video (Seidel et al., 2011). Martínez and colleagues (2016) selected videoclips of practices deemed rich, therefore, the clips did not represent 'good teaching' versus 'poor teaching'. Rather, interactions were very different, each offering instances in which students spoke and expressed mathematical ideas with different levels of teacher uptake (Nickerson et al., 2017). Given the wide range of grades in which participants taught (1<sup>st</sup> to 8<sup>th</sup> grades), I decided to select videos from the middle years of primary, which could appeal to a wider range of participants than extreme grades would. Specifically, the videos feature two Chilean female teachers: V1, in 3<sup>rd</sup> grade which show elements of dialogic teaching and V2, in 4<sup>th</sup> grade which does not. Full descriptions of each clip are presented in Chapter 7.

Regarding recording noticing evidence, tasks often include teachers' spoken or written responses to open-ended prompts about classroom video, whereas closed questions with Likert format are also employed (Seidel & Stürmer, 2014). In this case, written, open-ended questions were selected, based on our previous piloting and measurement in Chile (Muller et al., 2013), as well as the convenience of collective application rather than individual interviews. The application of noticing tasks in the field of dialogic pedagogy was (and still is) novel. Therefore, questions from existing studies needed tailoring. The formulation of questions was done in consultation with an educational researcher and a teacher in Chile, to guard the measures' overall validity (Cohen et al., 2011). The two questions, presented on separate sheets, were: Q1: *What did you observe in the video?* And Q2: *What could you say about students' and the teacher's talk?*

Teachers were given a whole page to answer each question and I created a script with verbal instructions for participants to standardise the application further, including initial instructions indicating teachers should observe and write an account of what they had seen without commenting out loud. I showed participants the first video (the dialogic one) twice on a projector or large screen using speakers and gave them up to ten minutes to write up. The same process was repeated for the second video (the non-dialogic one). The pre-test protocol was applied in the facilitators' induction and in an initial appointment with the other participants. The post-test was applied in a final data collection appointment with all participants in each school. Responses were transcribed and anonymised before analysis.

### 3.3.2.3 *Teacher and facilitator interviews*

Interviews are a useful technique in eliciting participants' perceptions, views and beliefs (Mertens, 2009), which were crucial in understanding the programme's implementation and results. Final individual semi-structured interviews were conducted with facilitators and teachers

focusing on the TPD design, its implementation, and their learning. They were included in Studies 1 and 4.

Regarding the sample, initially around 19 teachers were meant to participate, and I considered interviewing all facilitators and 1-2 participating teachers from each school regarding implementation. Additionally, I intended to interview in depth all participants from one school about their learning. This appeared to be a manageable subsample representing all schools (around 10 interviews). When School C dropped out, I decided to conduct in-depth interviews about implementation and learning with all participating facilitators and teachers from Schools A and B. I also interviewed the facilitators in School C regarding the dropout decision. Unfortunately, it was not possible to interview participating teachers at this school. This resulted in a total of 12 interviews (5 facilitators and 7 teachers). The topics covered were programme design and implementation, learning and intentions for the future. To deepen the conversation about learning and provide feedback to participants, a final interview segment involved observing and discussing a short clip of their final lesson which will be described in detail in this section.

Considering interview design, reducing bias in interviews is considered key to assure their validity as a research instrument (Cohen et al., 2011). To achieve this, interviewers need to be adequately trained and interview scripts prepared and checked for potentially leading prompts to avoid skewing participants' responses (Cohen et al., 2011). Taking these issues into consideration, the interview design included the development of initial thematic scripts featuring key topics. Questions and further prompts were then developed and tailored according to specific implementation processes in each school. The scripts were refined in conjunction with the team of research assistants (see Section 3.4.4 for further details about the team), paying special attention to potentially skewed questions. As an additional measure, it was decided that interviews would be conducted in pairs with one main interviewer and one observer (with some exceptions due to practical obstacles).

Another issue with interviews is that participants' reports can be imprecise or seek social desirability, especially regarding learning. To address this, I followed Hennessy et al.'s (2016) recommendation to probe for illustrative examples when changes in practice are reported, to maximise the evidence from concrete dialogic practices that were implemented and avoid superficial positive responses.

All interviews were conducted individually during school hours and were held in a private room. Two people from the research team were present in all but one case, one acting as interviewer and one as observer. I acted as the interviewer in the facilitators' interviews and with two teachers, swapping roles with the research assistants in the other five cases. The interviews lasted between 40 and 80 minutes and the interview scripts were used as a reference (see

Appendix 2). The order of the questions was flexible, following the topics that the interviewees brought up. Procedures included:

- (1) a briefing mentioning the confidentiality conditions to warrant teachers' trust
- (2) the question-and-answer section
- (3) an introduction to their own video, indicating that the observation was optional
- (4) video observation and questions
- (5) feedback

Steps 4 and 5 in the interview procedure require further clarification. The technique involved the discussion of video materials and has been typically employed to provoke participants' recall and reconstruction of their decisions (Calderhead, 1981; Kuzborska, 2011). In this case, the interest was in prompting teachers to reflect further on their perceptions and decisions regarding dialogue. Prior to the interviews, I selected 4- to 6-minute-long video excerpts from the interviewee's lessons that featured whole-class talk and at least some dialogic features. To prepare the feedback element, I watched the lessons, selected and coded the clips using the turn-level coding scheme (See Section 8.2.1.2.4 in Chapter 8) and listed aspects that showcased progress, as well as ideas of how to continue or improve (see example in Appendix 2). Interviews were audio-recorded and transcribed verbatim by two assistants and myself, following a transcription protocol that built on Jefferson (1984) (See Appendix 4).

#### *3.3.2.4 School leader interviews*

As part of Study 1, final semi-structured interviews were conducted with school leaders from two schools (A and B). Leadership teams are usually formed by a senior leader, one or more technical-pedagogical chief(s) [hereon UTP] that oversee teaching, assessment and curriculum and sometimes a chief of 'living together'. Given their responsibilities, UTPs were more involved in the project than other leaders, and thus they took part in the interviews.

The focus of the interviews was on the TPD design and its implementation, their perceptions of participants' learning and the future of the project in the schools. The interview rationale and development were the same as the teachers' interviews, but the scripts only included the question-and-answer section, and no video materials were discussed (see Appendix 2). In Araucaria School, I conducted the interview with the UTP individually. In Boldo School the interview was not feasible during fieldwork and was later conducted over the phone with the two UTPs. I contacted Canelo School via phone calls, e-mails and the post to attempt to arrange an interview with the leadership team, unfortunately without success.



### 3.3.2.5 Lesson videos

Classroom video analysis is a valuable source of information about teaching practices, given the potential to generate rich quantifiable data that provides a potentially valid measure of teaching with a relatively low cost compared to transcript analysis (Desimone, 2009). Lessons were recorded at the beginning and end of the TPD programme, and once during the implementation. The recordings were employed in Study 4 as the main evidence of changes in students and teachers with regards to classroom dialogue.

The number of observations is important when documenting teaching practices so that the measures can be considered reliable, that is, repeatable over time (Teddle & Tashakkori, 2008). It has been argued that the minimum should be nine lessons: observing three lessons in three different periods (Desimone, 2009). With 19 teachers from the three participating schools, this would have resulted in an unmanageable number of observations considering the available time and resources. Thus, I considered it viable to record them once before the TPD, and twice towards the end. Recording one pre-test lesson was considered viable given that there is consistent evidence that Chilean teaching practices in mathematics are usually not dialogic (Preiss, Calcagni, et al., 2015; Preiss et al., 2018), and that was likely to be the case initially. The inclusion of two recordings as the post- measure sought to approach the three-lesson recommendation, maximising the amount of available evidence given my resources.

Regarding these final recordings, during the second semester of the intervention it emerged that teachers' self-captured videos (to be used in the TPD context) had been delayed to the final months of the academic year, and teachers were having difficulties with self-videoing. Therefore, I decided that where teachers could not record each other (which only happened three times), the research team would video the lessons to be used in TPD as well as the final videos. This produced a number of 'extra videos', some recorded early in the second semester (September) and some recorded later (late October and November). I tried to negotiate the recording of two additional post-test videos, but this proved impossible in part because of the end of the academic year being so busy, and because the research team was only able to manage two simultaneous recordings. Additionally, some teachers were not keen on being recorded three times in such a short period of time. The resulting number of videos per teacher is shown in Table 3.3.

The videos employed for the pre-test are the 'video-pre', whereas in the post-test, where there was an 'extra video – late' available I considered the one that appeared to be more dialogic for coding, considering this as evidence of participants' maximal accomplishment regarding classroom dialogue. Cells marked in blue on the table indicate the videos used in the pre-post comparisons. P19 joined the project later in the year and therefore only had one videoed lesson, resulting in her exclusion from the quantitative analyses.

**Table 3.3. Classroom video data**

<b>Participant</b>	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	<b>Total</b>
Video pre											<b>9</b>
Extra video - early											<b>3</b>
Extra video - late											<b>7</b>
Video post											<b>8</b>
<b>Total videos</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>27</b>

Regarding videoing procedures, recording dates were agreed with teachers beforehand, asking them to choose one grade level for all recordings. The purpose was explained to the students before the recordings began. Given that the TPD focus was on whole-class dialogue, we employed one camera located at the back of the classroom, with an audio input from a lapel microphone carried by the teacher. I personally recorded most of the lessons, and I trained four research assistants to record independently. Additionally, we wrote field notes compiling aspects such as number of students, sitting arrangement and overall impressions to be consulted during analysis (see Appendix 5).

#### *3.3.2.6 TPD meeting recordings*

Meetings between participants (“sessions”) were the main TPD activity, and their videos offered evidence both implementation and peer facilitation. These aspects were the focus of Study 2. Originally, I had planned for research assistants to come to the schools to record every other session so that they would have someone from the project visiting, serving both as support and a reminder. Facilitators would record the remaining sessions. Unfortunately, facilitators’ recordings proved almost impossible. The reasons and solutions are detailed in Chapter 5. Consequently, School A had nine of their session videos, whereas in School B only two full sessions and part of another five sessions were recorded, limiting the available evidence. School C only had two recordings before dropping out, and these were excluded from Study 2.

#### *3.3.2.7 Implementation reports*

I asked facilitators to complete a brief report template after each session (See Appendix 6) to act as the main monitoring tool, recording attendance, modifications to session plans and other impressions for Study 1. These reports were completed by facilitators in Schools A and C for the first few sessions, while School B never completed them. As discussed in Chapter 5, facilitators considered them burdensome, and I decided to drop them and instead rely on other sources of information mainly through messaging recorded on fieldnotes.

### 3.3.2.8 *Field notes*

I wrote field notes in Spanish and English throughout the implementation and during the data collection activities (including research assistants' notes), especially documenting emerging issues and reflections. Their main use was documenting the implementation as part of Study 1.

### 3.3.3 Piloting

The novelty of the TPD design, especially in the Chilean context, made piloting before the main application advisable. The programme, which is described in detail in Chapter 4, involved facilitators' guidelines to mediate the different activities found in TPD sessions, including video observation and materials such as presentations, readings and written exercises. Outside these sessions, teachers were meant to record their lessons and select segments to show their peers. Ideally, a pilot would have involved teachers in Chile trialling these elements, either as stand-alone components or in conjunction, to incorporate the lessons learnt into the design. Yet, the timeline of the research (fieldwork commenced in November, as soon as possible after registration) and that of the Chilean school year (which ends in December) limited the opportunities to do this, especially given how busy schools are at the end of the year and the anticipated challenges with school recruitment. I thus prioritised the latter.

Some actions were taken to compensate for the lack of piloting. Firstly, I developed the resources building on facilitators' guidelines and TPD materials tried and tested in previous international and Chilean research (see details in Section 4.3) to attempt to maximise their usability. I also conversed with a teacher who had peer facilitation experience after taking part in a diploma course that I taught in 2014 to learn from her experience. Additionally, readings and other materials were checked by a local mathematics teacher and adjusted following her suggestions to ensure they were sound in terms of disciplinary knowledge.

Despite these measures, the lack of piloting meant that the usability and/or feasibility of key components had to be tested as part of the research and, indeed, they were found to be problematic at least to some extent (see related findings in Chapter 5). While these challenges are a part of the research findings, their earlier adjustment and/or negotiation with participating schools could have potentially boosted the programme's viability. In hindsight, an alternative could have been to conduct a pilot in England. While the school context and resources are vastly different and were thus considered too distant from actual implementation conditions, teachers' feedback could perhaps have nonetheless been informative and pre-empted some of the emerging issues. Thus, in the absence of more ideal piloting conditions, suitable options could have been sought to improve the programme's design, and especially to ensure a good learning experience for participants who volunteered to take part in the study.

### 3.3.4 Ethical considerations

The research complied with ethics guidelines from the British Education Research Association (2011) as well as the Faculty of Education's *Research Ethics Review Checklist*. The goal was to protect the wellbeing and dignity of all participants and the quality of the research. This compliance had a series of consequences, importantly establishing conditions of participation and data management. The former requires researchers to ensure voluntary and informed involvement from all participants, including disclosing the purposes of the research, the uses of the data, and the right to withdraw from the study at any stage.

Different types of participants required various degrees of involvement. Namely, teachers' and facilitators' contributions were more intensive, including videoing lessons focusing on their teaching, videoing TPD meetings, and taking part in written and oral interviews. UTPs' participation involved interviews only. Consequently, consent letters detailing the conditions of involvement of each kind of participant were created (See Appendix 7).

Students' participation, in turn, only included videoing of lessons from the back of the classroom. All participating schools had in place their own consent procedure for student involvement in research. At the beginning of the year, they requested all parents' permission for their children to take part in research and other activities involving videoing and photographing – both practices being common in all schools, including visits from TV stations – provided that the headteacher authorised the activities. This formal authorisation was sought according to the schools' regulations. Additionally, the information letters of consent for parents and opt-in consent letters for students that I had originally prepared were distributed by the teachers (See Appendix 7). I hoped that through the parents' signed letters they would grant an additional permission for me to use the videos in future TPD programmes, which was not specified in the schools' consent procedure. However, only in some classes did all parents return the signed letters, as is common in the Chilean context. Possibly, the fact that they had already given the schools consent for videoing was an explanatory factor as well. Therefore, taking maximal precautions, the videos will be used exclusively for research purposes, excluding any public display that I had anticipated.

The study did not involve physical risk for participants. Nonetheless the nature of the TPD design needed scrutiny, especially regarding local implementers and use of lesson videos (Finefter-Rosenbluh, 2016). A key issue reported by Finefter-Rosenbluh is that in observing others' classrooms, teachers and students can feel invaded, and colleagues might feel they are intruding on others. Managing this required that the TPD goals were well framed, and for teachers to adhere to them in order to deem recordings as purposeful and not intrusive. Negotiating recording dates and assuring the confidentiality of the videos were key in this regard.

Even so, some resistance to videoing was reported, and this issue was discussed during the final interviews. Students, in turn, were informed about the process and they were not in the focus of the camera unless they were asked to come to the board.

Another requirement I discussed with the schools regarding the use of videos was safeguarding principles of privacy and formative use. This precluded showing them outside the sessions and employing them for assessments. This is a particularly sensitive issue when working with teachers from municipal schools in Chile (Grau et al., 2017), because they have been regularly videoed for the NTES sometimes experiencing negative consequences (Manzi et al., 2011). To ensure these principles were enforced, they were discussed and agreed upon with all participants and UTPs. These aspects were not reported to cause any trouble throughout the year or in the final interviews, showing that the sought degree of privacy was achieved.

Aside from this, given that teachers examined their colleagues' classrooms, it was important to ensure that discussions held were respectful of the teachers and students being featured. Consequently, I included an initial TPD module focused on video observation, for which facilitators requested more sessions to make sure that they could build trust and a constructive environment (see Section 4.3 in Chapter 4), and I drafted an ethical commitment for them to discuss during the initial session (See Appendix 8).

Participant compensation can be considered an ethical dimension in research, especially in projects that require intensive commitment. Economic or material rewards are sometimes offered to teachers as incentives. In our own previous projects, we gave teachers netbooks or tablets, and some acknowledged that part of their motivation to get involved was to obtain these rewards (Grau et al., 2017). Additionally, teachers and schools could be compensated for their release time, so that their dedication to research is not absorbed personally or by the school. In this programme, schools agreed to cover teachers' release time so that the project could be completed during their working hours (see Chapter 5 for further discussion on time burden). Had more resources been available, paying at least for facilitators' release time would have been ideal, easing their workload and perhaps enhancing local recognition of their role. In terms of incentives, I provided the schools with free TPD design and materials, inclusive of the video cameras, so that they could continue to video their lessons after the project finished. Participants did not receive any further incentives, partly in the interests of scalability. After implementation had ended, I sent each of them a detailed private report of their lessons with feedback and indications on how they might continue with dialogic practices.

Finally, in my view, ethical considerations should also address researchers' critical reflection about the research design in the context of more encompassing goals such as promoting democracy and social justice (Cochran-Smith & Lytle, 1999). The decision to conduct the study

in municipal schools in Chile relates to these goals, even at this small scale, because they are attended by the country's most impoverished students (Centro de Estudios MINEDUC, 2012b). Thus, I am committed to working with municipal teachers in an attempt to contribute to their development. As regards democracy, focusing on dialogic pedagogy relates to promoting more just and inclusive participation in the classroom and contributing to students' development as citizens. This is relevant especially in municipal schools in Chile because they are the only public schools in a highly privatised system (Bellei et al., 2018).

## 3.4 RECRUITMENT AND PARTICIPANTS

### 3.4.1 Selection and inclusion criteria

#### *3.4.1.1 Target schools*

The target population of schools was defined as primary public schools located in Santiago, Chile. Public schools are overseen by municipalities and I decided to recruit schools from the same municipality so that they had shared administration. Working in a single territory could increase their similarity with regards to socio-economic composite, student achievement, local leadership and possibly ambient TPD, that is, other programmes attended by participants earlier or concurrently (Wayne et al., 2008). That way, school-level differences could be brought to the fore, harnessing the understanding of implementation factors.

#### *3.4.1.2 Inclusion criteria for teachers*

Teachers had to be teaching mathematics in primary school, which comprises 1<sup>st</sup> to 8<sup>th</sup> grade (6- to 7-year-olds to 13- to 14-year-olds) and decide to participate voluntarily. Other demographic criteria such as sex and years of experience were not considered for selection since variations in these characteristics are typical of schools and previous TPD studies. The fact that TPD participants are usually volunteers has been discussed by Desimone (2009) who stresses the importance of researching TPD with non-volunteers to examine the limits of TPD designs. The latter was not the case in this project. I considered that an initial design trial should work with volunteers, creating a more favourable setting to assess the programme's potential, and also because doing so respects teachers' professional judgment around TPD. Forcing teachers to participate was deemed problematic from both ethical and practical perspectives.

With respect to teachers' taught grade levels initially, I aimed to include teachers that taught in the second sub-cycle of primary (5<sup>th</sup> to 8<sup>th</sup> grade, 11-year-olds to 14-year-olds). This responded to the Chilean organisation of schooling, which makes teaching conditions more similar within

sub-cycles. In the first sub-cycle, homeroom teachers tend to teach all subjects, whereas in the second sub-cycle they tend to specialise in some subjects and teach these. Also, covering a smaller range of ages would make target students and classes more similar in terms of their development and the curriculum. Nevertheless, in the schools that agreed to participate, there were only a handful of teachers who taught mathematics from 5<sup>th</sup> to 8<sup>th</sup> grades (normally one or two). Therefore, in conjunction with school leaders, we agreed to widen the project's scope and include teachers at all primary grade levels. Leaders saw this as an opportunity to bridge between the two sub-cycles that are usually disjointed. Thus, most of the participants were homeroom teachers, imparting most subjects to one class. The few teachers that taught more than one class were asked to select one target class where implementation and data collection were conducted. Chosen classes spanned from 1<sup>st</sup> to 7<sup>th</sup> grades. Additionally, one of the schools – Canelo – requested the inclusion of special needs educators and supporting teachers that acted as co-teachers in the mathematics lessons.

#### *3.4.1.3 Inclusion criteria for facilitators*

Facilitators had to be working as teachers and/or school leaders and had to be chosen for the role by their school's leadership team. The original design contemplated only one facilitator per group. Nonetheless, headteachers suggested there should be two instead so that they could support each other, to which I readily agreed. As possible criteria for selection, I proposed: perceived expertise in mathematics teaching, good relationships with colleagues, and holding a reasonably neutral role in the organisation with respect to teacher assessment, given that duality of assessment and support roles might be perceived as threatening (Finefer-Rosenbluh, 2016). Selection criteria were discussed during the initiation stage of the programme and the final interviews with UTPs (see Study 1 for a discussion). In addition to the aforementioned reasons, interest in positioning teachers as leaders was mentioned.

#### 3.4.2 Participant recruitment

The target sample was four schools from one municipality, groups of 3-5 participants, aiming for a total of 12 to 20 participants including facilitators and teachers. Table 3.4 describes the recruitment process in each school. The first phase of recruitment focused on schools, feeding from two source types: NGOs that worked with municipal schools and direct contacts with schools. Directly contacting municipalities could have been more appropriate in principle. However, at the time of recruitment municipal elections had been recently held and new authorities were not yet in place.

**Table 3.4 Recruitment activities and participants**

School	Araucaria School	Boldo School	Canelo School	School D
<b>Participants in initial meeting(s)</b>	Researcher, headteacher and UTP	Researcher, headteacher and two UTPs	Fieldwork supervisor and headteacher	Researcher, fieldwork supervisor and headteacher
	-	-	Researcher, headteacher and UTP	Researcher, headteacher and UTP
<b>Negotiation meetings with UTP</b>	2 meetings	3 meetings	1 meeting	None
<b>Informative meetings</b>	1 meeting with 4 teachers	2 meetings, one with 3 teachers, one with 2	1 presentation with all the school staff (20+)	2 meetings cancelled without notice
<b>Main point of contact</b>	UTP and Facilitators	Facilitator	Facilitators	Facilitators
<b>Induction with facilitators (4 sessions)</b>	2 facilitators, P10-F attended 4 sessions, P14-F, 2 sessions	1 facilitator P15-F attended 4 sessions, UTP-1 attended 1 session	2 facilitators, P20-F attended 4 sessions, P21-F attended 3 sessions	2 facilitators, both attended 4 sessions

One school that I contacted directly<sup>19</sup> eventually agreed to meet and take part in the study (School A). I met with the leadership team that included the headteacher UTP. They acted as key informants (Flick, 2014) reaching out to another four of the municipality's headteachers who agreed to meet. Three became involved in the project, completing the targeted four-school sample. The second phase focused on participants and was mainly undertaken by the leadership teams. They pre-selected teachers and facilitators who then attended the informative meetings I held in each school. Teacher involvement was later secured by the leadership teams. School D only took part in the initial phase of induction, later ceasing their involvement in the project (see Chapter 5 for a discussion).

### 3.4.3 Schools and participants' characteristics

The municipality to which the schools belong is a middle- to middle-low income district that dates back to the expansion of Santiago in the first half of the 20<sup>th</sup> century. Its character is

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<sup>19</sup> The school had taken part in previous research by the field supervisor who facilitated the contact.



mainly residential with some industrial activity. Schools Araucaria, Boldo and Canelo were classified as middle income, whereas School D was classified as middle-low (Agencia de Calidad de la Educación, 2017). The four schools were underperforming in mathematics and reading compared in SIMCE to schools of similar socio-economic level, but School D especially so (Agencia de Calidad de la Educación, 2017). Given that School D dropped out before the TPD implementation reached the school, it is not considered in what follows.

#### *3.4.3.1 Schools' characteristics*

##### *3.4.3.1.1 Araucaria School*

This school covers preschool and primary, with 366 students in 2016 and an average class size of 36 students. The school has a focus on the arts (visual arts, theatre and music), which is reflected in their extracurricular activities. Two teacher-facilitators and three teachers joined the project and they taught all grades from 1<sup>st</sup> to 8<sup>th</sup>.

##### *3.4.3.1.2 Boldo School*

Boldo School is a larger school, that had 782 students from preschool to 8<sup>th</sup> grade in 2016. The leadership team selected one teacher and one UTP as facilitators, but in reality, only the former took part in the sessions. Additionally, three teachers were involved from the beginning, and another three joined for part of the project (one of whom stayed until the end). They taught from 3<sup>rd</sup> to 8<sup>th</sup> grades.

##### *3.4.3.1.3 Canelo School*

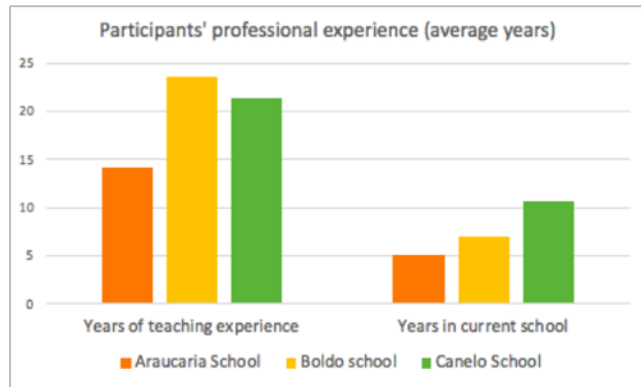
Canelo School covers preschool to 6<sup>th</sup> grade, which is somewhat unusual, since Chilean primary schools tend to cover all 8 primary grades. 765 students attended this school in 2016. Canelo used to be a higher-performing school in the municipality, and it was still known for this in the area. Initially, the UTP selected two teacher-facilitators, all the other teachers teaching mathematics (7 teachers) and five teaching assistants and special needs educators.

#### *3.4.3.2 Participants' characteristics*

Teachers completed an initial survey regarding their demographics and professional background. Figure 3.2 depicts their main characteristics (note that only 7 out of 9 teachers from Canelo School completed the survey). Most were seasoned, with over a decade of teaching experience, but only about a quarter had specialised in mathematics. The TPD topic and design were novel: most participants did not have any previous TPD experiences in dialogue, using classroom videos or working in teacher communities.

## Participants' demographics

	N	Mean age	Age range
Araucaria School	5	40.6	32 - 59
Boldo School	5	49.8	30 - 60
Canelo School	7	45.2	33 - 60



## Participants' professional development experiences

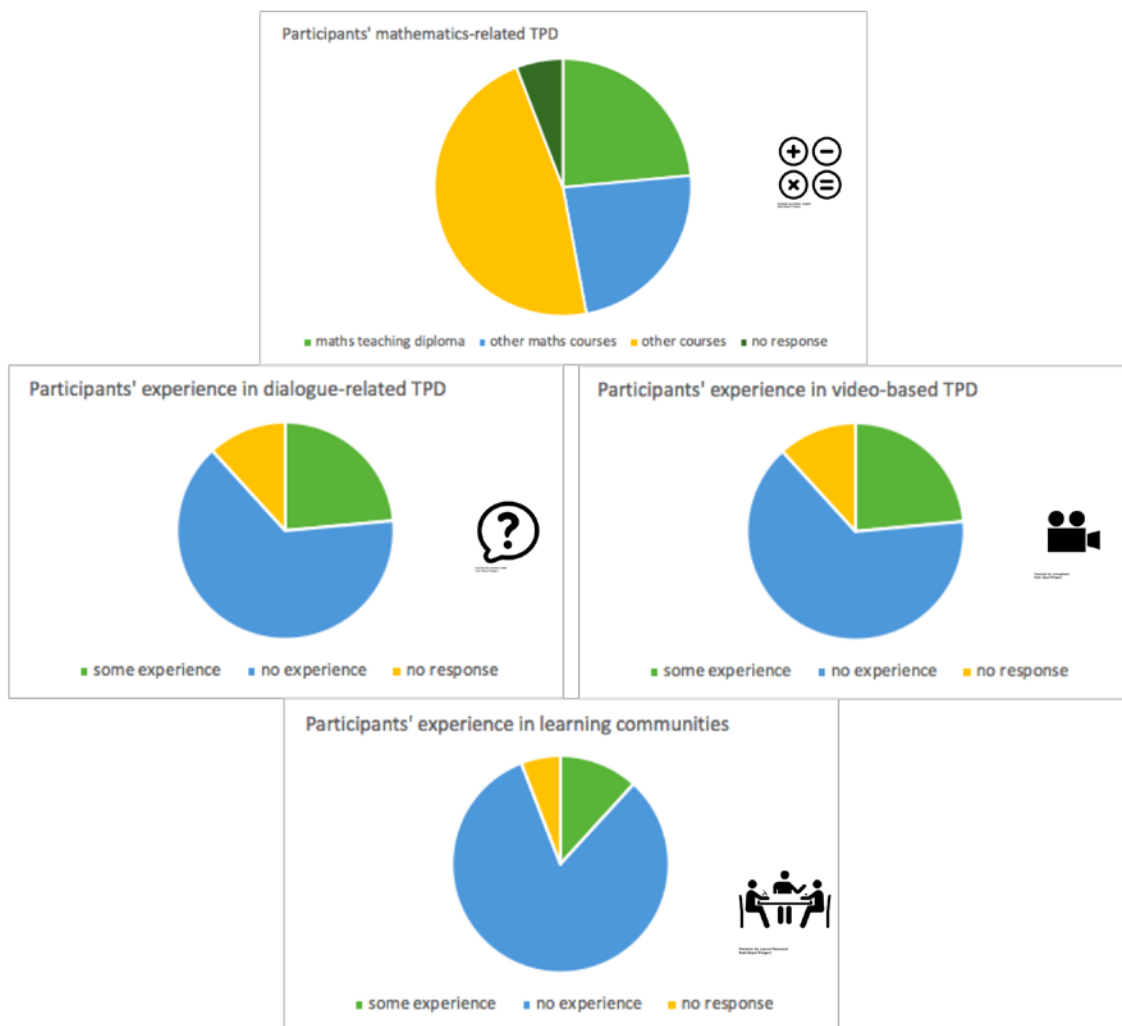


Figure 3.2 Participants' demographic and professional characteristics

### 3.4.4 The Chilean research team

I was fortunate enough to have a field research team engaged in my project. First, Dr Valeska Grau was appointed as fieldwork supervisor at the School of Psychology, Pontificia

Universidad Católica de Chile. She has undertaken substantive work in Chilean schools and oversaw the process, taking part in some TPD activities during the initiation phase.

Additionally, I sought support from students at the School of Psychology, especially for the months that I spent away from Chile. Initially, a Masters student joined the project, aiming to develop her thesis in the context of my TPD. She contributed in piloting the student measures and in school recruitment, but unfortunately, had to quit the project for personal reasons. As an alternative, Dr Grau recruited psychology undergraduates to fill assistant positions as part of an elective research course. In it, students must dedicate 150 hours throughout a year to a project. Two students signed up, and a third one offered to participate as a volunteer<sup>20</sup>. They were in their fourth and penultimate year of the course.

The research assistants had three main roles. First, each assistant acted as the point of contact for a school and visited when issues emerged. As part of that, I set up an instant messaging group (on the app WhatsApp, very popular in Chile) for each team of facilitators and assistants. Second, they contributed with data collection, recording lessons, TPD sessions and conducting interviews. Occasionally, I hired an extra assistant to do the recordings. Lastly, the team played an active role in some aspects of data analysis (Studies 1, 3 and 4), and actually remained committed to the project until the end of the analysis process.

### 3.5 CONCLUSIONS

This chapter has framed the research as a pragmatic, mixed methods project that integrated qualitative and quantitative data collection methods. These are fully integrated throughout the design, data collection and analysis. The four outlined studies aimed to answer the research questions concerning viability, effectiveness and impact on teachers employing a variety of methods. Data production was intensive, involving eight types of data, collected over a 15-month period by a team. This lengthy engagement in the field allowed for the TPD implementation and the corresponding longitudinal data to cover a whole academic year, which was highly beneficial to the TPD design possibilities.

The following chapters will introduce the TPD programme and its rationale and present the four studies that intend to provide an encompassing overview of the implementation and its impact. Analytical techniques are specific to each study and will therefore be described in the respective chapters. They drew mainly on thematic analysis, systematic coding and rating, pre-

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<sup>20</sup> The third student is a volunteer because she had completed this course's credits before and thus her involvement in the project could not count as course work. Nevertheless, she remained committed to the project throughout its implementation.

post statistical comparisons as well as correlational techniques, providing multiple insights into the programme and its participants, looking to produce robust and deep results. This is an important affordance of mixed methods for studying teacher development, given its multidimensional nature and complex patterns (Hennesy & Davies, 2020).

Reflecting on the overall methodological challenges and limitations, although the engagement in the field was extended, it would have been preferable to follow participants during the next academic year(s) to assess scale, sustainability and/or delayed emergence of changes (Hennesy & Davies, 2020). Informal contact with some participants gave indications of continued implementation (see Chapter 5). Had some schools not dropped out, a larger sample would have allowed the use of parametric statistical tools, making results more robust. Nonetheless, in the field of TPD, a multi-site 9-teacher sample is not negligible and many studies that have contributed substantially to the field have fewer sites and/or participants.

Considering the methodological approach, common struggles in mixed methods research are the required expertise across techniques and difficulties in integrating the different strands (Bryman, 2007). Indeed, mixed method studies' inferences should be distinctive, complying with quality criteria of all the methodologies involved (Bryman et al., 2008). Teddlie and Tashakkori (2008) suggest how mixing can be conducted in the analysis and inference phases and outline helpful criteria for auditing integration so that the purposes of mixing methods are actually met. They include *interpretive consistency* and *integrative efficacy*, that is, correspondence to lower-level inferences when formulating meta-inferences. Importantly, they stress that inferences coming from different data sets or analyses could yield contradictory conclusions, potentially informing more complex meta-inferences (Teddlie & Tashakkori, 2008). These quality criteria guided the studies presented in the following chapters and the issue of integration will be considered again in the Chapter 9.

# 4 PROGRAMME DESIGN: PROFESSIONAL DIALOGUES FOR MATHEMATICS TEACHERS

## 4.1 INTRODUCTION

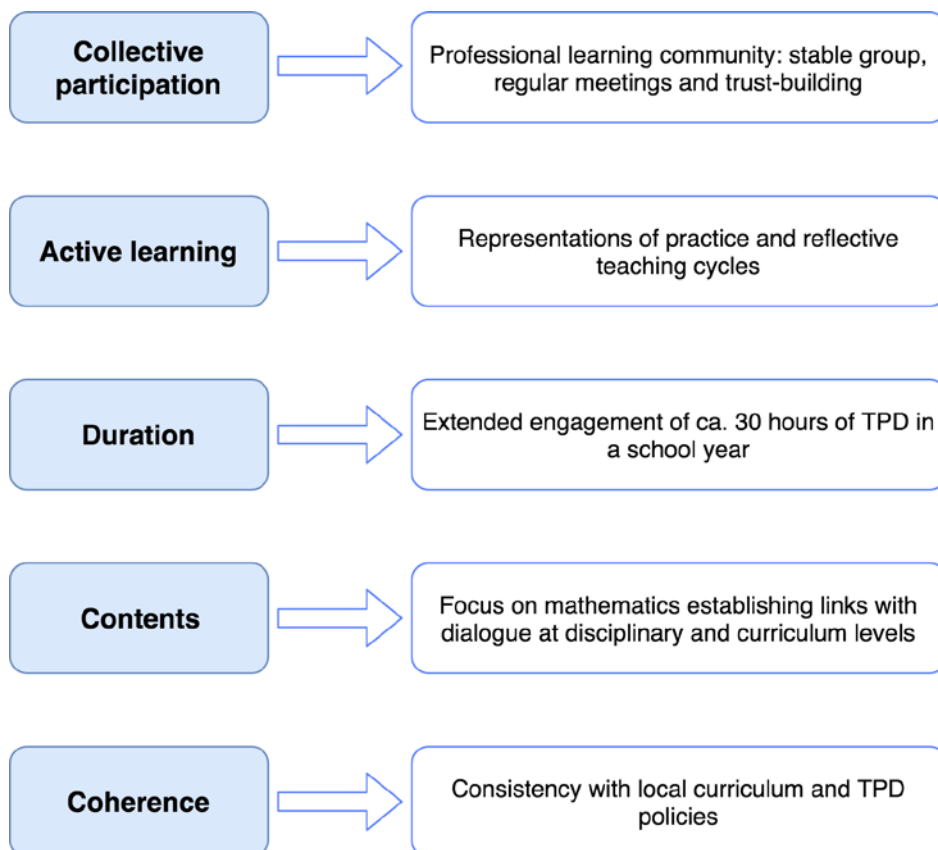
The literature review helped establish the challenges of and interest in promoting dialogic pedagogy. The key lever to achieve this goal is teacher learning, with TPD offering a structured, intentioned way of addressing it. Changing classroom dialogue remains an elusive goal, but the literature offers some insights regarding effectiveness and challenges involved in TPD for dialogue. As indicated before, TPD research should aim to be cumulative, building on previous findings and avoiding reinventing the wheel. Important aspects are programme duration and teachers' and educators' commitment (Hennessy & Davies, 2020). Research on TPD programmes for dialogue is still mostly populated by small-scale 'boutique designs' (Asterhan & Babichenko, 2019; Khong et al., 2017). They provide informative proofs of concept, but are very costly and hinder replicability, scaling up and sustainability (Borko, 2004).

In this context, the present chapter introduces the design of a TPD programme that aimed to address the outlined challenges of effectiveness, cumulativeness and scalability. The chapter provides firstly an account of the design rationale and decisions. Secondly, the TPD programme and its components are outlined.

## 4.2 RATIONALE AND DESIGN DECISIONS

### 4.2.1 Programme design features

Considering first the programme's underlying pedagogy, previous TPD programmes for dialogue have employed prescriptive, strategy-based and insight-based pedagogies, as outlined by M. M. Kennedy (2016). Considering their underlying mechanisms, they vary with regards to the control exerted by TPD designers in what teachers are meant to do throughout the implementation and learn from it. In designing the programme, mechanisms related to strategies and insights were considered. A combination of both can provide participants with structured support in dealing with a new topic while also relying on their analysis of established and new practices as a powerful form of learning alongside colleagues. A similar conclusion is reached by Khong and colleagues (2017) in their review of TPD for dialogue.



**Figure 4.1. Application of effective TPD features to the programme design**

Having established these general principles, I drew on Desimone's (2009) critical features of effective TPD that she regards as consensual and have some empirical support: *collective participation, active learning, duration, content focus and coherence*. These features were described in more detail in Chapter 2, and here I illustrate how I incorporated them in the programme design (see

also Figure 4.1). It is worth mentioning that, while this list of features provides guidance, there is still substantive research to be done with regards to how their presence is materialised, how the features interact and the degrees of intensity they require (Opfer & Pedder, 2011; Sims & Fletcher-Wood, 2018). Such research was beyond the scope of this work. However, incorporating the features explicitly and probing their meaning in the context of scale and sustainability was a way of building on previous findings.

#### *4.2.1.1 Collective participation*

This feature has been outlined as a way to provide an encouraging and critical context for teachers to learn among colleagues (Desimone, 2009). In this project, this aspect was not only considered in opposition to individual learning: it was the programme's central aspect. Sociocultural concepts, particularly community of inquiry (Jaworski, 2006) and of inquiry as stance (Cochran-Smith & Lytle, 1999), were key to the design. That is, the understanding that teachers learn by participating in a professional community where they inquire into their own practice, in this case focusing on the characteristics of talk and the pursuit of dialogue.

I drew on the literature on *professional learning communities* to decide upon the TPD participants and the core activities (e.g. Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Vescio et al., 2008). Specifically, I considered findings indicating that teacher learning is supported by a group that remains stable in time and develops into a supportive community. Consequently, the programme would consist of regular meetings of a stable group of colleagues and have built-in activities aimed at developing mutual trust and openness to share professional experiences among colleagues in a space guarded by confidentiality.

#### *4.2.1.2 Active learning*

This feature is outlined in opposition to listening to lectures and can take many different forms (Desimone, 2009). This definition is vague enough that it required further specification informed by evidence and theory. In programmes inspired by sociocultural research, learning is conceived as mediated by cultural tools that help to develop new forms of participation or social practices as well as new ways of thinking. In community-based programmes, research has found that a key tool to scaffold learning is that of rich representations of teaching work, most notably of classroom life (Hennessy, 2014; Opfer & Pedder, 2011; Segal et al., 2018). These materials (e.g. videos and lesson plans) can sustain a grounded and evidence-based analysis of current or desired teaching practices. Of course, the mere presence of such resources does not make them into productive learning tools: they need to ignite reflection and questioning in order to challenge the status quo. This productive, inquiry-driven use of representations can be framed as problems of

practice (Horn & Little, 2010), that is, discussing problematic or uncertain aspects of the teaching profession through open examinations and reflection.

This principle resulted in two design elements: *representations of practice* and *reflective teaching cycles*. With regards to the former, I considered the use of samples of teachers' own practices – mainly in the form of videos – a key resource. Videos of teachers' own practices have become popular precisely because they provide a rare window into others' classrooms (Major & Watson, 2018). However, they can generate stark resistance in teachers, who can be reasonably concerned about others' negative views, especially in contexts where video is used for evaluative purposes as is the case of Chile (Grau et al., 2017). Therefore, I decided to include other forms of representations, especially at the beginning of the programme. They included:

- (1) excerpts of classroom talk as part of the programme's readings
- (2) videos of unknown teachers to showcase different uses of talk in teaching
- (3) classroom activities to support the negotiation of ground rules for talk
- (4) lesson planning templates to adjust existing plans (both blank ones and examples)
- (5) videos of participants' teaching.

Taking into account the resistance to sharing teachers' own videos, I included an initial phase aimed to help teachers familiarise with the learning community setting, the TPD contents and the use of others' videos for reflective purposes focusing on dialogue. The latter aim built mainly on Video Clubs that focus on developing practitioners' video observation modes emphasising on detailed description and interpretation while trying to reduce teachers' impulses to evaluate and criticise (van Es & Sherin, 2008). We have applied this approach successfully in Chile before with in-service and pre-service teachers (Grau et al., 2017; Muller et al., 2013).

The work on videos was followed by *reflective teaching cycles* that linked iteratively activities of planning, implementing and reflecting. The cycles aimed to inform planning with locally-grounded knowledge of practice (Cochran-Smith & Lytle, 1999) and comprised four steps:

- (1) *informing practice* during TPD sessions by discussing dialogic pedagogy using readings and the abovementioned representations of practice
- (2) *adapting existing lesson plans* (during TPD sessions) to include detailed plans of whole-class dialogue segments
- (3) *teaching* planned lessons and sometimes videoing them to share with colleagues
- (4) *inquiring and reflecting* about implementation based on video evidence and going back to teaching, bearing new findings in mind.



#### *4.2.1.3 Duration of activities and overall span of the TPD*

Extended engagement has been rightly signalled as key to deep change (Desimone, 2009). Albeit there being no ‘golden standard’, there is consensus regarding the importance of sustained involvement in TPD to promote change in general, and in dialogic teaching in particular (Hennesy & Davies, 2020). This is because practice is deeply rooted in teachers’ beliefs and habits as well as in institutional and classroom routines (Hofmann & Ruthven, 2018). That said, the ideal of substantial commitment and extended duration has to be feasible and compatible with school realities or it risks becoming impracticable. In particular, I considered that in this project, learners needed time to engage in dialogue with each other and their students. At the same time, this had to be balanced with a PhD timeline and with my knowledge of the Chilean educational context and how little time teachers usually have away from the classroom (OECD, 2019b).

Considering these factors, I decided to design an induction for facilitators in a workshop format (18 hours) and then the main TPD programme as a 10-session sequence to be implemented over a school year (15 hours of meetings and around 15 hours of personal work). I acknowledge that this was on the lower end of recommended duration, especially when compared with claims by some that no less than two years are necessary (Osborne et al., 2013). However, even this amount of time was actually longer than many TPD programmes focused on dialogue (Vrikki, Wheatley, et al., 2019) and was considered hardly feasible by some of the schools in the negotiation phase.

#### *4.2.1.4 Focus on subject matter contents*

This focus on specific content during TPD has been linked with students’ learning of such content (Desimone, 2009) and it is popular in mathematics programmes in particular (e.g. Borko et al., 2008). In TPD for dialogue, there are cross-subject programmes as well as specific ones. I selected aspects of classroom dialogue that are widely applicable and linked them to mathematics. This way, I hypothesised, teachers would be able to concentrate on dialogue, which was new for them, rather than on differences across subjects (Sedova et al., 2016 make a similar point in their TPD). Now, because participants would be teaching different grade levels and throughout the academic year, further focus on specific curricular content was not ideal.

The focus on subject matter means not only that all the representations of practice in the programme came from primary mathematics. More importantly, I selected and drafted the TPD content attempting to take into account how mathematics shaped dialogic pedagogy and vice versa at different levels (e.g. talk, tasks, curriculum). I referred to what talk could look like in mathematics teaching, especially regarding the treatment of right and wrong answers which is a pressing aspect in the subject (Brissenden, 1988). I put these in the context of ‘traditional’

disciplinary discourse norms in mathematics, questioning the beliefs of mathematics teaching-and-learning as the transmission of algorithms and contrasting them with dialogic pedagogy (Sfard, 2008). The aims of mathematics education were thus problematised considering critical thinking and participation in the mathematical discourse (Alrø & Skovsmose, 2002).

In more practical terms, proposals about the use of dialogue in different kinds of mathematics tasks and in relation to diverse teaching goals (e.g. recounting previous learning, sharing progress while working on a task) were included in the readings, and I adapted some of the talk tools to be more specific to mathematics (Chapin et al., 2009). Both teaching and dialogue goals were illustrated in sample lesson plans through tasks grounded in the national curriculum. Additionally, I linked the contents with ‘communication and argumentation’ skills in the curriculum that appear throughout all grade levels (Ministerio de Educación, 2012).

#### 4.2.1.5 *Coherence*

Finally, Desimone (2009) describes *coherence* as an effective feature, stressing the necessary consistency between learning aims and the beliefs of teachers, and between TPD aims and content, and school, district and reform goals. This acknowledges the complex and nested nature of TPD (Opfer & Pedder, 2011). Alignment with teachers’ existing beliefs was a challenging aspect considering that dialogic teaching is not the norm in Chile and thus I could hardly expect a pre-existing alignment between them. The TPD aimed to provide a space for such beliefs to be discussed and possibly revised. This is why the next level of coherence between the TPD goal and its design was so vital. Having asserted that participating in dialogue is key to students’ learning, this applies to teachers as well (Hennessy et al., 2011). This was part of the reasons for the programme to be centred around professional learning communities (Vescio et al., 2008), thus enabling teachers’ personal experiences with dialogue (Hennessy, 2014), as well as embracing its dilemmas (Lefstein, 2010). This could be particularly crucial in Chile, since evidence shows that teachers do not normally engage in TPD with their colleagues but they greatly value such opportunities (OECD, 2019b).

A further level in which coherence was important was in the link between the programme goals and TPD policies. Indeed, as detailed in Chapter 2, the programme was not only aligned with the curriculum but also with the newly created National System of Professional Development and its emphasis on on-site collaborative TPD (Ministerio de Educación, n.d.).

## 4.2.2 Designing for sustainability and scalability

In addressing issues related to scale, Coburn’s (2003) proposed definition, explained in more detail in Chapter 2, was helpful in framing the design challenges and decisions. It includes

four dimensions: *depth* of teachers' change in practice, *sustainability* beyond the duration of direct support, *spread* within participants' classrooms and beyond initial participants, and *ownership* of knowledge and authority.

Considering these definitions, I hypothesised that limitations of boutique TPD programmes with regards to scale relate to their reliance on external control, expertise and resources, restricting spread and ownership. Furthermore, they usually create 'new' roles and TPD groups, instead of building on existing local groups that could aid sustainability. In reviewing the literature, it was apparent that programmes vary with regards to: (a) who the *participants* are; (b) how different *roles in the TPD* are filled; and (c) how *decision-making power* is distributed in the various phases of a project's life: design, initiation, implementation and continuation (Fullan, 2016). The issue of resources is also crucial but not openly discussed.

#### 4.2.2.1 TPD group

Regarding the participants, it is common for small Phase 1 studies to be small-scale and focus on one TPD group, usually with 4-10 participants (e.g. Gröschner et al., 2014; Hennessy et al., 2011; Lefstein & Snell, 2011b). These studies sometimes differ in whether they form groups within or across schools, and in whether these groups are formed ad hoc or pre-date the research. This study departed from such designs adopting a Phase 2 logic by being multi-site and including several TPD groups from the onset, precisely to assess its viability and impact in different settings. The question remained of what the 'site' should be and who would take part.

I decided to form groups *within* schools, which I thought was best for sustainability given that contacts between schools are more difficult and costly to sustain, as emerged in our Chilean study (Grau et al., 2017). Additionally, involving a few colleagues in each school could help create a critical mass of teachers familiar with the approach, potentially helping to maximise spread (Coburn, 2003). A further advantage reported by Hennessy (2014) is that teachers working with strangers can be more reluctant to critique their practices, whereas familiar colleagues can become effective "critical friends", contributing to depth. Teacher groups were formed specifically for the research, as there were no stable pre-existing TPD groups focused on mathematics in the participating schools.

#### 4.2.2.2 Roles in TPD

In TPD studies, important roles are participants (normally teachers), facilitators, school leaders, TPD designers and researchers. Typically, a team of at least two university-based researchers fulfil all but participants' and school leaders' roles. This distribution has some advantages, such as promoting otherwise rare researcher-teacher collaboration and making up-to-

date research available in schools (Hennessy, 2014; McIntyre, 2005). Despite this, intensive researcher involvement without appropriate scaffolds and stimulation of ownership hinders sustainability. Therefore, I decided that I would take the role of researcher and designer, school leaders would secure school access and implementation time, and teachers would act as participants and participant-facilitators, taking part in some design decisions as well.

As was described in Chapter 2, facilitating TPD requires numerous skills especially in community-based settings. The quality of facilitation can make or break a TPD programme even in the presence of other effective features (Borko et al., 2014). In TPD that is researched, the role is typically enacted by researchers with previous facilitation experience and expert knowledge (van Es et al., 2014). While offering experienced mediation, this is problematic when considering the involved costs (usually elevated and covered by research grants) and the number of such experts that replicating and scaling up would require. Therefore, in my design I decided to work with peer teachers as facilitators, to build on local resources and relationships as well as boosting ownership. This could also support replicability and thus scaling up possibilities. The downside was that I could not expect peer facilitators in Chilean schools to have expertise in dialogic teaching or in facilitation, thus I had to rely on the brief induction, scaffolding built into the TPD materials and minimal ongoing support to suffice.

To build such support in the resources I considered literature referring to facilitators' skills and tasks. Especially helpful was the work in Zambia by Hennessy and colleagues whose materials include embedded guidance for facilitators and participants, structured sessions and (often video-stimulated) activities and reflective questions (Haßler et al., 2018; Hennessy, Haßler, et al., 2014). Kaner's (1996) work on facilitators of participatory decision-making in organisations was informative too, offering practical advice on mediating conversations. Aside from their role within the meetings, the facilitators in my study had managing responsibilities in terms of being in charge of the materials and video equipment, and they had decision-making power in terms of making adjustments that they considered necessary.

The presence of an 'external expert' was not completely removed from the project because I conducted the induction phase for facilitators. I planned to provide minimal support throughout the year, to test if such an approach could be sustained exclusively by the facilitators using the materials and also because I was not in the country for most of the implementation. Notwithstanding, the amount of support and monitoring that facilitators would actually demand for the TPD to work was an open question that was addressed in Study 1. Even considering the induction and light-touch support, my involvement was marginal compared to most TPD studies, incurring relatively lower costs and dependence on external sources.

#### *4.2.2.3 Decision making in design, implementation and research*

Decisions happen at many levels which can be roughly seen as: (a) the research process; (b) TPD design, content and implementation; (c) teaching plans and their implementation. Typically, studies tend to report that researchers oversee the research aspect. They also have various degrees of control over the TPD design and implementation, including managing research funding and the introduction of resources into schools. School leaders usually act as researchers' counterparts, serving as gatekeepers and crucially impacting which efforts are taken forward and which are not (Fullan, 2016). With regards to teaching itself, considering M. M. Kennedy's (2016) distinctions, prescriptive approaches tend to provide readily planned lessons for participants to implement (e. g. Wegerif et al., 2005), strategy-driven programmes can involve proposed features of dialogue that participants adjust to their contexts through co-planning (e.g. Hennessy, Haßler, et al., 2014), and insight-driven programmes do not always attempt to change teaching directly (e.g. Lefstein & Snell, 2014). Thus, the three mechanisms can be seen as involving decreasing levels of external input and control.

I hypothesised that when (almost) all decision-making power lies with the research team, local ownership over the process and its continuation are limited. Therefore, careful consideration was needed if the goal was to maximise sustainability. Following Phase 2 studies, the research design was completely in my control. I also controlled most of the TPD design, but the contents and some aspects of the sessions were negotiated with facilitators during their induction, relying on their local knowledge to maximise viability (see Section 4.3.2). Implementation, in turn, was not meant to be in my hands, although I did exercise some degree of external supervision through monitoring and the presence of research assistants in schools. Indeed, the multiplicity of roles and goals required constant negotiation of control and accountability on both sides, which was examined in Study 1.

In multi-site TPD, implementation requires a well-defined TPD design to enable transfer (Borko, 2004), but at the same time, 'one size fits all' TPD designs are discouraged because of their lack of responsiveness to local conditions and needs (Fishman et al., 2003; Whitehead, 2010). To address this, aside from involving facilitators in some design decisions, I encouraged them to adapt the pace and contents of sessions according to their group's progress. At the lesson planning level, I decided to use a strategy-based approach, that is, to include suggestions that teachers could include in their own lesson plans. The rationale was that if teachers themselves incorporated dialogic teaching in their lessons according to their knowledge of local conditions and interests, this could benefit the depth of their learning and ownership over changes, as opposed to ready-made lesson plans typical of prescriptive approaches. Also, in

adjusting their lesson plans they could incorporate aspects of dialogue into the tasks, making it purposeful rather than just incorporating more talk (Wells & Arauz, 2006).

## 4.3 PROGRAMME CONTENT AND MATERIALS

### 4.3.1 Overall TPD goals

The programme aims were for teachers to:

- (1) enrich their knowledge about dialogic pedagogy;
- (2) refine their noticing abilities to focus on classroom dialogue;
- (3) plan, trial and incorporate dialogue in whole-class situations.

The TPD programme comprised two components<sup>21</sup>. First, a researcher-led facilitator induction, and second a facilitator-led programme.

### 4.3.2 Component 1: Facilitators' induction

The induction was intended for teachers (or school leaders) who would then become facilitators in their schools. The rationale was that they could benefit from experiencing the programme's contents and methodologies as participants in a low stakes context before having to facilitate them for their colleagues. Therefore, contents and activities were similar to the main TPD, focusing on observation of practice and classroom dialogue (see Table 4.1). Additionally, they covered contents regarding facilitating conversations and a final module was devoted to negotiating the main TPD contents and timeline, as well as agreeing on practical aspects such as means of communication between them and the research team. The results of these negotiations will be discussed in Chapter 5.

The induction followed a workshop format that I led for participants and it included four 4.5-hour workshops. Activities were mainly discussion-based, as well as brief presentations, and hands-on exercises like analysis of video (Martínez et al., 2016) and role playing.

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<sup>21</sup> The contents were initially devised in collaboration with a fellow PhD student, Leonardo Lago, who developed a similar project focused on science education in Brazil.

**Table 4.1. Facilitators' induction sessions**

Session N° and name	Contents
<i>1. Introduction and modes of observation</i>	Introduction
	Modes of video observation (presentation and practising)
	Observational foci (focusing on talk and dialogue)
<i>2. The importance of talk for learning and ground rules for dialogue</i>	The importance of talk for learning (cont. Observation focus)
	Ground rules for dialogue in the classroom
	Negotiating ground rules for video observation
<i>3. Dialogue in different settings</i>	Introducing dialogue goals and tools (talk moves)
	Dialogue among peers (exploratory, cumulative and disputational talk)
	Dialogue in the whole class
	Dialogue in the learning community and facilitators' talk moves
<i>4. Classroom dialogue: Planning to build ground rules with students</i>	Role playing: facilitating video observation and discussion among peers
	Presenting and negotiating TPD contents and sequence
<i>5. Negotiation of contents and next phases</i>	Discussion of programme contents and timeline
	Agreements to coordinate the implementation

For additional support, I wrote and distributed three brief research-based readings:

(1) *The role of the facilitator in a learning community*: the most theoretical of the readings, it outlined the main ideas around learning communities, the facilitators' role in different kinds of activities, and facilitation goals and tools, adapting Chapin et al.'s (2009) goals and linking them with Kaner's (1996) work around strategies for mediating conversation.

(2) *Goals and tools for facilitation*: this reading provided detailed presentations of the aforementioned goals and tools, offering concrete guidelines and examples (see Figure 4.2) alongside a more useable version akin to cue cards.

(3) *Dealing with difficult dynamics*: drawing mainly on Kaner's (1996) proposals, this brief reading unpacked a series of possible difficulties facilitators could encounter and suggests how to address them. For instance, it proposed dealing with a situation when someone is talking too much in a meeting by inviting into the conversation those who are being passive, instead of addressing that participant directly.

## Goal 1 - help each participant to share, expand and clarify their own thinking

*Participants' contributions are what make up dialogue. Once the dialogue is taking place, there are active listening tools and invitations that can promote participants' expression of ideas. These are performed by situating oneself in a neutral position as a facilitator.*

The goal includes the following **tools**:

1. **Thinking time**: this technique consists of a seconds-long pause and it is used to give thinking time to decide what to say to the participant holding the floor or the whole group. This also allows for more people to take part, and not only those who come up with answers faster (adapted from Kaner, 1996)
2. **Encouraging**: motivating people to take part, opening up the conversation through open questions addressed at the whole group (adapted from Kaner, 1996)
3. **Inviting to say more**: holding the floor after someone's contribution and asking them to expand or complement what they have said, mainly to clarify (adapted from The Inquiry project, 2012)
4. **Paraphrasing**: taking someone's contribution and attempting to reproduce it using your own words, without changing or evaluating it. This slows down the conversation and is a form of active listening. Besides, it shows participants that you are trying to understand what they say (adapted from Kaner, 1996)

Figure 4.2. Example of facilitation goals and tools

### 4.3.3 Component 2: peer-facilitated TPD for teachers

#### 4.3.3.1 Structure, contents and materials

##### 4.3.3.1.1 Structure

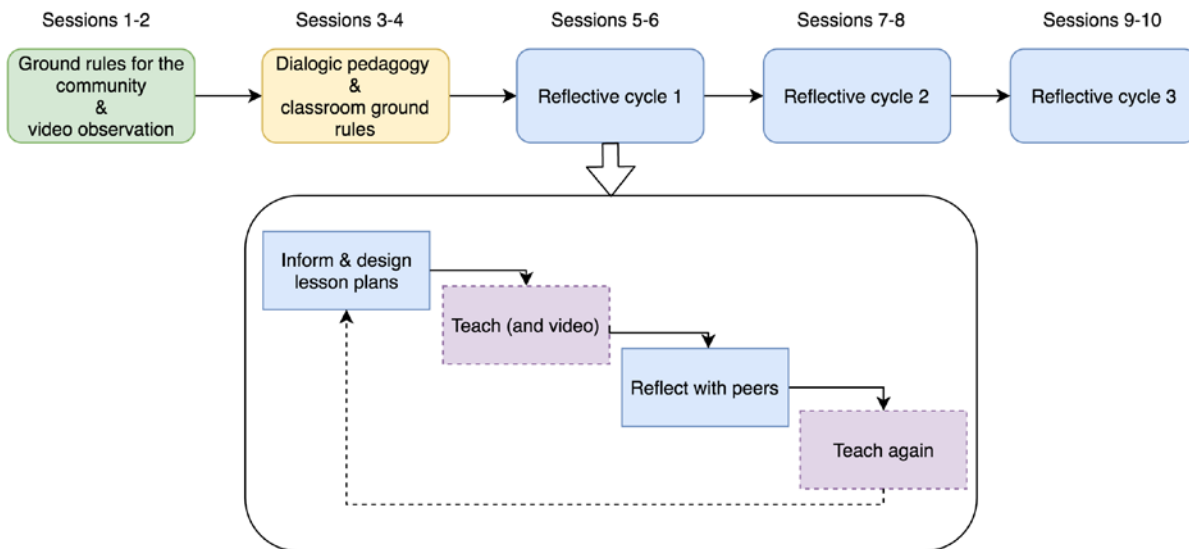


Figure 4.3. Sequence of TPD Sessions

The TPD programme was designed to be implemented over one school year, in this case from March to December 2017. The overall design and some materials were drafted before commencing fieldwork, and the bulk of materials were developed from December 2016 to March 2017, with some small additions being delivered throughout the year. It consisted of a series of



10 sessions in which the same learning community would meet for 90 minutes (15 hours total). Teachers' individual work planning lessons, trialling dialogic activities, recording and viewing their own classroom videos accounted for another 15 hours. Sessions were planned to take place every 2-3 weeks. As described in Section 4.3.2.2, the original TPD structure was revised in response to facilitators' concerns (see Figure 4.3).

#### 4.3.3.1.2 Contents and materials

Considering the fact that the TPD was intended to have minimal external support, I decided to create a substantive body of materials in Spanish for participants and detailed guidelines for facilitators. To develop them, I built on previous work on dialogic teaching and video-based TPD, both internationally and by my previous research team in Chile. I thought this was important to avoid reinventing the wheel, however, I did have to design most materials anew considering that the programme was peer-facilitated and focused on mathematics. Table 4.2 details the sequence of sessions, contents and materials.

Previous programmes that inspired the contents and materials design are:

- the OER4Schools programme (Hennessy, Haßler, et al., 2016) especially since it is based on peer facilitation in a transmission-based pedagogy context
- the Thinking Together project (Mercer et al., 2004)
- the epiSTEMe project (Ruthven et al., 2011)
- the Cam-UNAM Scheme for Educational Dialogue Analysis [SEDA] (Hennessy, Rojas-Drummond, et al., 2016), and its teacher-oriented version, T-SEDA of which I am a co-author (Vrikki, Kershner, et al., 2019)
- Resources for interactive teaching and learning (Hennessy, Warwick, et al., 2014)
- the Inquiry Project (Michaels & O'Connor, 2015)
- video clubs focused on teacher noticing (Sherin & Han, 2004; Sherin & van Es, 2009; van Es & Sherin, 2009)
- Martínez et al. (2016) Chilean work on video-based pre-service teaching
- our Chilean work with video-based TPD in university-school partnerships (Grau et al., 2017; Muller et al., 2013)

It is worth noting that, not being a mathematics teacher myself, to ensure that TPD materials were sound I enlisted the help of a Chilean mathematics teacher and researcher. She provided disciplinary advice, co-designed the lesson plan examples and checked the readings and materials suggesting improvements.

**Table 4.2. TPD Sessions, activities and materials**

Session N° and name	Activities	Materials
<b>1. Basic rules for the learning community</b>	Introduction	
	Importance of ground rules	Presentation about ground rules
	Creating ground rules for the TPD	Worksheet, ethical commitment
<b>2. Observing video to reflect (modes of observation)</b>	Observing video and writing an account	Video clip, video observation protocol
	Constructive modes of video observation	Presentation about video observation
	Negotiating ground rules for video observation	Additional readings "Suspending critical judgment" and "Modes of observation"
<b>3. Observing videos to reflect (focus on talk)</b>	Reading about dialogic teaching	Reading: "Dialogic teaching: rethinking the role of talk in learning"
	Observing videos focusing on talk and dialogue	2 video clips, one with and one without dialogue, video observation protocol
<b>4. Classroom dialogue: Planning to build ground rules with students</b>	Reading about ground rules	Reading "Ground rules for communication"
	Self-audit of current classroom rules	Questions to reflect on rules
	Joint planning and adapting of activities to negotiate groundrules in teachers' classrooms	Activities for raising awareness, negotiating and rehearsing ground rules. Adapted from Thinking Together project
<b>5. Reflective cycle 1: designing activities (dialogue goals 1-2)</b>	Review of activities to negotiate rules	Questions to reflect on implementation of rules
	Reading about dialogic teaching II	Reading "Dialogic teaching: goals and tools"
	Joint planning incorporating whole-class dialogue into existing lesson plans	Templates for adapting lesson plans and designing dialogic activities (incl. dialogue goals and planning questions and prompts), examples of dialogic goals and lesson templates
	Agreeing a video-recording calendar	Reading "Guidelines for recording and selecting video clips"
<b>6 Reflective cycle 1: analysing colleagues' videos</b>	Introduction and reminder of ground rules for observing videos	
	Observing video of one colleague	Video observation protocol
	Observing video of the second colleague	Video observation protocol
<b>7 Reflective cycle 2: designing activities (dialogue goals 3-4)</b>	Review of any new dialogic activities implemented by participants	Questions to reflect
	Joint planning incorporating whole-class dialogue into existing lesson plans	Same as Session 5
<b>8. Reflective cycle 2: analysing colleagues' videos</b>	Observing video of one colleague	Same as Session 6
	Observing video of the second colleague	Same as Session 6
<b>9. Reflective cycle 3: designing activities (dialogue goals 1-4)</b>	Review of any new dialogic activities implemented by participants	Questions to reflect
	Joint planning incorporating whole-class dialogue into existing lesson plans	Same as Session 5
<b>10. Reflective cycle 3: analysing colleagues' videos and Programme</b>	Observing video of one colleague	Same as session 6
	Closing remarks	To be decided in each school

With regards to the specific materials, each session comprised activities for participants and guidelines for facilitators (see Figure 4.4 for an example of Session 2 guidelines and Figure 4.5 for guidelines and materials for an activity). These guidelines were meant to present the session rationale and provide specific indications so that facilitators could understand the underlying intentions and apply their judgement accordingly. They included overall learning goals and success indicators, a sequence of the activities and specific goals of each, and potentially useful ‘facilitator talk moves’, referring back to the induction materials.

<b>Session 2 - Video observation to promote reflection (Observation modes and focus)</b>	
<b>Learning intentions and objectives</b>	<b>Achievement criteria (to accomplish this, we will)</b>
- Practising the use of videos aimed at learning and reflecting	- Observe videos and produce written accounts
- Knowing and practising video observation modes: descriptive, interpretative and evaluative, honest questions and judgements.	- Analyse observation accounts using the key distinctions
- Acknowledging the importance of the observational focus and identifying 'focusing on students' and 'focusing on talk' as central to analyse dialogue.	- Discuss and analyse written accounts
- Negotiating ground rules to observe videos and strategies to promote the use of videos with formative purposes.	- Synthesise strategies and rules to observe videos in the learning community. - Share the video observation template.

**Session sequence:**  
 Activity 1: elaborating written account from a video (10 minutes)  
 Activity 2: presentation and discussion about observation modes (30-40 minutes)  
 Activity 3: elaborating new written accounts from a video (15 minutes)  
 Activity 4: negotiating ground rules to observe videos (25-35 minutes)

<b>Overall notes about the session</b>
<p><b>Notes about learning objectives:</b> the goal of this session is to share and practice the key concepts about modes of video observation that will be used throughout the year. Also, you should build ground rules to observe videos that complement the community ground rules that you created in Session 1. These observation modes are important to promote evidence-based teacher reflections, that produces an interpretative rather than evaluative account of videos. During the session, you can highlight the relationship between these observation modes and the community goals as well as its ground rules.</p> <p><b>Notes about the activities:</b> the video observation activities are basically the same as the ones we did during the facilitators' induction in December, and its advantage is that it's a practical activity.</p>

**Figure 4.4. Facilitators' guide example from Session 2**

Session materials included sheets with writing exercises, video observation and lesson planning templates, readings and, on two occasions, video clips (Martínez et al., 2016). Additionally, each group was given a video camera and a tripod. The original activities were designed for small groups (4-6 participants), but some schools had larger groups (9-14 participants) requiring adaptations, usually sub-dividing the group and adjusting activity duration. In addition to the sessions, I devised exercises labelled ‘personal work’ that followed up on the

session's topic and were meant to be engaged with in the next session (see example in Appendix 9). I gave facilitators printed session-by-session materials and digital copies as well.

**Session 2 - Activity 1: elaborating written account from a video**

Goal: observing a video and creating the first written account  
Time: 10 minutes

**Sequence**

1. Introducing the activity saying that a video will be observed. Provide video context (see 'materials' section)
2. Hand out observation template and indicate that the work will be individual. They should write as much as possible in answer to the question: what do you observe in this video?  
Play the video and then give 3-4 minutes to complete the written account.

**Materials**

- Video: "explaining how you solved it". Watch from the beginning until minute 5:30.  
Video context: a 1st-grade lesson about addition and subtraction in which a series of tasks is presented in the context of one 'problem-situation' about Martin's birthday party. Before this video, the students have calculated the number of attendees by using paper figurines that they pasted on the board.
- Written account template (open format)

**Notes for facilitating**

Notes about this activity type: elaborate your own written account while participants are working on theirs. It will help you focus on the activity.  
While participants are writing, tell them to write as much as possible.

**Written account template - open template**  
(participants' materials)

Write: what do you observe in this video?

**Figure 4.5. Facilitators' guide example from Session 2 - Activity 1 and participants' materials**

Finally, I prepared a set of six ad hoc readings, with the exception of “Suspending critical judgement” from a previous project (Grau et al., 2012). The contents of the readings (in the order in which they were presented) were as follows:

(1) *Suspending critical judgement*: how to refrain from judging the teachers featured in videos, including moderating the impulse to evaluate, focusing on students' ideas, substantiating claims, and tolerating uncertainty given the limited information provided in short video clips (Session 2).

(2) *Modes of observation*: presented different modes of video observation and production of written records providing and examining examples (van Es & Sherin, 2009). The first mode is

*describing* in detail, then *interpreting* what is being described, and also posing '*honest questions*' that point to what we do not know. It also explained what should be avoided: *unfounded judgements* and *founded evaluations* (when they are not the goal of the observation) (Session 2).

(3) *Dialogic teaching: rethinking the role of talk in learning*: the lengthiest and most theoretical of the readings, covering the importance of talk in thinking and learning drawing on Mercer's work (1995, 2000). It characterised classroom talk as predominantly non-dialogic, linking these topics to teaching-and-learning in mathematics and then presenting dialogic pedagogy. The latter was introduced through Alexander's (2008) five principles and a typology of 'dialogic functions' of talk, following T-SEDA (Vrikki, Kershner, et al., 2019) (Session 3).

(4) *Ground rules for communication*: combined theory and practice drawing on Mercer and colleagues' work (Wegerif et al., 2005). It covered 'traditional' ground rules in mathematics teaching (Walshaw & Anthony, 2008) and described and gave practical examples of how rules for talk and good relationships in the classroom could be negotiated and practised (Session 4).

(5) *Dialogic teaching: goals and tools*: gave examples of possible mathematics teaching situations in which dialogue is relevant. It then introduced Chapin et al.'s (2009) four goals and nine tools for dialogue with detailed examples. These goals are: (1) for students to express their ideas, (2) to listen to one another, (3) to deepen their thinking and (4) to think with others. Finally, it provided guidelines for managing responses in a whole-class discussion, as well as managing the floor to make turn-taking more inclusive. The latter built on materials from OER4Schools (Hennessy, Haßler, et al., 2014) and were used from Session 5 onwards.

(6) *Guidelines for video recording and selecting video clips*: this reading was devised for teachers who would be presenting their video clips. It comprised technical guidelines about how to produce quality self-captured video and tips on choosing a focal topic or question, observing the complete video and choosing a video clip to share with peers (Session 5 onwards).

## 4.4 CONCLUSIONS

This chapter introduced the design rationale of the TPD programme, which aimed to make it effective while raising its potential for scale, a key component being peer facilitation using detailed guidelines. It comprised a researcher-led facilitators' induction which allowed for the negotiation of substantial aspects of the TPD design. Facilitators then took over to implement a 10-session programme throughout a school year. Having introduced its contents and exemplified the materials, the following four findings chapters examine the programme's viability and effectiveness integrating multiple methods to provide an in-depth examination of the implementation and its results.

# 5 FINDINGS I: VIABILITY AND IMPLEMENTATION OF THE TEACHER PROFESSIONAL DEVELOPMENT PROGRAMME

## 5.1 INTRODUCTION

There is now considerable evidence that transforming classroom practices towards dialogic pedagogy is no easy task (Hennessy & Davies, 2020). It might involve challenging beliefs and assumptions, redefining roles, expectations and communication patterns, making TPD a necessity (Mercer & Howe, 2012). In this project, TPD has been defined as *an intentional and systematic attempt* to promote teacher learning. Currently, even intensive, researcher-led dialogic pedagogy interventions exhibit mixed results (Khong et al., 2017; Vrikki, Wheatley, et al., 2019). Furthermore, these are hardly scalable, undermining their possible system impact.

Consequently, the programme researched here sought to address the issues of scalability potential combining effective principles of TPD and structured guidance for peer facilitation with minimal external support. This innovative design made understanding the implementation process a central task (Borko, 2004), and the working concept of viability was proposed in the literature review to consider feasibility and navigate the space between fidelity and adaptation. The chapter addresses sub-question *1.1 How is the programme implemented in different schools?*

To answer the research question, the chapter provides an account of the implementation based on field notes and it examines 14 interviews conducted with facilitators, participating teachers and leadership teams considering their perceptions on initiation, implementation of the induction and programme, and anticipated continuation (Fullan, 2016). Completing schools as

well as dropouts were included. The multi-sited design affords engaging in cross-school comparisons and advancing hypotheses about paths to viability (Borko, 2004).

## 5.2 DATA ANALYSIS

### 5.2.1 Corpus and analytic approach

Participants' perceptions and experiences throughout the programme implementation were collected through interviews (see Table 5.1)<sup>22</sup> and complemented by fieldnotes. Thematic analysis was employed, which is a form of qualitative analysis that focuses on the contents of texts to identify topics relevant to the research questions. Inductive and deductive logics can be combined allowing for previously selected topics to be considered, as well as the emergence of unanticipated themes (Flick, 2014).

**Table 5.1. Interviewees in each school**

Interviews	Araucaria School	Boldo School	Canelo School
Teachers	3: P11, P12, P13	4: P16, P17, P18, P19	-
Facilitators	2: P10-F, P14-F	1: P15-F	2: P20-F, P21-F
UTPs	1: UTP-A	2: UTP-B1, UTP-B2 (joint interview)	-
<b>Total</b>	<b>6</b>	<b>7</b>	<b>2</b>

The coding process follows a logic similar to that of grounded theory, as researchers engage in iterative cycles of data analysis going from open towards selective coding (Strauss & Corbin, 1990). It is a recursive process in which themes are created as data analysis progresses and interpretations are constantly checked by revisiting the data, akin to the principles of constant comparison (Taylor et al., 2015). This strengthens descriptive and interpretative validity, that is, for themes to be grounded in the data, and for interpretations to be coherent with them (Cohen et al., 2011). In turn, unlike grounded theory, thematic analysis does not necessarily aim for theory development and consequently sampling is not iterative (Flick, 2014).

In this case, the analysis followed the phases outlined by Braun and Clarke (2006), as detailed in the next sections, employing the software QSR-NVivo 11<sup>23</sup>. The products of thematic

<sup>22</sup> Facilitators are labelled with an additional F (e.g. P10-F) to make them distinguishable from other participants.

<sup>23</sup> <https://www.qsrinternational.com/nvivo/home>

analysis are usually thematic maps that display different kinds of relationships between the emergent themes, such as hierarchical relationships. Relevant distinctions in the coding process include the corpus, open codes, themes and categories, as depicted in Figure 5.1<sup>24</sup>. These are illustrated with an example from the data showing how these components looked in the category *research team's role*.

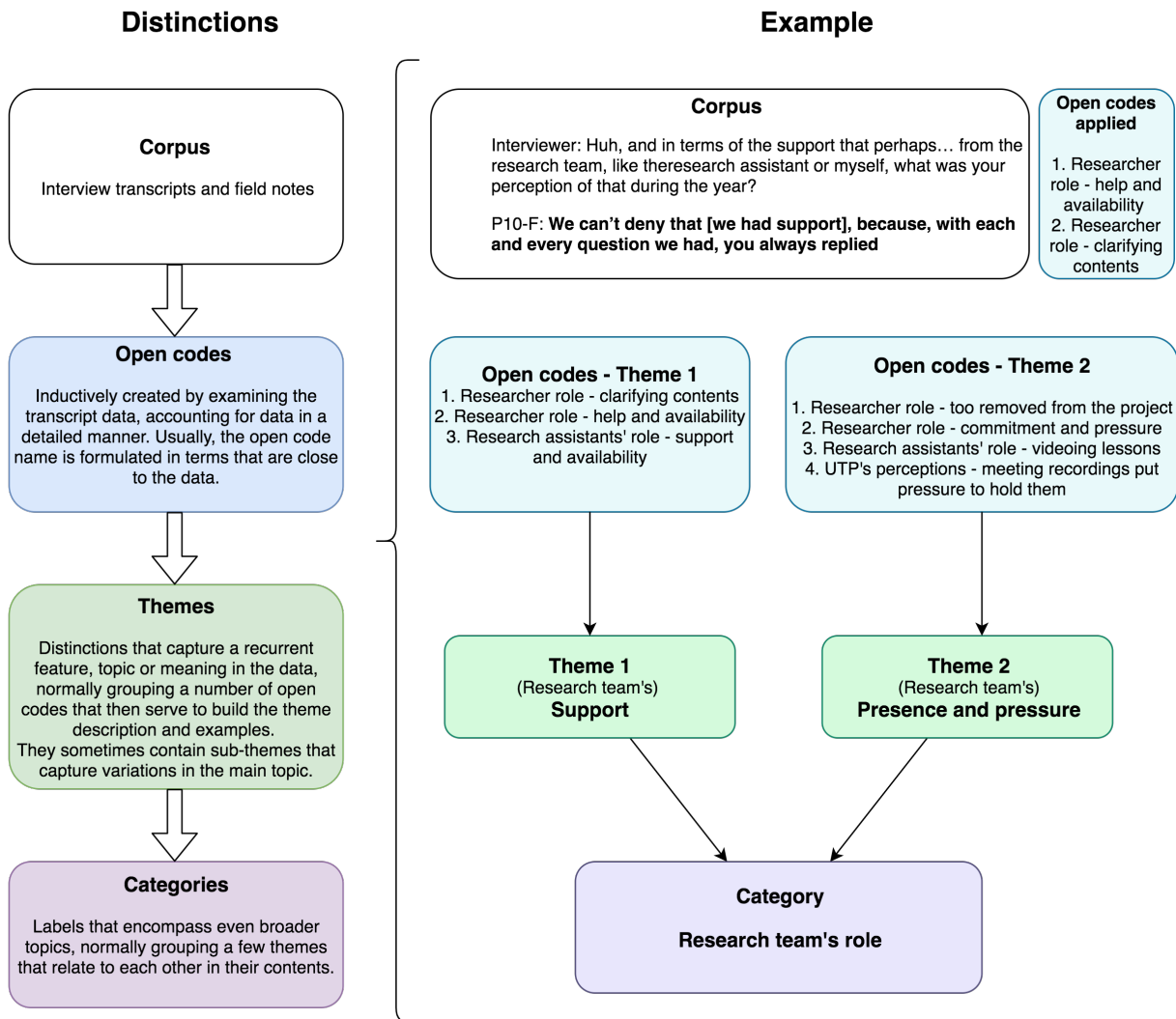


Figure 5.1. Analytic categories and an example from the data

## 5.2.2 Phases of analysis

### 5.2.2.1 Phase 1: familiarisation and open coding

Firstly, a round of familiarisation with the data was conducted through reading the whole corpus. This was followed by open coding, whereby I re-read all the interview transcripts and labelled the data with *open codes*, short phrases closely representing the data, sometimes using

<sup>24</sup> The arrows connecting the distinctions indicate hierarchical relationships. They do not represent the analysis process, which is iterative and thus would be best depicted with multiple double-sided arrows.



participants' words (in vivo codes). This phase was fully conducted in Spanish, to remain as close to the data as possible. Examples are *Researcher role – clarifying contents*, *Researcher role - help and availability* (see Figure 5.1 for more examples). During this phase, I often created separate open codes for each school when a topic appeared to capture the process in context. Examples are the following open codes, all referring to the facilitators' role: *School A – they [facilitators] were focused on the topic*; *School B – she [the facilitator] projected confidence*; *School C – it was pleasant to facilitate among peers*. Whenever an excerpt referred to a topic that had already been labelled, I applied the existing open code.

The creation of school-specific open codes, alongside their detailed nature, meant that 260 open codes were created initially, which is normal considering they are exhaustive and preliminary. To make them manageable for the next analytic phases I checked them looking for ones that could be deleted due to overlaps or irrelevance. Based on these criteria, 31 overlapping codes were found and merged into 8 codes. 13 codes were considered irrelevant and were discarded. Table 5.2 shows examples of both kinds of decisions.

**Table 5.2. Examples of merged and deleted open codes**

Examples	Initial open code(s)	Decision
<b>Merging overlapping open codes</b>	Observing video - "I didn't know what my colleagues' lessons were like" (in vivo)	Merged to create "lack of knowledge of each other's practices"
	Observing video - lack of knowledge between 1st and 2nd primary subcycles	
<b>Deleting irrelevant open codes</b>	School A - The school does not prepare students from SIMCE (national standardised test)	Deleted given that they were not central to viability. The topic of standardised measures is considered in the study about teacher learning
	School B - The school prepares students from SIMCE (national standardised test)	

#### 5.2.2.2 Phase 2: search for themes

The next analytic phase consisted of collating the 221 open codes in the search for commonalities that could result in more abstract themes. I printed the open codes to facilitate visualisation and re-organisation.

##### 5.2.2.2.1 Sorting related open codes in preliminary categories

Given that working with 221 codes at once was not viable, I sought to cluster them in piles of related topics from which themes could be created. Initially, I grouped them according to the school looking to characterise them separately. However, overlaps between them were evident and thus I thus discarded schools as a grouping criterion. This decision highlights the moves between the particular and the general that are characteristic of thematic analysis (Flick, 2014). I

subsequently collated the open codes again by observing recurring broad topics related to viability, forming new piles. These preliminary topics were only meant to assist the analysis and are shown in Table 5.3.

**Table 5.3. Preliminary broad topics**

Preliminary topics	N° open codes	Preliminary topics	N° open codes	Preliminary topics	N° open codes
Programme design and materials	61	Research team	8	Implementation obstacles	12
Facilitators	41	School characteristics	10	Future and sustainability	25
Leadership and UTPs	25	The TPD group	35	Other aspects of teacher work	4

#### 5.2.2.2.2 Creating themes by collating open codes

The next step focused on examining each pile of open codes, seeking to identify commonalities between them to create themes. For instance, as can be seen in Figure 5.1, a number of open codes pointed to different aspects of the researcher’s and assistants’ roles. Upon examination, some were grouped because they reflected the perceived support and help, forming the theme *(research team’s) Support*. Others, in turn, referred to the pressure the team put on participants, sometimes linked to their physical or virtual presence, giving rise to the theme *(research team’s) Presence and pressure*. Importantly, some themes were formed drawing from different piles. For instance, open codes from ‘implementation obstacles’ were then part of the themes *technical issues*, and *group development during the year – obstacles and problems*.

Through this process, I created 20 themes that represented the contents of the open codes, sometimes containing sub-themes to capture nuances. Having completed this in print, I then digitalised the themes on NVivo by merging the original open codes onto the newly created themes<sup>25</sup>.

#### 5.2.2.2.3 Grouping themes into categories

Having as many as 20 themes, some of them had clear relationships with one another. Furthermore, such a long list is hardly communicable. I thus examined them looking for links in their contents and organised them into six broader categories, three of which refer to the TPD design and implementation, and three referred to the key roles in it. Categories are particularly

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<sup>25</sup> On NVivo, this was done by merging the open code nodes onto newly created nodes for each theme and coding all the excerpts with the new theme. In that way, the open codes were preserved.

helpful in capturing broad aspects of the data and in building thematic maps to visualise it (see Section 5.3.2). Continuing with the example in Figure 5.1, the themes (*research team's*) *Support* and (*research team's*) *Presence and pressure* were grouped in the broader category *Research team role*.

#### 5.2.2.3 Phase 3: Review of the themes and categories

In the next phase, I reviewed all the themes on NVivo by reading the corresponding selected quotes to check for consistency. Occasionally, this led to un-coding some of the quotes that did not match the theme, whilst others were selected for translation and illustration. Theme names were refined, and theme descriptions drafted to compile a complete code book with descriptions, examples and coded sources (see Appendix 10).

#### 5.2.2.4 Phase 4: Researcher triangulation

This step was conducted to ensure the clarity, consistency and dependability of the final themes (Creswell & Miller, 2000). Three research assistants checked the coded extracts, examining roughly a third of the data each. They read the theme descriptions and all the coded excerpts adding comments, questions and suggestions where pertinent. Comments were added in just under 10% of coded quotes. I then checked each comment and re-read the extracts in context to make decisions, recording the rationale as reported in Appendix 11.

In most cases, no changes to the application of themes were made because I considered the links to be clear after checking the theme description. When the links between the quote and the theme were too tenuous, I proceeded to un-code or recode extracts (around a third of raised issues). Occasionally the identified issues related to the scope and adequacy of the theme name or description rather than specific quotes. This led to refining four sub-themes: *participants' initial characteristics - positive disposition to change* and *- negative disposition to change*, *facilitator's role - demanding role*, and *- conditions for sustainability - coherence at school and teacher levels*.

Most decisions appeared straightforward, and I only considered it necessary to discuss with the research assistant when renaming the sub-theme *facilitator role - time-consuming role* as *demanding role* to capture role requirements that went beyond the use of time, as identified in the triangulation process. To finalise, codes and themes were compared across schools.

## 5.3 RESULTS

### 5.3.1 How did the initiation and implementation of the TPD unfold?

#### 5.3.1.1 *Initiation*

Initially, four schools decided to take part in the project. The initiation phase required them to select teacher-facilitators (November-December, criteria were discussed in Section 3.4.1.3), and negotiation of the TPD monthly session dates with UTPs (January-March), including an introductory session and pre-test data collection with the research team (March). This was successfully completed in Schools A, B and C, although scheduling deserves consideration.

Schools took different approaches to finding time for TPD sessions, which required them to adjust or replace existing activities within participants' limited non-teaching time. Schools A and C opted for adapting the existing available time. They contemplated scheduling the project to clash with the mandatory staff 'reflective meeting,' meaning participants would have been absent from the latter, but ultimately decided against this. Instead, they opted for the sessions to clash with 'articulation meetings' between teachers and the Special Needs Education team. In School B they negotiated additional time for the project, cutting 1.5 hours of participants' teaching time to devote to the programme and other activities, and potentially having 20 sessions instead of 10. However, because they were meant to have a session almost every week, they never defined a fixed session calendar.

School D did not complete the initiation phase and its case is worth examining. The school principal seemed very enthusiastic about the project and wanted 10 teachers and teaching assistants to take part. Two teachers attended the facilitators' induction. However, when the time came to negotiate the schedule, she failed to attend two agreed meetings in her school. After finally meeting with the principal and the UTP, it became clear that the latter's opinion about joining the programme had not been considered, despite being in charge of TPD. Nonetheless, they agreed to start the programme and scheduled an introductory session, which again did not materialise on the day. They said they would reschedule it for April<sup>26</sup> but after this, they never returned calls or email again, keeping the project materials and videorecorder.

Given the scarce information available, only tentative explanations for these events can be put forward. Firstly, a low level of prioritisation was evident from their lack of responsiveness and consideration. A possible reason for this, explained by the local facilitators, might be that the school was about to be intervened in by the Ministry of Education because of its poor

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<sup>26</sup> My fieldwork supervisor agreed to host this session in April, since I had to return to England.

performance, and thus they had bigger concerns. Secondly, the observed lack of alignment between the principal and the UTP reduced potential support. After this failed initiation, School D was dropped from the sample.

### *5.3.1.2 Induction*

The aim of the induction was to give facilitators an initial preparation for their role and to establish rapport to sustain out subsequent communication. The role was described as requiring them to convene the sessions and lead the activities in the learning community following tailored guidelines. The induction was conducted at the end of December 2016 and beginning of January 2017, that is, before the beginning of the 2017 academic year, when the TPD took place. The workshops were held at a local highly-regarded university. Attendees were seven teachers from the four schools that had initially agreed to participate, plus one UTP that attended only one session. All but two teachers attended all sessions and the other two attended three (P21-F) and two (P14-F) sessions.

For the first three days, the group ran smoothly, and participants seemed truly involved, taking part in the discussions and making helpful design suggestions. Indeed, as is often the case, some of the activities in the first two workshops overran, and not all planned activities were implemented, although we did cover all the topics. Part of what we did was jointly drafting a template for observing and analysing videos that took into account the TPD contents: The importance of descriptions, interpretations and questions, as well as withholding judgments. While this built on the materials that I gave them, it was their idea to create the template.

At the end of the third day one facilitator that had not attended the first two modules started raising concerns about the programme. This was partly because she had been told that this was a mathematics TPD and the topics were not what she expected, and because she thought that the programme's aim was to evaluate colleagues' practices, which would spark resistance. These issues had already been addressed and I as well as other participants responded to her criticism by clarifying these matters. Nonetheless, this situation led to other teachers expressing their own concerns. They opened up about not feeling prepared to mediate a group of colleagues, being themselves new to the topic, especially considering that they thought the proposed form of video observation was very challenging. Additional concerns were the workload, the need for schools to be committed to the project for it to be feasible, and their fears around leadership teams not respecting the required level of confidentiality.

After this, we only had one module left, and I had to react to prospective facilitators' concerns and address them, because the project depended on their willingness to engage. I therefore decided to adjust the original design. Initially, I had planned for participants to start

reflective cycles, including showing their own videos, around Session 3, and had contemplated teachers trialling dialogue in the whole-class and peer group contexts, with two reflective cycles focused on each. However, this would have meant that participants would be showing their videos quite early on, which made facilitators uncomfortable. Hence, I decided to leave more time to introduce dialogic teaching and video observation with a focus on noticing, thus delaying reflective cycles until Session 5. This would allow for the groups and facilitators to become more established before having to expose their practices.

Alas, these changes reduced the available time for sessions in which teachers would learn about and engage in classroom dialogue. Thus, I decided that I would narrow the programme's scope to whole-class dialogue only, excluding group work as a topic. This had the additional advantage of making the TPD more realistic in terms of classroom change goals, considering that engaging any kind of dialogue can be challenging, and giving participants more time to practice could lead to stronger results. I opted for whole-class over group work since the latter is extremely rare in the country (Preiss et al., 2016) and I anticipated that adapting a more familiar form of interaction would be less risky to begin with.

Having drafted these changes, I discussed them with the facilitators the next day in the time that I had allocated for the final negotiations, and they agreed with the proposal. Moreover, they expressed gratitude about their concerns being taken into account in the design. After this, the sense of interest and commitment that I had observed in the first days was re-established.

### *5.3.1.3 Main TPD components*

#### *5.3.1.3.1 TPD sessions*

The distance between the initial plan and actual implementation differed across schools (see Table 5.4). Session rescheduling was widespread due to clashing events (e.g. the school anniversary) and facilitators' leave. These problems signal how challenging it can be to introduce a new programme in schools constantly faced with pressures and unexpected events, which is sadly frequent in Chilean municipal schools (see participants' views in Section 5.3.2).

The most severe case was Canelo School in which, additionally, facilitators rescheduled sessions twice because of feeling unprepared. They only managed to have four meetings in the first semester, after which they scheduled further sessions that did not take place. However, they did not openly drop out until the end of the year. In the other two schools, rescheduling meant that reflective cycles did not start until well into the second semester, curtailing time to trial new practices. Despite this, they managed to complete all the substantial programme components and only one teacher did not get to show their video (Boldo School). This can be considered an encouraging degree of viability for a self-sustained programme.

**Table 5.4. Implementation of sessions in schools**

Session N° and name	School A	School B	School C
1. Basic rules for the learning community	1	2	1
2. Observing video to reflect (modes of observation)	1	2	1
3. Observing videos to reflect (focus on talk)	1	2	1
4. Classroom dialogue: Planning to build ground rules with students	2	3	1
5. Reflective cycle 1: designing whole-class dialogue activities (Dialogue Goals 1 & 2)	2	2	-
6 Reflective cycle 1: analysing videos	1	2	-
7 Reflective cycle 2: designing whole-class dialogue activities (Dialogue Goals 3 & 4)	1	-	-
8. Reflective cycle 2: analysing videos	1	-	-
9. Reflective cycle 3: designing whole-class dialogue activities (Dialogue Goals 1, 2, 3 and 4)	-	-	-
10. Reflective cycle 3: analysing videos and TPD closure	-	-	-
<b>Total meetings</b>	<b>10</b>	<b>13</b>	<b>4</b>

#### 5.3.1.3.2 Self-captured video

The initial design detailed the distribution of cameras to each school which would be used for two main purposes: session recording (for research purposes) and self-captured lesson videos (for TPD purposes). Both proved practically impossible because cameras, batteries and memory devices failed. Hence, a few months into the project, I purchased new, higher-quality cameras to replace the original ones. Beyond technical problems, it appeared that videoing the sessions was an excessive demand for facilitators and they did not do it well or simply forgot to do it. Boldo School's facilitator was more confident with technology and made some recordings, albeit flawed. Similarly, teachers would often agree to record their lessons and then simply not do it.

**Table 5.5. Arrangements for video recordings in each school**

Videos	School A	School B	School C
<i>Sessions</i>	Research team	Facilitator	Research team
<i>Lessons</i>	Research team	Facilitator and Research team	Not recorded

Given the importance of video data for the research and the TPD, I decided to offer alternatives including the research team visiting the schools to record sessions. These

arrangements are summarised in Table 5.5. Unfortunately, session recordings were not possible in Boldo School due to timetable clashes.

In addition to recording their own videos, teachers were meant to select interesting excerpts to show their peers. However, due to time constraints this was rarely completed. For the most part, they brought their videos to the sessions and watched the beginning of their lessons. The one exception was Araucaria School, where I recorded the final two videos, and P10-F and P14-F agreed for me to edit clips for them. The use of self-captured video as part of the programme can thus be viewed as possible but problematic due to technical issues, participants' skills to handle technology as well as their willingness and availability. It is likely that on-site support (e.g. from a teaching assistant or colleague) is necessary to incorporate this component under current conditions in municipal schools.

#### *5.3.1.4 Ongoing research team support*

##### 5.3.1.4.1 Initial design: minimal external support

The initial plan was for the interactions between the research team and the schools to be limited to collecting session video recordings and solving technical issues. Accordingly, each school was assigned a research assistant who would act as the main point of contact while I was in England. As agreed with facilitators in the induction, to keep in regular contact with them, I set up WhatsApp groups for each school including facilitators and the research assistant. Meanwhile, the main monitoring activity was facilitators' brief reports, which I emailed after each session, and they completed using Google Forms. Facilitators in Schools A and C completed some of them.

##### 5.3.1.4.2 Adjusted conditions: responsive support

After the first few sessions, some issues arose that made me change these arrangements to respond to emerging needs and make implementation possible. Replacing self-captured videos with filming by research assistants was one of these adjustments. Second, it became apparent that facilitators struggled to complete the session reports due to lack of time and internet access, so I ceased to request them. And third, since research assistants required confirmation to record the sessions, we started communicating before each. Additionally, through the messaging group, facilitators sometimes asked clarification questions about the sessions. On occasions, we decided it would be best to speak on the phone to discuss specific points. Thus, research team involvement increased beyond what was initially envisioned, however, this was done without compromising the design principle of the programme being locally based and peer led.



The character of exchanges with the facilitators varied. With Schools A and B, messaging was usually fluent, with both ends initiating contact and being responsive. Communication related to checking progress and questions about session contents or materials. The latter were problematic in both schools. In the beginning of the year, I had given facilitators the printed materials labelled for each session and a folder for each participant to store them after use. I thought that this would enable facilitators' control over the materials and adaptation of session plans. However, they lost some of them and/or they became out of sequence leading to confusion. Two solutions were jointly created around Session 5. In Araucaria School, a few days before each session, I emailed them an outline of the session and the materials. These outlines were shortened versions of the facilitators' guides. In Boldo School, P15-F asked us to bind participants' materials into booklets to make them more organised.

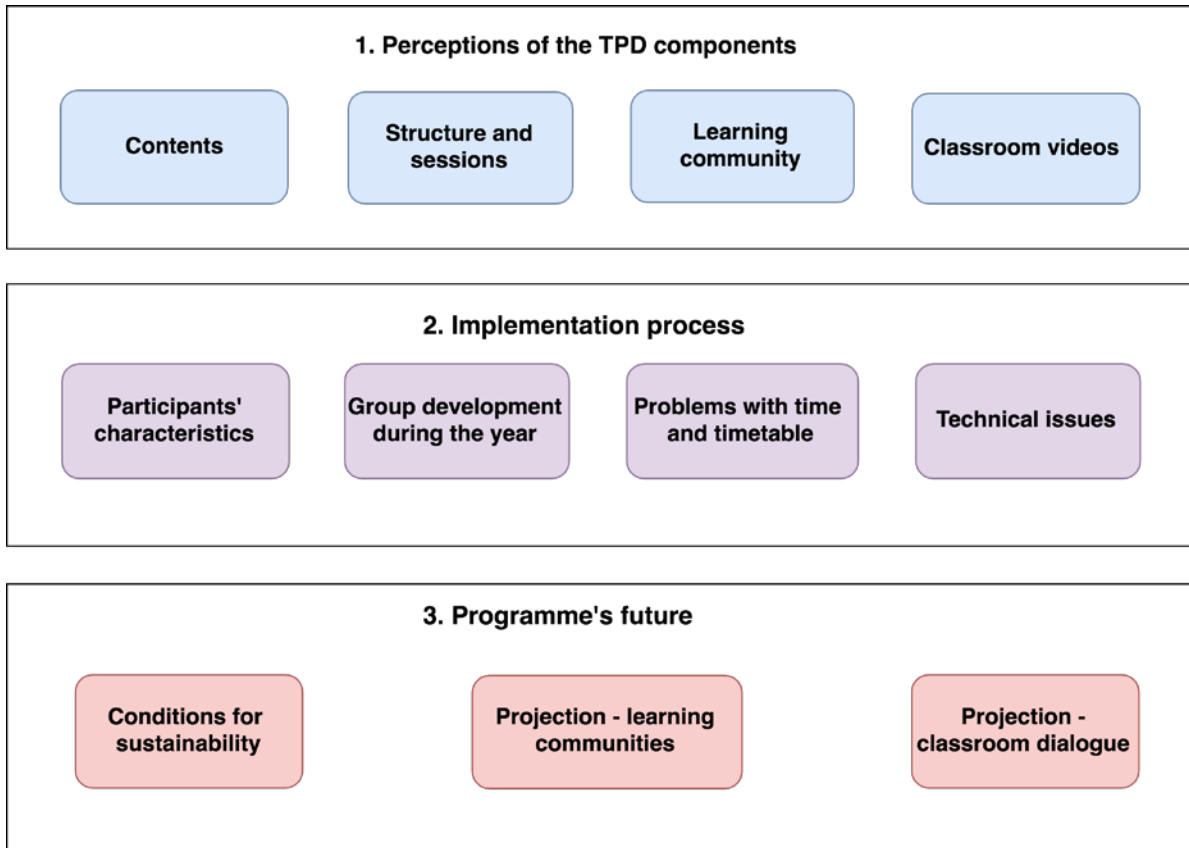
While confusions with materials were mostly inconsequential, one instance in Araucaria school required more intensive intervention. When observing their session video, I realised that they had revisited the reading about dialogue of Session 3, instead of using the assigned reading 'Goals and tools for dialogue', which they needed before starting recordings. Therefore, we adjusted their timeline so that they would do the reading and discuss it in the session, postponing their own video recordings.

Interactions with Canelo School were different. First, communication was less fluent. Messaging was not smooth, with scarce replies; indeed, P20-F eventually abandoned the WhatsApp group without giving any reasons, whereas P21-F remained more responsive. When issues emerged, they emailed instead of messaging, and they often did not address my replies. Their main recurring request was for an external facilitator to replace them, which contradicted the peer-led design principle. I discussed this via email and over the phone with P21-F, and she agreed to continue facilitating the sessions. I called her again before Session 5 to explain the reflective cycles and discuss dividing the 14-participant group in two so that all teachers would show their videos. She tried to assure me that sessions would continue, but this never happened. Finally, when I returned to Chile in October, I met with her and she insisted that it was still possible to resume the meetings and start the reflective cycles, planning a timeline that never materialised.

### 5.3.2 What were participants' views about the programme's implementation and viability?

From the interviews, 20 themes organised in six categories were created. Three of them refer to the design and implementation: *perceptions of the TPD components*, the *implementation process*

and the *programme's future* (see Figure 5.2) while three focus on key roles: *facilitators*, *UTP and leadership*, and the *research team* (see Figure 5.6).



**Figure 5.2. Categories concerning design and implementation**

*5.3.2.1 Design and implementation categories*

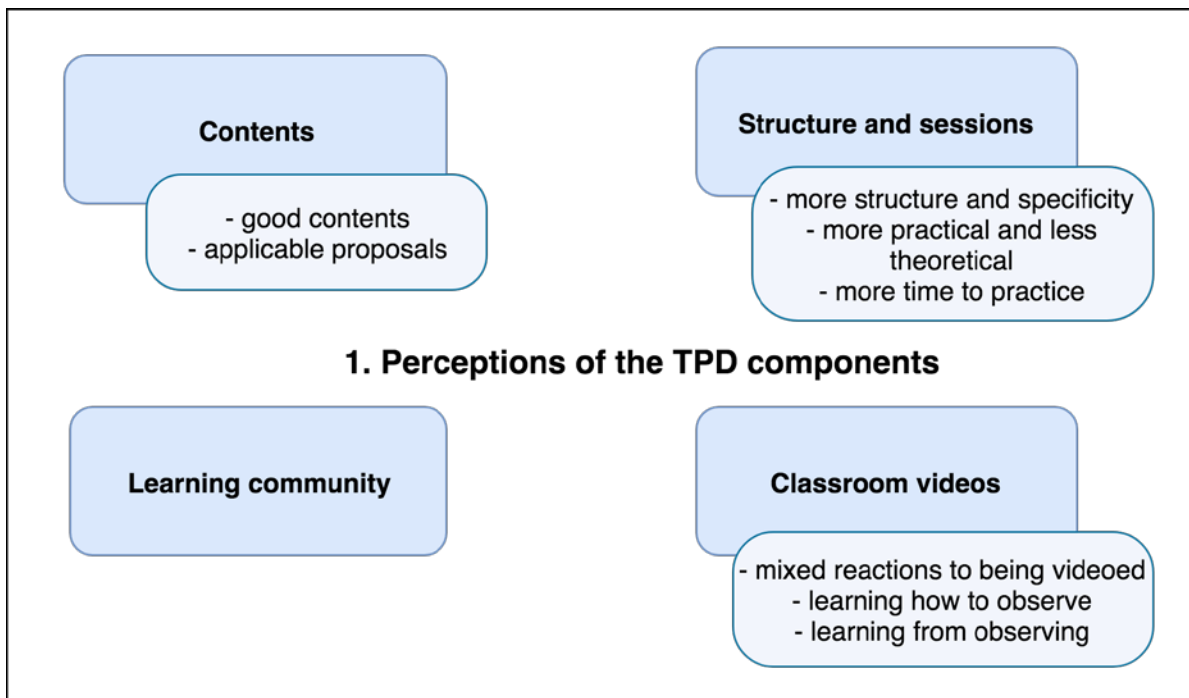
5.3.2.1.1 Perceptions of the TPD components

5.3.2.1.1.1 Contents

Generally, participants had positive views about the programme contents, captured in two sub-themes (see Figure 5.3). Firstly, seven teachers mentioned *good contents*, referring favourably to the quality of the topics and materials, mentioning their appeal, interest and clarity: “the topic is very rewarding, and the way in which you treat it (...) the level of the materials you gave us, [it] was a lot and it was really complete.” (P20-F). The second sub-theme is *applicable proposals*, capturing that all participants found the dialogic strategies relevant for their practices, even in Canelo School:

The [participants'] comments always related to that, uhm, that the materials were useful, that, that it was possible to implement this, because, it's not as if it was that crazy, it was very specific, it went to the point, and that was the good thing (P21-F)

Applicability was also reflected in teachers' ownership of the strategies, apparent in their selection and adjustment to suit their goals and students (P12, P16, P19). Furthermore, adapting lesson plans was feasible, either because they were not very scripted (School A) or because adaptations were possible before or during teaching (School B). Finally, teachers that were evaluated with the NTES said they wrote about the programme in their portfolio, since its topic and format fitted the 'professional responsibilities' and 'reflection on teaching' dimensions (P11, P14-F, P19, P20-F).



**Figure 5.3. Themes in category 1, Study 1**

#### 5.3.2.1.1.2 Structure and sessions

Teachers had numerous suggestions regarding the programme's structure and sessions, which they saw critically. First, seven participants mentioned elements that required *more structure and specificity*. Most comments related to the provided strategies being seen as domain-general, and thus some requested providing more direct applications to mathematics, and/or additional tailored examples. Meanwhile P18 suggested structuring and pacing the application of strategies in the year. Another sub-theme is for the TPD to be *more practical and less theoretical*, mentioned by nine teachers. They said that the first sessions, especially, involved too much reading, which sometimes made them tedious and removed from practice. To address this, some suggested synthesising the readings and making them more visually attractive. Others proposed more radical format changes: having only conversation-based sessions (P12) or video-based contents (P20-F).

Finally, four participants mentioned the need for *more time to practice* and suggested starting the reflective cycles earlier<sup>27</sup>. P14-F stressed that this would have increased participants' engagement. Additionally, P18 indicated that when observing their own videos, they needed more time to have “(...) a deeper comment about the lessons, because we saw ‘yes, there was this strategy, there was that other strategy’”, but reflections did not go further.

#### 5.3.2.1.1.3 Learning community

Eight teachers and UTPs-B found the learning community format very positive. They praised the opportunities to share experiences, to help and support each other, and to receive feedback: “one of the aspects about teachers that we always emphasise is the learning community, which is precisely that: sharing experiences (...) ‘how do you do it? How do *you* do it?’” (P13). Seeing others' classrooms, especially from different sub-cycles, was unusual and highly valued. This was seen as beneficial for articulation and learning: “I think that it also contributed to the [teachers] (...) to feel more security regarding their own practices and more confidence also to acknowledge what their weaknesses were, uhm, accepting and taking in others' contributions” (UTP-B2).

#### 5.3.2.1.1.4 Classroom videos

This theme was discussed by all facilitators and participants, mostly in a positive light (except P20-F). The first sub-theme is the widespread *mixed feelings about being videoed*. Some teachers and UTP-A said it was not a problem because they were used to observations and recordings. However, most of them expressed some discomfort, especially around seeing themselves: “I don't like to watch myself because my voice changes... and not so much because of the physical aspect, but I don't know, I've just never liked it.” (P17). Others (especially older teachers, like P18 and P19) were concerned about aspects like whether students would act naturally or misbehave.

Participants, mostly in Boldo School, talked about *learning how to observe* in relation to the project's noticing goals as described in Chapter 4. They focused especially on trying to withhold judgements and instead posing questions or giving suggestions:

I think that it was a beautiful experience (...) to open up [the classroom] for critique. I mean, not to critique but (...) what you [the researcher] often suggested ‘it's not a critical eye or a value judgement, but through questions, starting to analyse and how did you do it, and how, if maybe it would have worked better this way...’ (P13)

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<sup>27</sup> As described in Section 3.1.2, this would have happened in the original plan, but was impeded by constant rescheduling of sessions.

However, some teachers said the groups tended to be overly friendly, which undermined their analyses' depth. Shifting the observation focus from the teacher to the students was another noticing goal and it was mentioned by two facilitators (P14-F, P15-F): "I think that, in the end, with the last videos it was possible to move the focus away from the teacher and onto the kids, but it was too hard!" (P15-F).

The third sub-theme is *learning from observing*, mentioned by nine participants. Concerning their own videos, they referred to being able to reflect on their teaching, changing their views and increasing awareness of practice (P12, P14-F, P16, P18). P12 is an example:

I did manage to see positive things about myself, like the way I address students (...) I think that sometimes I'm too stiff towards them (...) and I've tried to change that, so uhm... I felt that on the video I wasn't that stiff.

Regarding others' videos, many appreciated learning and borrowing ideas from colleagues, as well as making comparisons across classes: "we learnt several techniques, which we could apply in our classrooms (...) we got to know the reality, mostly of the second primary sub-cycle (...) I could understand what the level is, their teaching methods, and how students are" (P11).

#### 5.3.2.1.2 Implementation process

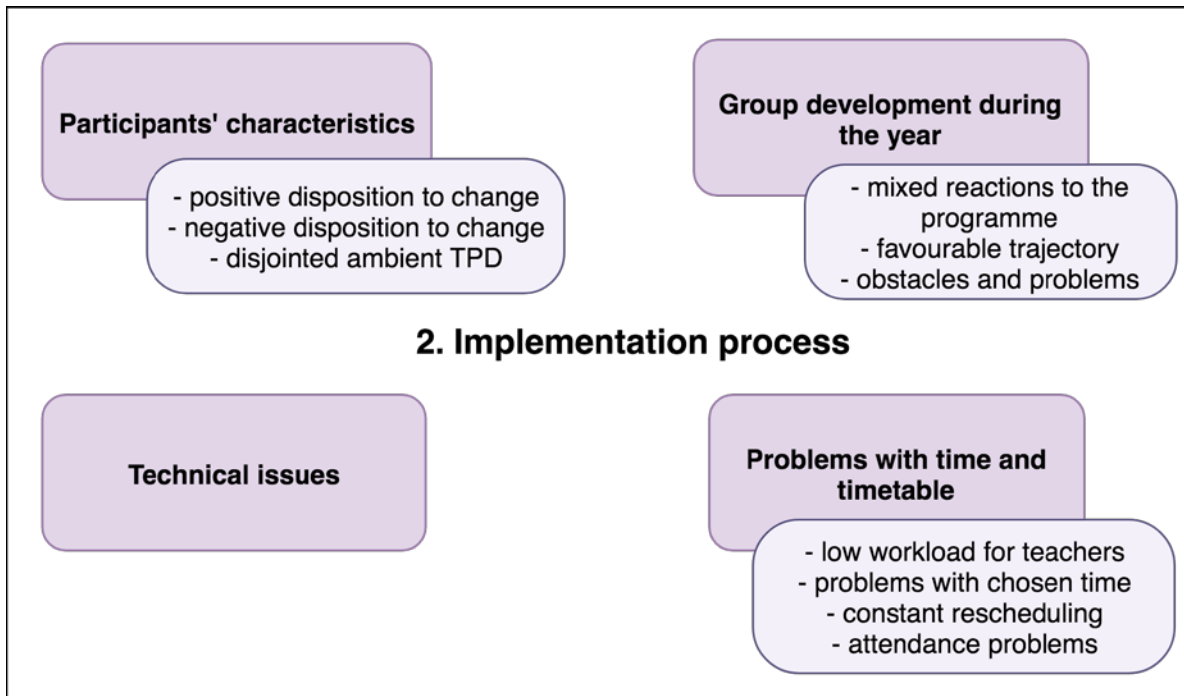


Figure 5.4. Themes in category 2, Study 1

#### 5.3.2.1.2.1 Participants' characteristics

Two sub-themes capture participants' perceptions of their colleagues' dispositions to change (see Figure 5.4). A few interviewees characterised teachers as having a *positive disposition* related to their competence (P17, P19). In School A, UTP-A highlighted that strong teachers made the autonomous TPD possible: "I feel that among them there was good participation (...) this stronger group that I mentioned [P12, P13, P14-F], I feel that they managed... uhm... like... to move forward in a way with the other teachers that were lagging behind." On the other hand, five participants characterised their group as having a *negative disposition to change*, linking this with three factors. First, some thought teachers in general were too set in their ways (P13 and P14-F). Second, others saw their older peers as less flexible: "I think this also relates to their age, in terms of [years of] professional experience and their actual age, uhm... it's really hard to change their vision" (P15-F, also P13, and P16). Third, a culture of minimal effort in municipal schools was mentioned (P16 and P20-F).

A final sub-theme is *disjointed ambient TPD*. The concept refers to participants' previous or current involvement in TPD that potentially affects the focal programme (Wayne et al., 2008). In this case, participants had disparate previous experiences prompting diverse reactions to the programme if they considered them compatible (P12, P13, P16), unrelated (P21-F), or superior in structure to the project (P17). UTPs mentioned their own efforts to promote professional exchanges between colleagues, which was coherent with the project providing in principle a supportive TPD context.

#### 5.3.2.1.2.2 Group development during the year

Participants reported their group's *mixed reactions to the programme* from the onset. On the one hand, many found the topic interesting. In Araucaria School, even if motivation was not very high: "They had a good disposition, sometimes we were overwhelmed with work and we always left that aside, and they always took the time, it was never like 'let's just leave soon'" (P14-F). That said, seven participants discussed lack of initial motivation for different reasons: seeing the programme as an imposition (P13, P20-F), external TPDs being removed from classroom realities (P18, P21-F), the reading-heavy sessions (P12, P13, P14-F), and their excessive workload (P10-F, P15-F, P20-F, P21-F).

Ten participants and UTPs-B observed their group having a *favourable trajectory*: "We started really unmotivated (...) later as the sessions progressed, we began enjoying it more, because we started sharing, we started looking at [others'] experiences" (P10-F). This was linked to the trusting environment that was created (P10-F, P18, P19), and to the chance of getting to know colleagues: "[the project] allowed me to get to know these people and knowing and discovering

the... the... what they've got to say" (P12). P21-F in Canelo School also found this, whereas her co-facilitator P20-F thought the opposite.

Each school faced some *obstacles and problems*, such as teachers' involvement, with some under-participating (UTP-A) and the fact that in School B some classes were not involved, undermining coherence (P15-F). In Canelo School, P20-F discussed obstacles in detail to explain his group's decaying motivation: the sessions were often cancelled damaging teachers' interest and commitment, and a conflict among the staff erupted, harming relationships<sup>28</sup>. While P21-F acknowledged the problems with cancelled sessions, she thought only the practical issues led to their dropout.

#### 5.3.2.1.2.3 Technical issues

These involved mainly the outlined problems with the physical and digital copies of materials, mentioned by participants and facilitators in Araucaria and Boldo Schools. This led to disorganisation and sometimes wasting session time (P16). Additionally, the problems experienced with the cameras were discussed.

#### 5.3.2.1.2.4 Problems with time and timetable

Time was a major issue discussed by all participants. They reported often being overwhelmed with their workload. Amidst this, some teachers appreciated that the TPD involved a *low workload for teachers*, concentrating its activities only in sessions and teaching (P12, P13, P16, P17, P18, P21-F).

As described in Section 5.3.1.1, defining when sessions would take place was challenging for UTPs. Regardless of the arrangement, seven participants identified *problems with the chosen time*. In Schools A and C, the clash between TPD sessions and SNE articulation meetings created additional work, raising some participants' concerns. Another issue was that having the meetings late in the afternoon meant they were exhausted and focusing was difficult. In Boldo School, where meetings took place during the school day, they complained about the noisy environment, the lack of meeting space and of prioritisation, with some teachers being asked to skip meetings mostly to cover for colleagues on leave.

Sessions, preparation meetings and lesson recordings faced *constant rescheduling* in all schools, especially due to other activities – planned or not – taking precedence over the sessions (seven teachers and UTP-B). This was particularly severe in Schools B and C. In Boldo School, aside from clashing events, they often did not have a meeting space leading to cancellations and wasting

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<sup>28</sup> The conflict was caused by the differences between advocates and detractors of a colleague that faced a serious disciplinary investigation over student abuse.

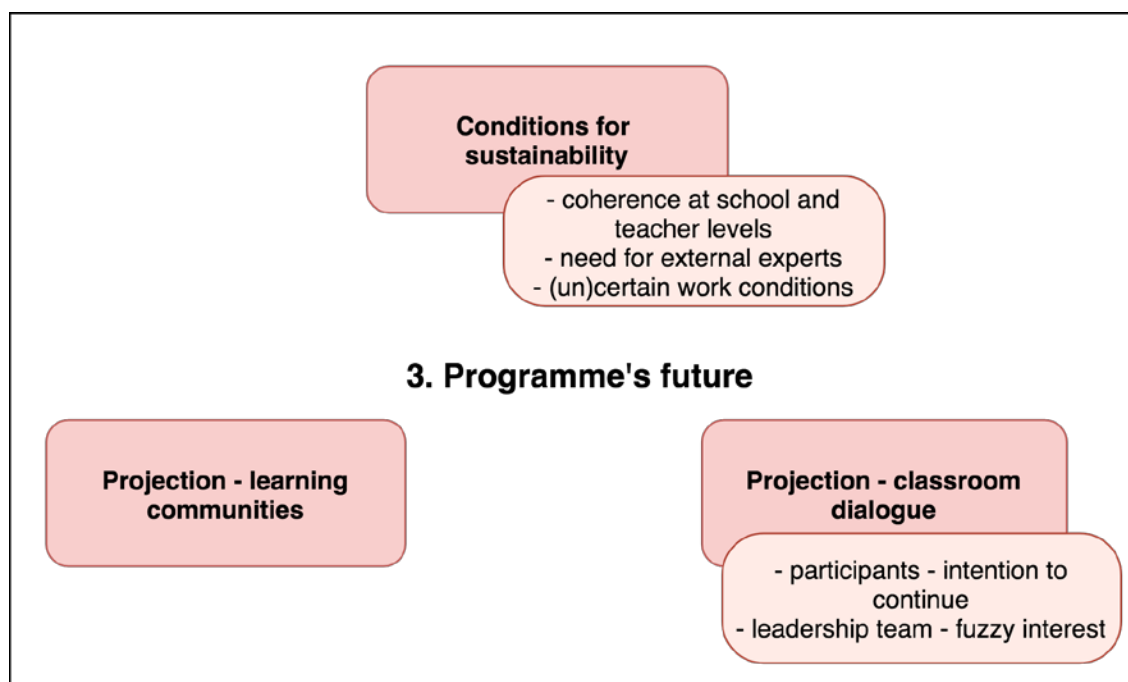
time. In Canelo School many teachers vented their frustration about this, but P21-F said that the issue was not limited to the project:

Everything that happened to the project happens to us [teachers] (...) we're the polling station, there's a bank holiday, so everything turns to custard! (...) when they organise the school's timetable it's as if they didn't know that all of this is going to happen.

Finally, Schools B and C had some *attendance problems*. In Boldo School two participants were involved only in the first few sessions, while P19 joined late because of sick leave. According to P16, this meant that some of the contents had to be constantly revisited, delaying the process. In School C, P20-F said that, because of the constant rescheduling, some teachers stopped attending meetings altogether.

### 5.3.2.1.3 Programme's future

#### 5.3.2.1.3.1 Conditions for sustainability



**Figure 5.5. Themes in category 3, Study 1**

Across all schools, six participants mentioned that to sustain the project results would require *coherence* at different levels (see Figure 5.5). First, related to dialogue becoming embedded in the whole institution (P10, P12, P14-F, P15-F and P21-F) by including all teachers or grades: “[they should start] from when they’re little so that... children’s awareness can be raised about this topic” (P10-F), having the leadership team on board with the goals and the necessary time commitment, and possibly collaborating with a curricular expert to assist application. Second,



teachers referred to coherence in their practices and the need to consider planning, teaching and assessment from a dialogic standpoint (P12, P13, P14-F and P16).

A different angle on sustainability was taken by P10-F, P15-F, P21-F and UTP-A, who mentioned the *need for external experts* to be involved to various degrees providing expertise and/or structure to the process. In Araucaria School, the emphasis was on the need for clarification, feedback and advice:

if... one wants to sustain it in time, there needs to be someone to be there permanently that specialises on the topic (...) for instance, [someone] that comes to the classroom and tells us (...) ‘you could’ve improved this activity, you could’ve changed this, included that’.  
(P10-F)

Finally, in Boldo School, participants’ *uncertain work conditions* were an issue. Teachers without contracts were unsure about continuing at the school (P15-F, P16), and the UTPs had difficulties making staff development plans because decisions were imposed at the municipal level. Indeed, after the TPD, they had to reduce P15-F’s hours.

#### 5.3.2.1.3.2 Projection – learning communities

UTPs in Schools A and B were interested in continuing with school-led TPD through professional learning communities, which they found fruitful. Their plans were not defined yet, but they intended to set up communities for subject areas and/or grade levels. Interestingly, most teachers thought the format would not continue. This was especially the case in Boldo School: “(...) the teachers’ schedule was organised, ok? And because P15-F was so high-spirited, she continued on... ok?... but I think that concluding... concluding the project that’s as far as we’ll go.” (P17). In Araucaria School there were mixed views, while P12 took an active stance:

*we* already proposed that there were, uhm... these like groups of... dialogue between teachers (...) I think it should go beyond [the topic of] dialogue, so [I’ve] suggested to her [UTP-A] that instead of having the ‘reflective meetings’ we split up in teams and we do a bit of this.

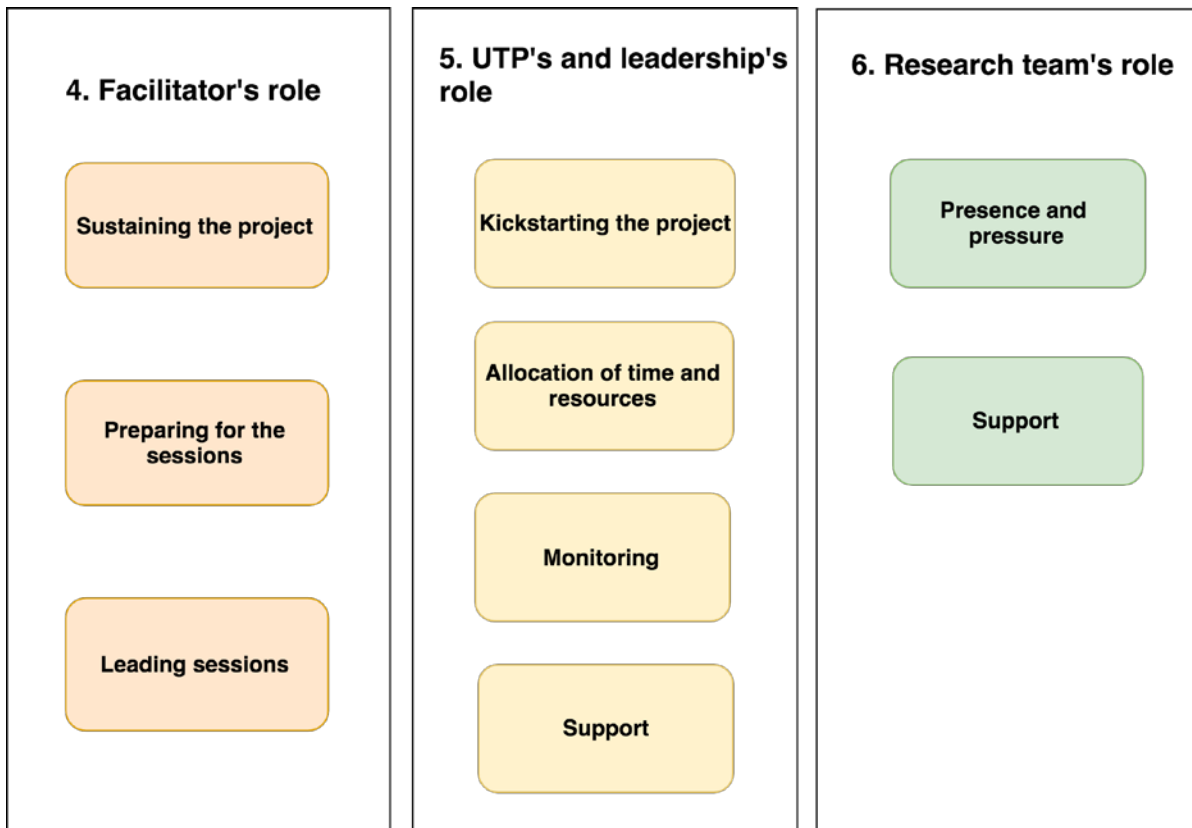
#### 5.3.2.1.3.3 Projection – classroom dialogue

All teachers in Schools A and B (except for P17) expressed their *intention to continue* with dialogic practices even in absence of a formal community. They thought it was their decision to do so: “I think that I will continue with this system. I, I’m clearly interested in promoting this change and, uhm, I don’t know about the rest. I cannot speak on their behalf, but I do, this really interested me.” (P16). Their reasons included that dialogue was beneficial for them and their students and they could build on their learning: “Obviously! It was such a plus I don’t even think

it's worth changing it.” (P14-F). The *leadership teams* appeared to have a rather *fuzzy* interest in its continuation. While they wanted to make the most of participants’ learning by sharing this with others, at the time of the interviews they had not thought through how to achieve this.

### 5.3.2.2 Roles in the programme

The following three categories describe how the roles of facilitators, UTPs and the research team were constructed by participants (see Figure 5.6).



**Figure 5.6. Categories related to key project roles**

#### 5.3.2.2.1 Facilitator’s role

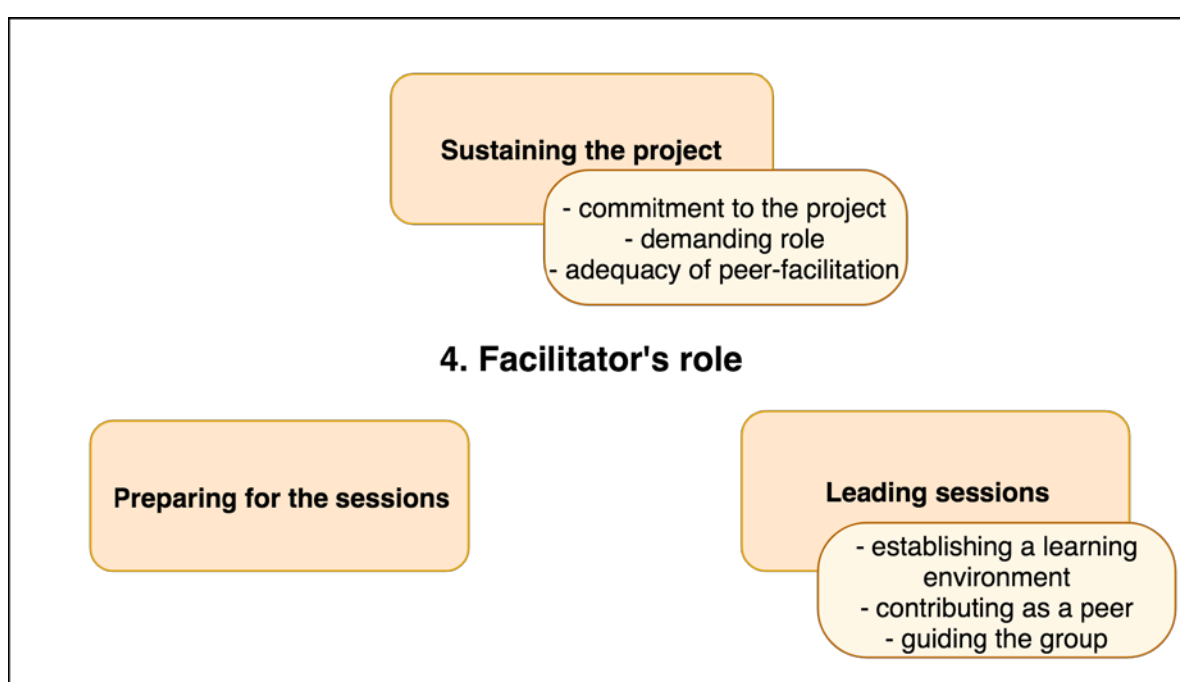
Peer facilitators are unusual in Chile, where TPD programmes are typically externally run. Interviewees’ perceptions about their role are organised in three themes (see Figure 5.7).

##### 5.3.2.2.1.1 Sustaining the project

Participants discussed how facilitators made the project possible in three sub-themes. The *commitment to the project* was discussed by facilitators and the UTPs in Araucaria and Boldo Schools. P14-F and P15-F said this engagement came from personal convictions. In P14-F’s words:

It was taxing for me, because I care, because if I take on something it's because I'm going to do it fairly well, if not very well. And doing it fairly well meant presenting the process as I was told to do.

This was acknowledged by UTP-A, who praised her for her 'punch' to sustain the project. P15-F, in turn, said: "You can't go back on something you've commenced; I've always been of the policy that if one starts something, one has to finish. Come what may but finish it". In turn, P20-F indicated that the role was imposed on him, undermining his commitment: "in the beginning it, it was like an imposition, uhm... I feel that if they had asked us if we were interested, probably uhm... the process and its ending would've been different". However, in Schools A and B facilitators were also chosen by UTPs and they reacted differently.



**Figure 5.7. Themes in category 4, Study 1**

All facilitators characterised their role as *demanding*, requiring them to take responsibility over multiple tasks, from managing the project's resources and activities to keeping their colleagues engaged. This put strain on them, as P10-F puts it:

The project is great because it was something useful for us and everything, but we also have to deliver on the other part [of our work] (...) we had to adjust because the other things, you just have to comply with them.

Indeed, some facilitators wanted to quit the project because of this. This happened at the end of the first semester in Araucaria School, but facilitators were encouraged by the leadership team to continue and try to negotiate the demands with the researcher. In Canelo School, they

also expressed being overwhelmed and at first, the UTP gave them preparation time, but this was not enforced. When the problems continued, they did not manage to solve them:

There was a big lack of communication [on our side] because, in a way, now one can analyse things from a distance and in a better way, but at the time I feel like perhaps we could've communicated with you and said 'you know, this is actually happening, and (...) it would be good for you to come over' (P20-F)

In describing this role, some interviewees touched upon the *adequacy of peer facilitation*. Some said they would have preferred more involvement from an external expert, given that they did not feel competent enough in the topic to lead the process (Facilitators P10, P20, P21). P13 said all teachers should have had a similar induction to maximise ownership of the project. However, P12 and several teachers in Boldo School indicated that a local peer was better because of their closeness to practice:

I loved working with her, with a peer, that knows, that is in the classroom, because sometimes people will come (...) to tell you things and it's been *years* since they've been in a classroom and they don't really know what's happening, whereas P15-F does (P18)

#### 5.3.2.2.1.2 Preparing for the sessions

Facilitators agreed that some preparation was needed to read the materials and understand the sessions, and all but P15-F said that this took too much time. In Schools A and C, they negotiated a dedicated slot for this, but it was either not stable (School A), or not respected (School C):

It's not like they really gave us those hours, they still sometimes sent us, mostly me, to cover other classes (...) it was a pain because we were there [in the sessions], like presenting something 'ok quick, quick, what was this about?' (P21-F).

Sometimes, preparation included modifying the sessions' activities. In Boldo School, P15-F split sessions in two or three because they had more meetings and could thus devote more time to each planned session. In Araucaria School, it was mostly about shortening the sessions:

Either because P14-F's folder was messy, or I lost my folder, so we did it the way we thought it should be [I: ok] ok? And we had to shorten the sessions (...) the readings (...) trying to summarise as much as possible. (P10-F)

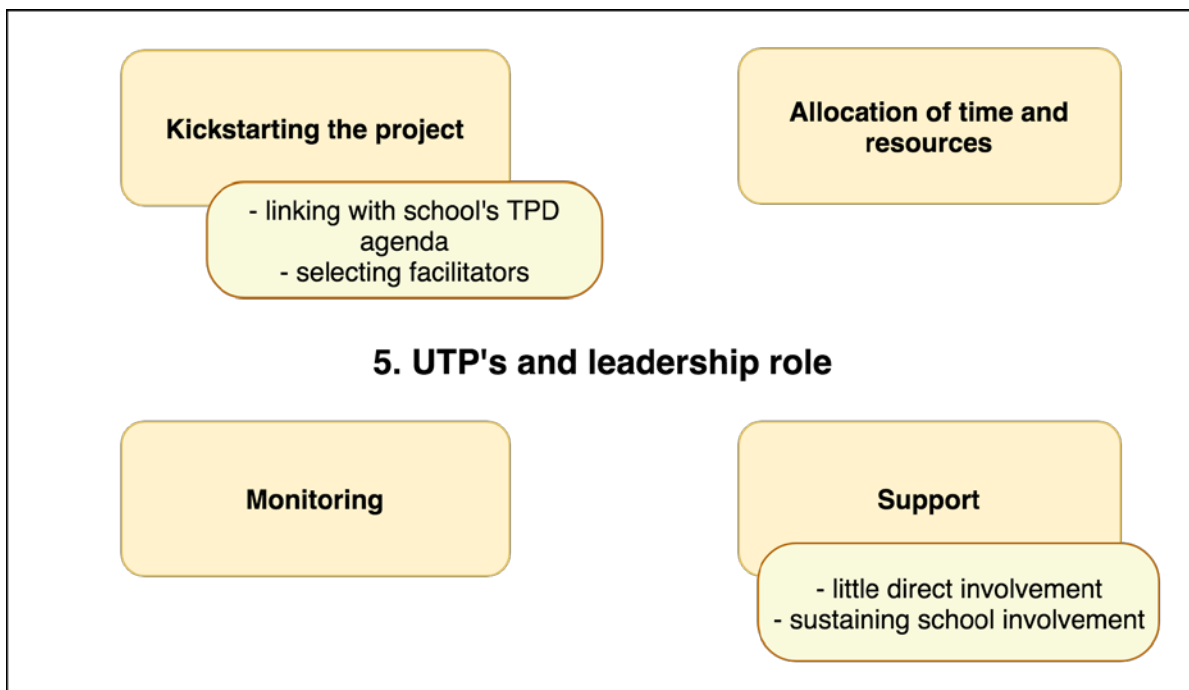
#### 5.3.2.2.1.3 Leading TPD sessions

This was the most salient aspect of the facilitators' role. First, it required *establishing a learning environment*, engaging their colleagues and establishing a positive climate. P15-F considered

this challenging: “I don’t know, sometimes they preferred to (...) finish pending work or other things, so they had to be changed and constantly motivated to continue working on the project.” Interestingly, two of her participants praised her ability to engage them despite their initial lack of motivation (P17, P18). The second sub-theme, *contributing as a peer*, was mentioned by both facilitators in School A. They liked their distinct role, but said: “in any case, it wasn’t, it wasn’t like ‘oh, I’m the facilitator!’ But instead we all were just one of the bunch.” (P14-F). Similarly, P18 and P19 said P15-F’s combination of knowledge and contributing a peer made meetings pleasant.

Finally, facilitators *guided the group*, leading activities, managing materials and providing examples. Again, in School B, P15-F’s peers praised her leadership, indicating she gave good examples and projected confidence, convincing them to trial new things: “She wasn’t someone that was stressing us out. (...) she structured [the work], in terms of knowing how things were like, so she gave us the ease of working... in a trusting, easy environment.” (P18). P11 also praised her facilitators: “[they] were very focused on the topic, so I think that it was, like, easy to follow (...)”.

#### 5.3.2.2.2 UTP’s role



**Figure 5.8. Themes in category 5, Study 1**

##### 5.3.2.2.2.1 Kickstarting the project

The UTP and leadership teams had a crucial function in the project initiation (see Figure 5.8). This involved *establishing links with the school’s TPD agenda*, which was discussed in the initial recruitment meetings and reinforced during the final interviews. Each school had different

priorities that they linked to the programme. In Araucaria School, they had concerns about the quality of questions and the way teachers managed students' contributions, a criterion in the NTES. In Boldo School, the UTPs had diagnosed that in their school:

each of us was like an island, and that it is essential [to have] the, the conversation, reflection on practice, listening to others, the, lowering the, the anxieties and also the fears of being observed, of others knowing what I do [in my practice] (UTP-B2)

In School C the interest was primarily in making links with research and its up-to-date knowledge, as well as strengthening their mathematics department.

Next, a crucial step was *selecting facilitators*. In Araucaria School, they chose a teacher that had good relationships with colleagues (P10-F), and someone with a mathematics background who was also more assertive (P14-F). In Boldo School, P15-F was seen as popular and they intended to put her leadership to use, although her teaching practices were not seen as especially strong. Initially, UTP-B1 was meant to be the second facilitator, but only attended one of the induction sessions and was not involved in the TPD. In Canelo School, the UTP mentioned she chose a teacher that was strong in mathematics (P20-F), and someone who they wanted to position as a leader (P21-F).

#### 5.3.2.2.2 Allocation of time and resources

UTPs identified this as their main role. In Araucaria School, P10-F agreed: "The school leader was open to give, to give us the time that we needed for this project". In Boldo School, the UTPs stated that the project was prioritised: "We tried to, regardless of the, the, emergencies, because [at schools] we always work in a state of emergency. Trying not to touch that space, because it is considered important" (UTP-B1). Participants' perceptions differed starkly: "What bothered me the most was that the [session] time kept changing. That is, the time to work on this was not respected." (P16). In Canelo School, time was allocated but seldom enforced (P20-F, P21-F).

#### 5.3.2.2.3 Monitoring

Monitoring happened at two levels. First, UTPs checked progress regularly with facilitators through informal conversations: "They were always reporting on what they were doing and what they were working on" (UTP-A). Second, they usually observed lessons, which allowed them to form an opinion of participants' progress. In Araucaria School, the UTP had more detailed impressions of each teacher, whereas in Boldo School, they reflected critically, but generally, on what they observed:

there were more moments [in the lessons] when questions were being asked (...) today there's more awareness that, like, that spaces need to be created for children to start expressing what they think or feel, or uhm critique or evaluate (...) but this is still within a logic of a lot of questions without much focus.

In Canelo School, in turn, P20-F indicated that there was no monitoring from the leadership team, which he found necessary.

#### 5.3.2.2.2.4 Support

A final theme is supporting the implementation. UTPs acknowledged not being directly involved, which facilitators in Schools B and C described as *little direct involvement*. P15-F said: "On our bosses' behalf there was no support at all with regards to the project (...) in the end, I led the project alone for the whole year". P19, in turn, reflected: "I don't think that, that they [UTPs] even understand the project."

An emerging aspect was *sustaining the school's involvement in the project*, which happened in response to facilitators' intentions to quit the programme. Furthermore, in Araucaria School they suggested reaching out to the researcher:

'Talk to the researcher' I told them 'because she's in England', I said, 'she's not here where... where you are all swamped' (...) 'communicate your concerns to her, [tell her] that you feel too overwhelmed, maybe she'll change a session, you can organise the topics (...) talk to her because she knows and I think she'll understand'

#### 5.3.2.2.3 Research team's role

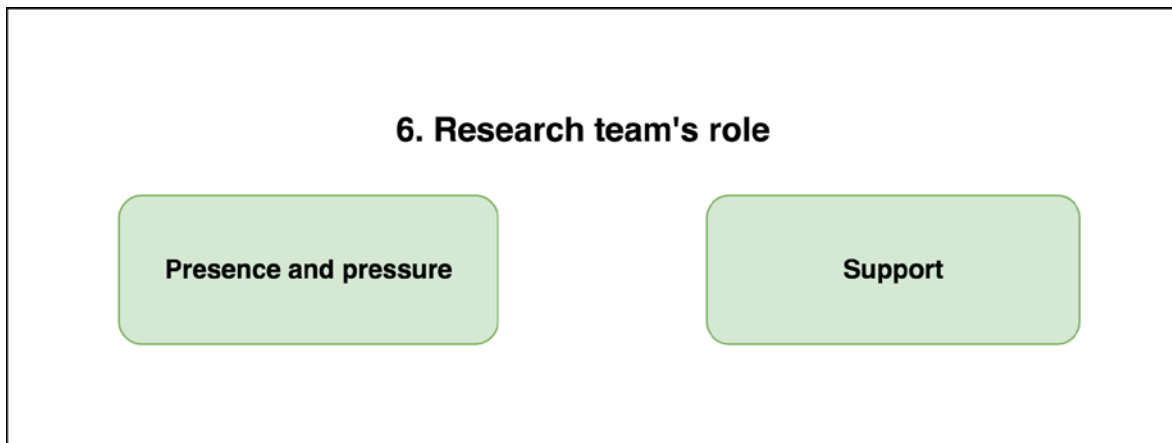
##### 5.3.2.2.3.1 Presence and pressure

The presence of the research team during implementation was unusually low compared to other interventions (see Figure 5.9). Nonetheless, research assistants' visits and communication via messaging or email was received differently in each school. In School C, P20-F saw it as a sign of high demand, which burdened him. In School A, P14-F and UTP-A found it necessary:

It's a strength and at the same time a weakness that you were putting pressure on us but unfortunately, we [teachers] are like that, if we're not pressed, well, we'll do it for a while and then, well uhm... we'll just let things slide (P14-F).

P15-F, in turn, saw the team's presence as a source of commitment:

You [the researcher] were always so willing to help, regarding all the assistance, and all the little things we asked you during the year, that it was like absurd, it would've been a pain to say 'no, you know what, we're going to quit the project, we're not going to do it anymore.'



**Figure 5.9. Themes in category 6, Study 1**

#### 5.3.2.2.3.2 Support

Some facilitators highlighted that they relied upon the team’s support. The assistants’ role was mostly seen as technical and practical, but nonetheless considered professional. The researcher’s support was mostly about clarifying and negotiating issues regarding the sessions through WhatsApp and/or phone calls: “We can’t deny that [we had support], because with each and every question we had, you always replied” (P10-F). P15-F also stressed this:

[after our calls] it was clear, so, that, uhm, it was nice because you managed the contents in the way it was supposed to be, and not how one thinks it should be. Because sometimes on paper, one reads in a way, but can interpret it differently [I: right]. Therefore, I think that the support of clarifying the sessions was fantastic.

#### 5.3.2.3 Understanding viability across contexts

##### 5.3.2.3.1 Cross-school comparisons

At this point, it is necessary to provide tentative explanations about the different degrees of viability in the participating schools, which can be put forward by considering how the themes varied between them. The breath and intensity surrounding each theme in the schools were considered as indicators of how widespread or important certain aspects of the project were. These were determined by using NVivo’s coding matrices tool, considering *how many participants* had mentioned each theme and *how often* in their interviews<sup>29</sup>, as well as checking the coded extracts to examine the ‘flavour’ of the themes. Considering breath, intensity and flavour, I developed descriptive labels for the themes (e.g. ‘strategic articulation with TPD interests’ and

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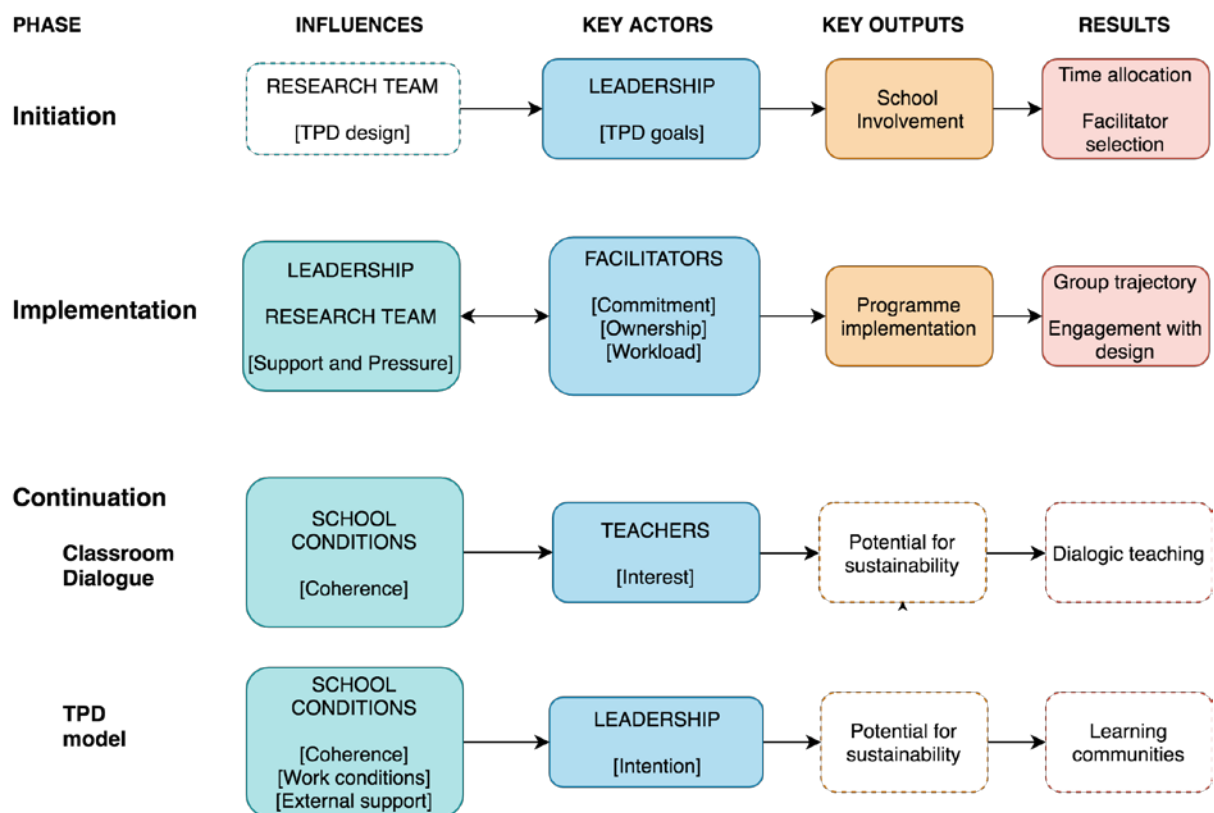
<sup>29</sup> Araucaria and Boldo schools had six interviews each, whereas Canelo School only had the two Facilitators’, which did not cover all the topics in other’s interviews; however, I still included their perspectives, examining which themes appeared and how intensely, taking into account that they were only two participants.



‘medium-low perceived support’) and compared them across schools. For instance, the level of ‘UTPs monitoring progress’ was high in Araucaria, medium in Boldo and low in Canelo. The detailed coding matrices and descriptive phrases for each category can be found in Appendix 12.

This analysis made apparent that viability was related to certain influences, key actors and resulting outcomes, which changed over time. Thus, comparisons were organised in two axes: horizontally, considering *influencing factors*, *key actors* and *outcomes*, and vertically considering *implementation phases* of initiation, implementation and projected continuation (Fullan, 2016). This allowed for an overall model of viability, which was applied to each school featuring its special characteristics. In doing so, influences were categorised as positive or negative, depending on how interviewees portrayed their relationship with viability.

### 5.3.2.3.2 Viability model



**Figure 5.10. Overall model of viability**

Figure 5.10 depicts the overall viability model, representing the phases of the project including initiation, implementation and intentions for continuation and in each, the key actors differ. In the initiation phase, the leadership team in each school was crucial. Specifically, the leadership varied in their TPD goals and the degree to which they considered this programme strategic to advance their existing teacher development agenda. Their decision to become involved resulted in allocating time for the programme and selecting facilitators, which again they

did strategically. Participating teachers were also selected by facilitators, although they could decline to take part.

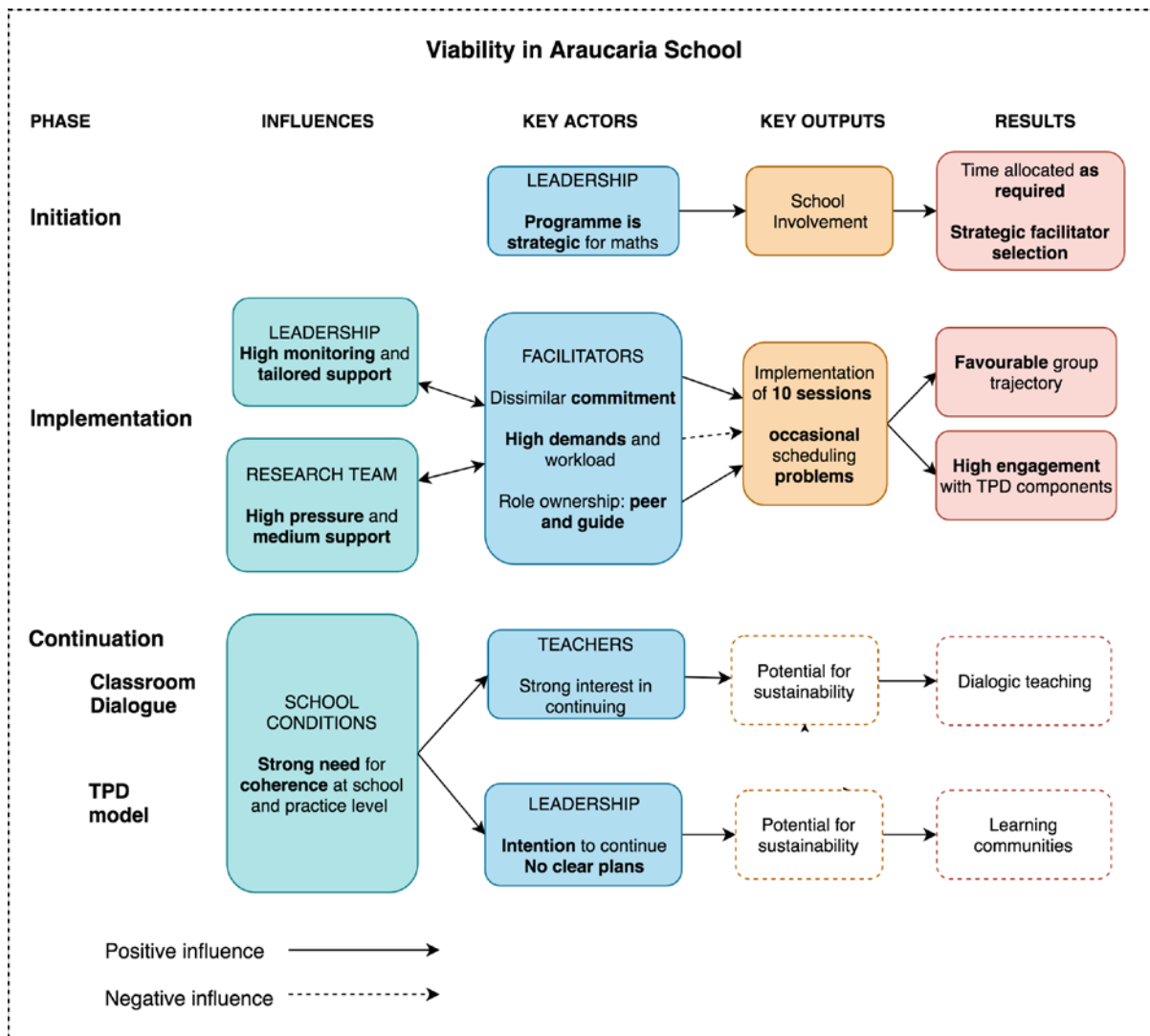
In the implementation phase, facilitators became the key actors and what differed across schools was their degree of commitment and ownership of their role, as well as the perceived workload. During the year, this meant that they sought or triggered different levels of support and pressure from the leadership and research team. The balance between perceived support and pressure varied. Facilitators' actions allowed for the implementation of the programme to dissimilar degrees, resulting in their group's learning trajectories and participants' engagement with the TPD components.

Regarding participants' intentions for continuation, it was apparent that this consisted of two rather separate strands: classroom dialogue and the TPD model focused on learning communities. The former was mainly discussed by teachers and was seen as part of their own domain of decisions, while they stressed that a degree of coherence within their practice and across the school would be beneficial. The latter was the focus of UTP's interest, who considered learning communities a valuable form of local TPD independent of the contents and had envisioned ways in which they could continue. The potential for sustaining the changes was delineated but follow-up data would be necessary to confirm this.

#### 5.3.2.3.3 Viability in Araucaria School

In Araucaria School (see Figure 5.11), a number of positive influences led to the positive outputs and results observed. In the *initial involvement* phase, the key element is that the leadership team considered the TPD strategic to achieve their existing goal of fostering teacher-student discussions in mathematics teaching.

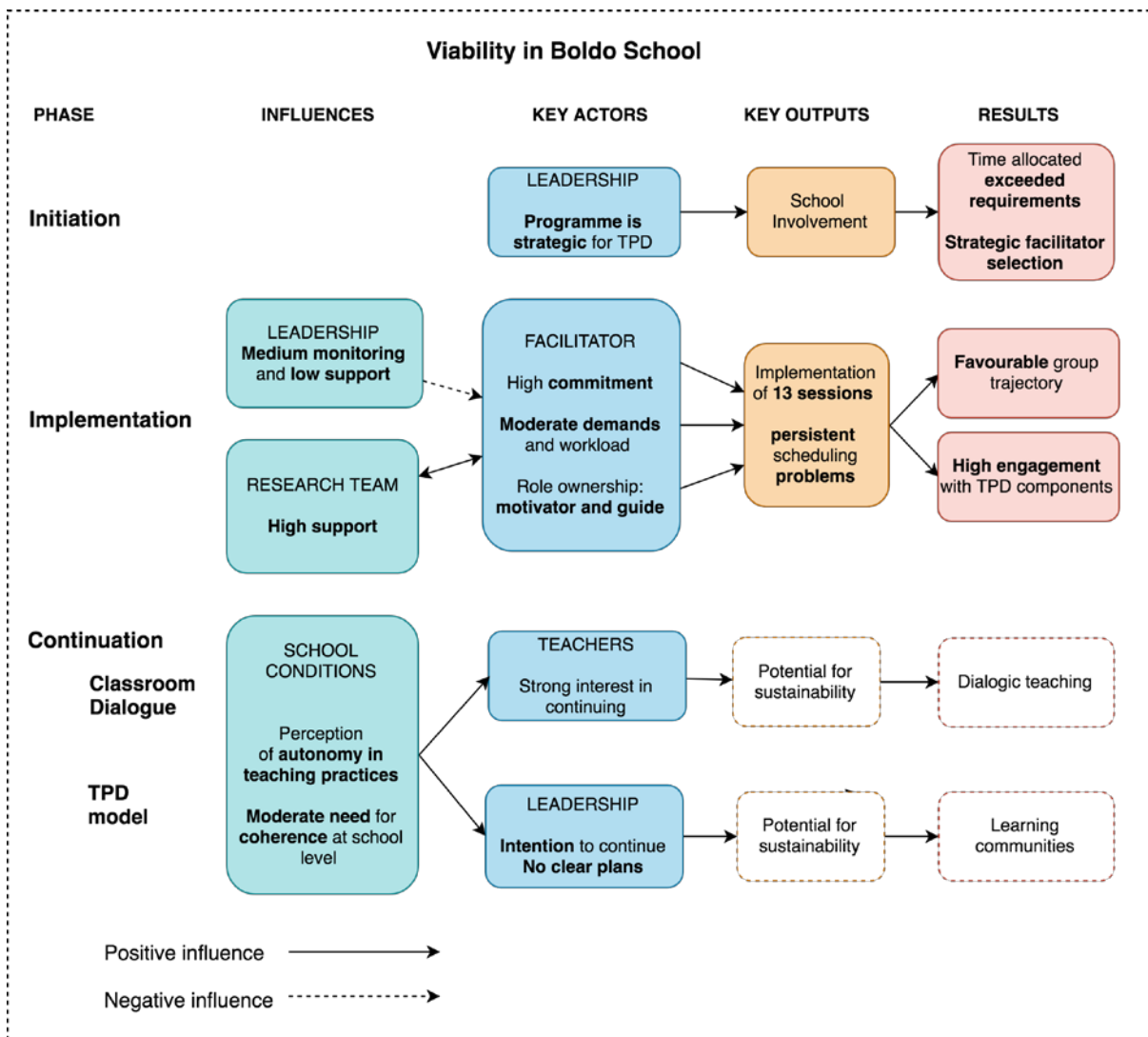
During the *implementation phase*, the leadership and research teams were seen as positive influences, helping the facilitators sustain their involvement in the project through support (UTPs) and pressure (researchers). The facilitators had different levels of commitment, with P14-F taking a leading role. The high level of demands perceived influenced implementation negatively restricting facilitators' time to prepare and engage in their role. However, when they intended to drop out the support of the leadership team helped keep the project afloat. Facilitators' ownership is reflected in their adaptation of session plans, and their enjoyment of the contents and of their role as learning peers in the TPD meetings. To sum up, in the face of sometimes struggling and overwhelmed facilitators, the reported support and ownership seemed crucial for viability.



**Figure 5.11. Applied viability model 1**

Focusing on *sustainability potential*, both UTPs and teachers saw sustaining aspects of the project as possible, emphasising the need (and sometimes taking actions) to ensure coherence at the school and teacher levels to make this a reality.

### 5.3.2.3.3.1 Viability in Boldo School



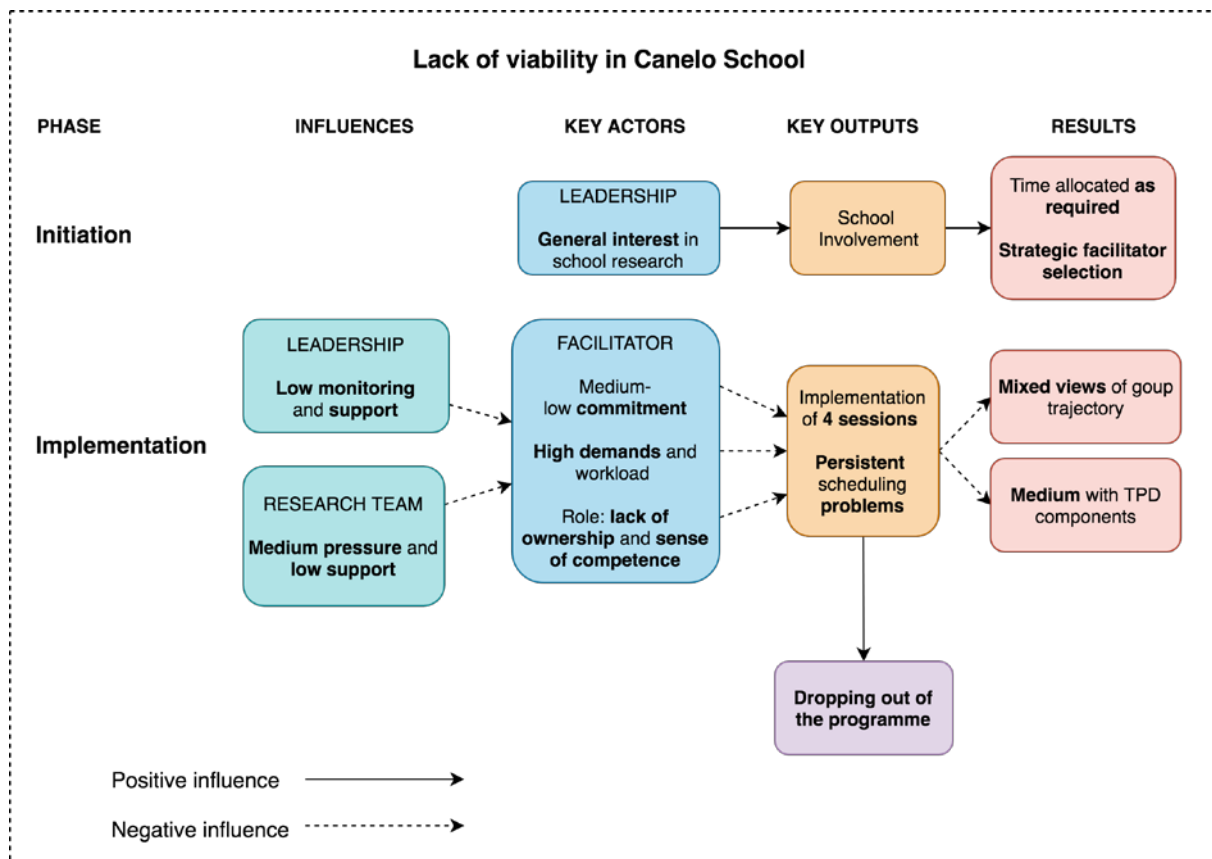
**Figure 5.12. Applied viability model 2**

In Boldo School, the positive outputs and results in terms of viability were akin to those found in Araucaria School, with the exception that persistent problems with scheduling were experienced (see Figure 5.12). The *initial phase* was similar too, with the strategic character of the learning communities for the school acting as a positive influence that led to arranging teachers' schedules and securing more time for the project.

During *implementation*, the UTPs' low levels of support including monitoring and securing time were considered negative factors. Yet, the facilitator's ownership and commitment to her role, alongside her perception of the workload as manageable, appear to have compensated for this, safeguarding viability. Additionally, P15-F saw the research team as an available source of assistance that favoured implementation. In terms of sustainability, participants saw continuation of dialogic teaching as a personal decision, thus giving less emphasis to the need for coherence.

### 5.3.2.3.3.2 Lack of viability in Canelo School

Implementation in School C looks different than the previous two schools (see Figure 5.13). In the *initial phase*, the UTP's interest in the project was general, but still they scheduled the required sessions. A series of negative factors during *implementation* resulted in low viability.



**Figure 5.13. Applied viability model 3**

Facilitators reported a lack of UTP's monitoring and effective support, related to the persistent scheduling and cancellation problems. The research team's presence was characterised by some level of pressure, while support was not discussed. They saw the workload as exceedingly high, and they understood their role in the sessions as requiring expertise in the topic, thus feeling unprepared and unsuited. Relatedly, they constantly requested being replaced by someone from the research team. Their level of commitment was dissimilar, with P20-F seeing the project as an imposition and P21-F expressing more interest and being more responsive during the year (as detailed in Section 5.3.1.4.2). Indeed, they also held dissimilar views about the group's trajectory, with P20-F seeing his peers' interest decline and P21-F arguing the opposite. In the end, facilitators were not able to overcome the challenges, resulting in sessions being constantly cancelled in the second semester, and finally dropping out.

## 5.4 DISCUSSION

### 5.4.1 Methodological considerations and study limitations

In this chapter, I employed a descriptive design and qualitative analysis to answer in part the research question about the programme's viability. The corpus consisted mainly of interviews with different stakeholders. In Araucaria and Boldo Schools it was possible to interview all relevant stakeholders, accessing their sometimes-contrasting views. Unfortunately, unfruitful attempts to interview participants and school leaders in Canelo School limited evidence to facilitators' opinions. Their perspective was crucial, but hearing from other actors would have been ideal, especially since facilitators sometimes offered opposing views, indicating the need for further exploration. In addition, it would have been informative to document the induction process in more detail, to allow for the exploration of its viability and the researcher role in it.

Interviews are often used in educational research given their richness and potential for accessing participants' views (Gubrium & Holstein, 2002), which proved true in this case. Like other self-report methods, they can be affected by social desirability, which should be considered in TPD research (Olofson & Garnett, 2018). Here, although I as the designer-researcher was present, participants did not withhold their criticism of the programme, making their responses appear dependable. In turn, thematic analysis is a flexible tool that provided an overview of participants' perceptions as well as allowing for cross-school comparisons allowing for the tentative explanatory models (Braun & Clarke, 2006).

Looking more broadly at the research design, it involved a one-off implementation of the programme with minimal external support. Participants raised improvement suggestions that could have been addressed during implementation and likely made it smoother, but the 'minimalist' approach (Osborne et al., 2013) made extensive alterations undesirable. Time constraints with regards to fieldwork led to discarding other suitable alternatives. For instance, Borko, Koellner and Jacobs (2014) implemented a programme to develop mathematics teacher leaders' skills to locally facilitate TPD for their colleagues, lasting for 2½ years and focusing on implementation integrity. Hennessy, Haßler and Hofmann's (2015) design for Zambian schools initially involved collaborative design of Open Educational Resources with local teachers and subsequent teacher-run application. Design-Based Implementation Research [DBIR] would also have been possible, permitting the iterative and collaborative development of the programme to maximise its applicability while producing knowledge about the under-researched area of peer-facilitated TPD (Fishman et al., 2013). In reality, these methods would not only have been more

demanding for the research team but would have posed even higher demands on participants' limited time, undermining scalability.

## 5.4.2 Assessing programme viability and scalability

### 5.4.2.1 Programme components

The perceptions about positive elements of the programme echo previous findings on effective TPD features (Desimone, 2009): participants appreciated its applicability, relevance and clarity, and especially the learning community format. It is worth noting that it was possible to achieve such a positive community experience without the presence of external experts, the most common TPD arrangement in the field (Haßler et al., 2018 being an exception).

One of the main critiques was that some of the sessions were too reading-heavy and theoretical. The abundance of readings accompanied with illustrative videos and discussion were planned because facilitators were not experts, thus texts could provide an alternative 'authoritative voice'. This was thought to offer two elements deemed important in TPD: clarity about the programme's goals and intentions (Fullan, 2016) and scaffolding for facilitators and teachers (Haßler et al., 2018). It is apparent, however, that materials were not sufficiently accessible, and thus alternatives should be sought. These could involve substitute materials (e.g. using videos featuring key ideas instead or aside of text) and/or altering the design more substantially. Namely, if facilitators were given more time to develop knowledge and expertise in a lengthier programme, materials could be less heavy. This problem exposes the tensions between effectiveness and time/resources that are likely to emerge when considering scalability as an integral part of TPD design.

Teachers also saw video observation as a motivating and rich activity for learning by reflecting on their and colleagues' practices, consistent with previous video-based TPD (Major & Watson, 2018). Nonetheless, self-captured video and participant video editing proved unfeasible, questioning how videos could be produced in school-run TPD. Potentially, this could have been solved by offering teachers on-site training to operate the handy-cams (although they were basic devices and written guidelines were offered). Alternatively, it could be negotiated for other school staff to do the recordings, which could produce better-quality videos and circumvent teachers' forgetfulness. In any case, these difficulties reinforce the fact that making technology available in schools is not enough for appropriate use to occur (Hennessy et al., 2015).

The problems experienced with printed materials and self-captured videos are worth examining. They illustrate an aspect of TPD labour that is usually absorbed by dedicated research teams and hardly discussed in the research literature. Although they may appear to be mere practicalities, once they are passed onto practitioners who already have other more pressing

responsibilities, they can become a burden and indeed an obstacle for implementation. Their existence and its consequences should be considered carefully and be subject to negotiation when thinking of designing for scale.

Time for practising was another of the widespread suggestions. Some of the ten original sessions required more time to be implemented, which meant groups spent less time on the reflective cycles than originally intended. It is likely that more implementation time in the year or continued implementation in the next years would have given participants more valuable changes to try new practices and reflect on them. In turn, the fact that facilitators adjusted the pace of sessions raises questions of implementation fidelity and adaptation. Fidelity is important to ensure that the intended components are applied (Hennessy & Davies, 2020), however, from this study it is apparent that some room for local adjustments was vital and helped facilitators to develop an important sense of ownership, crucial for scale (Coburn, 2003). Moreover, it was reasonable and even desirable for facilitators to adjust to their colleague's pace. This kind of tailoring happens in researcher-led TPD as well (van Es, 2010), but in multi-site TPD with different facilitators it can result in greater variations (Borko, 2004). These results point to some of the areas that can be subject to such modifications, suggesting aspects for which built-in support and flexible implementation paths could be devised. With the programme rationale and main goals clearly stated and shared by implementers, such flexibility could be achieved without compromising the programme integrity (Fullan, 2016).

Drawing on the TPD models proposed by M. M. Kennedy (2016) outlined in Chapter 2, I chose to incorporate elements of strategy-based and reflection-based programmes by introducing elements of dialogue for teachers to trial and then reflect upon in a more open-ended way. Participants' positive views about the programme contents and the applicability of strategies and the opportunities to discuss each other's practices indicate that the combination was appreciated. However, some participants did indicate that they needed guidance and feedback from an expert about their application of the proposed strategies (an element in strategy-driven programmes). Considering how challenging dialogic teaching has been found by practitioners in the past (Osborne, 2015), such a request seems sensible, however, it would not be feasible at scale. Perhaps supplying resources for self or co-evaluating implementation in a more structured way could provide the checks and reassurance that was mentioned. T-SEDA provides resources for this kind of approach and is now available in Spanish (Hennessy et al., 2019). Of course, the accuracy in applying self-assessment tools still remains a challenge.



#### *5.4.2.2 Implementation process and key roles*

Chapter 4 proposed the roles that key actors would have in the decision-making and implementation processes: the researchers' role in designing the programme, the leaders' function in committing to its application, and the facilitators' centrality in the programme implementation. An important finding of the present chapter, thus, is that participants' perceptions in this regard, as depicted in the proposed viability mode, seem to confirm the intended 'key actors' in each phase of implementation. Furthermore, their insights contribute to understanding how these roles materialised, enabling or hindering viability.

Specifically, regarding the initiation phase, the leadership team's importance has been described as 'change gatekeepers', ultimately responsible for prioritising innovations (Fullan, 2016, p. 62). The results show that, in successful cases, the leadership achieved a degree of ownership by linking the programme to their own TPD goals, making sense of this external programme within the organisation. This meant they provided some support and pressure to continue, which are important in conducting TPD (Guskey, 2002). These teams were also crucial in securing time for implementation, which confirms previous findings (Haßler et al., 2018). However, this appeared to be especially critical in Chile, since teachers' time outside the classroom is minimal and schools experienced troubles even with scheduling a monthly meeting. Meanwhile, the more generic interest for research found in Schools C and D that dropped out did not appear sufficient for sustaining the programme. This indicates that assisting this initial articulation process might be especially important for school-based TPD. On the other hand, pursuing implementation in the absence of such articulation might not be worth the school's and researchers' efforts. This finding is particularly important for TPD focused on dialogue since it's a relatively novel topic and its relevance and appearance in the classroom may be less obvious than researchers would wish. The inclusion of more senior figures such as UTPs in some aspect of the school-run programme could be an alternative.

The importance of leadership teams in school change is a research topic in its own right, however, to my knowledge its insights have not yet been integrated in the literature focusing on TPD for dialogue in general and were not part of the literature review of this work in particular. While their importance in any school-based programme can be assumed, these findings point to specific ways in which their influence could be anticipated and considered in a TPD design to maximise its success. It seems that contemplating their understanding and promotion of dialogue could be an important next step to the research in this area.

Following with the programme, undoubtedly, facilitators were the main piece in the implementation puzzle, which was appreciated by their peers and UTPs. Facilitators took part in an 18-hour induction before the programme started but did not get a chance to trial dialogic

teaching in their classrooms before engaging in their role, nor substantial study time during the year. Seeking to build in support for the complexity of the facilitator role (Coles, 2012) I developed facilitator guidelines for each activity that focused especially on how to manage discussions dialogically. I followed recommendations from OER4Schools, a tested programme with peer facilitators (Hennessy, Haßler, et al., 2014). That way, it was anticipated that despite not being experts in the contents, they could support and sustain professional dialogues. Peer-facilitated programmes in the literature have included lengthier preparation and/or continued support (Borko et al., 2014; Hennessy et al., 2015; Osborne et al., 2013), making it relevant to understand facilitators' work in this case.

The findings show that in Araucaria and Boldo Schools, facilitators and their groups construed the role in a way that made it viable and even fruitful. They saw it in terms of establishing the learning environment, motivating peers and guiding the activities, feeling competent for the task. On the contrary, facilitators in Canelo School thought they should have more knowledge to guide the discussions and treat key concepts properly. While this was important, it made their position impossible and the project unviable.

Examining School A and B facilitators' accounts of their role, these do not point to more substantive aspects of facilitation (as highlighted in researcher facilitation), like focusing the conversations, pressing participants' thinking or contesting their interpretations (van Es et al., 2014). Nonetheless, at this stage, the desirability of trying to equate expert versus peer facilitation in the quest for scalability is not obvious, especially since not many examples of scalable programmes are available in the literature. Is the (potentially costly) development of high-skilled teacher facilitators a requirement of school-based TPD? Or can such TPD be thought of as a rather different learning setting with its own affordances and requirements? This will be further examined in Chapter 6 through the analysis of facilitators' actions during TPD meetings.

With regards to the researcher role, the project design represented a departure from my experience as a researcher-facilitator (Grau et al., 2017). Thus, the programme required a challenging change of roles from me as well. In it, the very design principle that I attempted to test meant that I had to have far less control over the implementation than previously, while also monitoring and recording the process for research purposes. In this sense, being 11,665 km away helped make the point that the programme was really meant to be school run. Notwithstanding, implementation was highly taxing for me. Uncountable unforeseen circumstances emerged, including the dropouts, which were stressful. My decision to be available via messaging (and the time difference) meant that I was 'on call' daily until midnight for almost a year.

The facilitators' point of view on my role should also be considered. Even though I offered relatively little support, in Araucaria and Boldo Schools they did see the research team as a

positive and decisive factor considering the induction, which was vital, and providing support and beneficial pressure throughout the year. Thus, in ‘minimalist’ initiatives, especially at a larger scale, it will be crucial to specify what the researchers’ or developers’ role is. This study indicates that my pressure and support were seen as necessary. Thus, considering if and how these functions should be transferred to the schools is a crucial aspect in designing for scalability. An alternative could be a ‘fading support’ approach rather than providing minimal support from the onset (Haßler et al., 2018).

#### 5.4.2.3 Potential for scale

Two relevant concepts with regards to sustainability are *stick* (the continued use of resources), and *sharing* with colleagues (Hegedus et al., 2014). From the teachers’ interviews, it was apparent that they intended to continue with dialogic practices, which would ideally be confirmed with longitudinal evidence from practice (Hennessy & Davies, 2020). Sharing, in turn, was anticipated by UTPs but plans were fuzzy at the time of the interviews. In turn, the *depth* of these sustained pedagogical changes would have to be considered, especially in the event of further sharing it with colleagues new to the approach (Coburn, 2003).

The fact that there was a group of teachers in each school is a favourable factor, offering participants potential support and a community that shares their practices, as opposed to TPD in which only one or two teachers per school take part (Grau et al., 2017). This group within the school can be seen as a context to develop new professional norms and facilitating critical alignment with existing school policies and practices (Cochran-Smith & Lytle, 1999; Jaworski, 2006), while providing a sense of coherence important to sustain change (Desimone, 2009). Interestingly, participants pointed to the desirability of the whole school being involved, showing that coherence between new approaches and institutional practices is a salient aspect of TPD for teachers (see also Hardman, 2019), and that even an aligned group of colleagues is not sufficient for spread and sustainability (Coburn, 2003).

Some evidence of sustainability and local scaling came from Araucaria School a few months into the following academic year. P14-F approached me because the leadership team, partly building on the positive learning community experience, had decided to start a new peer-coaching system whereby a more expert teacher in a chosen subject would support a group of colleagues. P14-F and P12 had been enlisted to work in mathematics and history, respectively. P14-F wanted to focus her coaching on dialogic pedagogy and thus we telephoned about potential goals and I shared the project resources with her<sup>30</sup>. This is an interesting example of

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<sup>30</sup> Interestingly, she would coach her co-facilitator P10-F among other teachers.

*spread* within the school and *ownership*, on the part of the leadership team and P14-F, which are important and often neglected aspects of scalability (Coburn, 2003).

## 5.5 CONCLUSIONS

This chapter has shown that the proposed TPD design was viable under certain conditions related to the relevance of its contents and format, and strategic actions and dispositions from the school leadership teams, the research team and, more crucially, of local facilitators. Taking into consideration the myriad of constraining factors that are typical in Chilean schools, it was extremely pleasing that the programme was sustained throughout the whole year in two schools. The programme led to significant changes, as will be reported in Chapters 7 and 8, and to a desire to continue with dialogic teaching which had become embedded.

Evidence about the potential of this form of TPD is particularly relevant considering the current teaching reform in Chile, in which in-house programmes will become a requisite (Treviño, 2018). Beyond local importance, in studying the implementation process from the standpoint of the key actors, this study offers some important insights for TPD implementation in other contexts, which will be further discussed in the Conclusions. The next chapter explores how the programme sessions were run, which will allow for a deeper understanding of the implementation, facilitation and learning conditions.

# 6 FINDINGS II: FACILITATORS' ACTIONS IN THE TEACHER PROFESSIONAL DEVELOPMENT SESSIONS

## 6.1 INTRODUCTION

Studies on facilitation of teacher learning remain relatively scarce. However, relevant insights have emerged from research on professional learning communities (Vangrieken et al., 2017) and video-based teacher learning (Major & Watson, 2018). For the most part, such studies document facilitation by researchers with expert subject knowledge and/or facilitation experience (Coles, 2012; van Es, 2010; van Es et al., 2014). The emerging consensus is that this is a complex task, largely due to the fact that the kinds of conversations that have been deemed more productive do not emerge spontaneously and facilitators' focusing and challenging seem to play an important role in their occurrence. Chapter 2 describes in more detail what it involves, but some of the key features are managing the group and its learning environment as well as mediating inquiry-oriented conversations. Meanwhile, expert facilitation has drawbacks such as the asymmetry of decision-making power and ownership between participants and (potential) disconnection from practice. More importantly, given the concerns of the present research with the scalability of TPD models, relying on researcher-facilitators to implement TPD programmes makes them virtually impossible to scale. Therefore, this programme relied on local teachers to be facilitators after a brief induction period.

This chapter focuses on the viability of the peer facilitation component in the programme, responding to RQ 1.2 *How does peer facilitation unfold in the TPD sessions?* Peer facilitation has rarely been employed and studied, especially focusing on dialogic teaching. Hence, exploring how it played out during the main part of implementation can allow for critical consideration of the

potential benefits and shortcomings of this TPD feature, central to its viability and potential. The question was addressed through the qualitative analysis of meeting videos of Araucaria and Boldo schools. Firstly, the main activities in the sessions are described and contrasted with the original design. Secondly, through detailed examination of the videos, the role facilitators played in different activities is described and compared across schools. Finally, the findings are put in context considering the literature on expert and peer TPD facilitation.

## 6.2 DATA ANALYSIS

### 6.2.1 Data

**Table 6.1. Meeting videos available for Araucaria and Boldo School**

<b>Araucaria School</b>				
<b>Meeting N°</b>	<b>Session materials</b>	<b>Recording available</b>	<b>N° attendees</b>	<b>Absent teachers</b>
1	1	-	5	-
2	2	74 min	4	P14-F
3	3	46 min	4	P10-F
4	4	50 min	4	P12
5	4	35 min	5	-
6	5	65 min	4	P14-F
7	5	53 min	4	P12
8	6	72 min	5	-
9	7	68 min	5	-
10	8	61 min	4	P12
<b>Boldo School</b>				
<b>Meeting N°</b>	<b>Session materials</b>	<b>Recording available</b>	<b>N° attendees</b>	<b>Absent teachers</b>
1	1	28 min	4	P19
2	1	-	-	-
3	2	9 min	6	P19 (2 extra Ps)
4	2	28 min	6	P19 (2 extra Ps)
5	3	-	-	-
6	3	17 min	6	P19 (2 extra Ps)
7, 8, 9	4	-	-	-
10	5	53 min	5	-
11	5	43 min	5	-
12, 13	6	-	-	-

The data consisted of video recordings of TPD meetings (see Table 6.1). In Araucaria School, available videos included nine out of their ten meetings. In Boldo School only partial

evidence was available given the issues with recordings discussed in Chapter 5. Upon examination, I decided to consider these fragments in the analysis because most of the videoed activities were depicted in full in the footage and they were spread enough that they were not skewed towards certain contents or phases of TPD.

### 6.2.2 Analytic approach

The video data were rich, making diverse analytical techniques possible. Furthermore, the relatively novel topic demanded careful consideration of analytical choice. Seeking to make the study cumulative, I first surveyed and trialled some of the existing methods. Commonly, in-depth analysis of transcripts is conducted using methods such as conversational analysis (Dobie & Anderson, 2015), ethnography of communication (Segal et al., 2018) and interaction analysis (van Es et al., 2014). Others have attempted to quantify aspects of productiveness using video or transcripts building rating scales about mediation in problem-based mathematics TPD (Borko et al., 2014) or the quality of dialogue (Asterhan & Babichenko, 2019).

Unfortunately, transcription of the meetings in full was not possible due to constraints in time and resources. Considering the available options, I explored the suitability of Asterhan and Babichenko's (2019) scales that assess: (1) inquiry-oriented discourse considering the appearance of relevant dialogue categories, (2) focus on teaching and students and (3) interactivity. While readily applicable, they depicted the group as a whole rather than the facilitator(s) and thus I did not consider them fine-grained enough to answer the RQ at hand. Therefore, I decided to use thematic analysis, which would allow for the inductive creation of themes to represent the data to contribute to the field, as well as considering relevant literature in the process (Braun & Clarke, 2006). Defining the unit of analysis was necessary at this point. Episodes or segments are commonly used in the study of TPD meetings. These are purpose-driven sequences where participants remain constant. This seemed an appropriate match for the data, given that the planned sessions were divided in sequences of activities. Thus, mapping their occurrence and facilitators' actions in them was of importance.

To orient the analysis, from the main RQ about how peer facilitation unfolded I derived more specific guiding questions: what are the activities that facilitators implement during the sessions? How do these compare with the original session design? What actions are characteristic of facilitators in these sessions? Considering that sessions involved different types of activities, do their actions vary accordingly? Do these actions differ across schools?

## 6.2.3 Phases of analysis

The main distinctions adapted from thematic analysis and used in the analysis are described and exemplified in Figure 6.1. Analytic phases will be described in what follows.

### 6.2.3.1 Phase 1: Activity segmentation and coding to document time use

All videos were observed using the specialised software Elan 5.0<sup>31</sup>. The first observation round focused on familiarisation with the data. The following rounds included segmentation and coding of the meetings using a coding scheme and the development of a typology of activities.

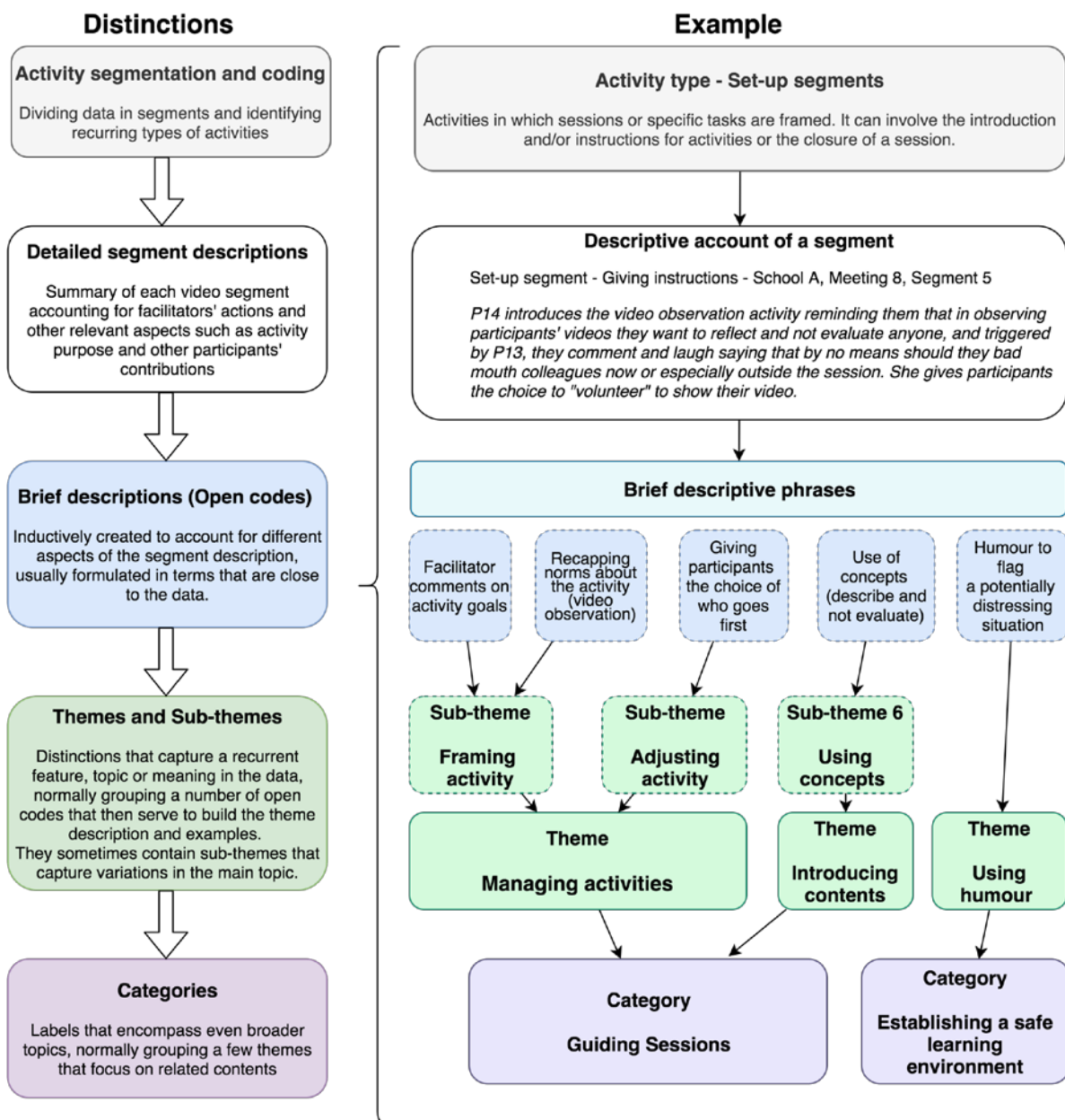


Figure 6.1. Data analysis - distinctions and examples

<sup>31</sup> Software obtained from: <https://tla.mpi.nl/tools/tla-tools/elan/>



#### 6.2.3.1.1 Coding scheme and reliability

Videos of structured learning situations were used in this study of TPD meetings and in the fourth study that focused on mathematics lessons (Chapter 8). I decided to analyse the learning activities that were conducted in both contexts to examine time use and the relationship between activities and more specific discursive features. This required the segmentation and analysis of activities, and I opted for a coding scheme devised to identify a wide range of learning activities. The analysis of mathematics lessons was conducted before this analysis. Thus, I first used the coding scheme in its original context, that is, school teaching, and then decided to apply it to the sessions considering that they were a structured learning environment as well. The scheme and interrater reliability process are described in what follows and apply to both studies.

The scheme (Amodia-Bidakowska, n.d.) was developed by a fellow PhD student linked to ESRC-funded project ‘Classroom dialogue: Does it really make a difference for student learning?’ of which I was part as well (Vrikki, Wheatley, et al., 2019). It was devised to be a comprehensive and applicable representation of learning activities. I thus considered it fit for purpose. The unit of analysis is an *activity segment*, defined as a period of time characterised by a constant topic and features regarding the following dimensions: (1) Organisation of Participants [hereon OP] focused on the way in which learners are interacting; (2) Activity Function [hereon AX], which reflects the activity goals; and (3) Activity Format [hereon AF], depicting the way the task is set up<sup>32</sup>. In the coding process, the data are first segmented and then coded across all dimensions.

Interrater reliability was assessed jointly with the scheme’s author. It started with training and refining the coding units and scheme. The reliability trial was conducted with randomly-selected lessons from the ESRC project, equally representing three primary school subjects (English, science and mathematics) using the software Elan 5.0. Krippendorff’s alpha (2011) was chosen as a reliability measure, given that it has been found to be more adequate than other common measures such as percentages and Cohen’s Kappa, especially in dealing with missing data (e.g. inaudible segments) and calculating reliability based on coding decisions on each codable unit rather than larger units<sup>33</sup>. Six lessons with 121 segments were coded, achieving the established reliability level. However, some codes remained rare, requiring further coding to make reliability more informative<sup>34</sup>. The final Krippendorff’s alpha values were: OP=.973, AX=.812,

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<sup>32</sup> The coding scheme also includes a dimension of task structure, but it was found through the training process that activities were almost never semi-structured. I thus decided to exclude the category.

<sup>33</sup> The number of decisions to assess reliability increases according to: (a) the possible variable values; (b) the smallest alpha value to consider coding is reliable; (c) the level of confidence. Following these guidelines, at least 110 units per coder were needed for the 7-value variables AX and AF (target alpha .800, 95% confidence).

<sup>34</sup> Based on Krippendorff’s equations for information about variables (2011, pp. 11–12) three extra lessons were added reaching 168 units per coder. The codes AX-6 and AF-5 were still not observed after the second round, and further addition of units was unlikely to produce them. Therefore, it was decided that in the event of occurrence, consensus coding would be conducted. This only happened for AF-5 in a few instances.

and  $AF=.868$ . When applying the scheme to the TPD sessions, it was apparent that video observation was a common and readily identifiable AF that was not contemplated in the original scheme. I thus added it in this context.

**Table 6.2 Activity coding scheme**

<b>1. Organisation of Participants [OP]</b>	<b>Code N°</b>	<b>Description</b>
<b>Individual</b>	OP-1	Individual
<b>Group</b>	OP-2	Group (2 plus participants)
<b>Whole-Class</b>	OP-3	Whole group
<b>2. Activity Function [AX]</b>	<b>Code N°</b>	<b>Description</b>
<b>Organising</b>	AX-1	Completing organisational tasks
<b>Introducing new content</b>	AX-2	Introducing established procedures, facts and contents.
<b>Evaluating/ Commenting/ Interpreting</b>	AX-3	Engaging in critique/evaluate/comment upon/interpret. This could be something participants have read/ an image / a video etc. It involves participants going beyond simply stating what is present and adding a substantial thought/idea/opinion/critique
<b>Recounting/ Recapping/ Reporting</b>	AX-4	Recounting facts/knowledge or recap from a previous lesson or previous discussion/activity from the same lesson. The function of this task is to report knowledge without evaluating/commenting or constructing something new.
<b>Generating/ Constructing/ Formulating</b>	AX-5	Using provided information to construct/generate/develop ideas, theories, solutions or plans etc.
<b>Investigation/ Inquiry</b>	AX-6	Identifying solutions/explanations for an open-ended situation through questioning/trialing (rather than the teacher presenting the information needed from the start).
<b>Procedural practice/ Skills practising</b>	AX-7	Practising skills. The intention of the task is to master a skill through repetition.
<b>3. Activity Format [AF]</b>	<b>Code N°</b>	<b>Description</b>
<b>Direct Instruction/ Monologue/ Lecturing</b>	AF-1	Teacher/facilitator-led with very little input, if any, from others. Few, if any, invitations.
<b>Exchange</b>	AF-2	Any discussion between two or more participants.
<b>Table work</b>	AF-3	Participants work at tables individually or in groups on written (often pre-prepared) task.
<b>Collaborative Construction</b>	AF-4	Any shared activity between two or more participants. This is distinct from table work as the aim of the task is to produce a jointly constructed outcome.
<b>Presenting</b>	AF-5	Previously prepared work that is presented to a group/whole class.
<b>Practical</b>	AF-6	Practical work. Example: students devising questions for survey/role play
<b>Reciting/reading</b>	AF-7	Reading texts /books etc. Reading out loud AND reading individually in silence (with little or no discussion).
<b>Video observation*</b>	AF-8	Observing a video (e.g. a clip of a lesson taught by an unknown teacher)

Source: Adapted from Amodia-Bidakowska (n.d.)

\* The Category was not used in the lesson analysis scheme, but it was added in the TPD session analysis

### 6.2.3.1.2 Activity coding and generation of descriptive activity categories

To code the session activities, I segmented the sessions and coded the dimensions of Organisation, Function and Format by observing each video twice. Having completed the coding, it became apparent that certain Organisation-Function-Format combinations were recurrent across sessions and schools (e.g. whole-group-commenting-exchange). Therefore, I devised context-specific descriptive categories<sup>35</sup> and grouped them in eight ‘main activity formats’ (see Table 6.3). As could be expected, these combinations coincided with the contents of session plans, however they provide a detailed account of implemented activities, including emerging ones such as some open discussions and ‘other tasks’. The annotated data were extracted to document time use.

**Table 6.3. Activity types observed in the TPD sessions**

Main activity formats	Specific activity formats according to their goals
<b>1. Set-up activities</b>	Introducing sessions Giving instructions for an activity Closing the session
<b>2. Presentations</b>	Presenting or introducing TPD contents
<b>3. Discussion-based activities</b>	Sharing answers to pre-defined questions Recapping Commenting other's videos Commenting or presenting own's videos Open discussion
<b>4. Video observation</b>	Observing other teachers' videos Observing teachers' own videos
<b>5. Individual writing activities</b>	Writing video accounts Completing individual worksheets
<b>6. Lesson planning</b>	Adjusting lesson plans individually or jointly
<b>7. Reading</b>	Silent reading TPD materials Shared reading TPD materials
<b>8. Other</b>	Organising and coordinating (e.g. materials, scheduling video recordings) Off-task talk

### 6.2.3.2 Phase 2: Creation of detailed segment descriptions

Based on the previous phase, it was apparent that formats 1-3 in Table 6.3 contained most of the facilitators’ talk and conversations between participants. Therefore, I excluded the less-informative formats 4-8 from the following analytic steps. I then observed all segments corresponding to the selected ‘specific activity’ formats (e.g. all ‘introducing session’ segments followed by all ‘instruction segments’, etc.). I played them two to three times and wrote detailed

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<sup>35</sup> In contrast, Amodia-Bidakowska’s (n.d.) scheme aims to capture the whole variety of possible activities found in lessons across school subjects and is therefore fairly generic.

descriptions of what facilitators did and said, mentioning participants' actions to provide context. Given my interest in depicting overt facilitation actions and contrasting them with the existing literature about expert facilitation, the descriptions referred to explicit contents and observable actions, rather than their possible latent meaning (Braun & Clarke, 2006). An example of a description focusing on an introduction section can be found in Figure 6.1.

*6.2.3.3 Phase 3: Creation of brief descriptions and organisation of initial (sub-)themes*

**Table 6.4. Initial themes**

<b>Initial Themes</b>	<b>Initial Subthemes and number of open codes</b>
<b>1. Managing tasks</b>	1.1 Framing tasks and sessions (3)
	1.2 Adjusting tasks (3)
	1.3 Sustaining tasks (3)
	1.4 Sorting confusion (1)
<b>2. Introducing authoritative perspective</b>	2.5 Introducing TPD contents (4)
	2.6 Employing concepts during tasks (2)
	2.7 Stressing the limits of dialogue in their context/practice (2)
<b>3. Mediating the conversation</b>	3.8 Opening up the conversation (2)
	3.9 Accepting participants' contributions (2)
	3.10 Pressing participants to develop their ideas (3)
	3.11 Summarising (1)
<b>4. Showing responsiveness to participants</b>	4.12 Welcoming participation (3)
	4.13 Showing empathy towards participants (1)
<b>5. Stressing confidentiality</b>	- (1)
<b>6. Using humour</b>	- (1)
<b>7. Contributing to conversation with own perspective</b>	- (3)
<b>8. Developing other's contributions</b>	- (1)

I re-read each detailed description to create brief descriptive phrases, such as 'facilitator comments on activity goals' or 'giving participants the choice of who goes first' (see Figure 6.1 for more examples). I often checked the accuracy of interpretations against the video excerpts. I then considered overlaps in their contents and collated the phrases into 36 open codes and the codes into eight themes, as depicted in Table 6.4 (see open codes in Appendix 14).

#### 6.2.3.4 Phase 4: Organisation of initial themes into categories

At this point, it became apparent that the themes could be grouped into more overarching categories. The findings in Chapter 5 already provided some insights about the role of facilitators in the TPD meetings, as perceived by them and their colleagues. Specifically, the theme *facilitators leading sessions* (see Section 5.3.2.2.1.3) provided suitable distinctions to organise the video-based themes under:

- (1) *guiding the group* (initial themes 1, 2 and 3)
- (2) *establishing the learning environment* (initial themes 4, 5 and 6)
- (3) *contributing as a peer* (initial themes 7 and 8).

#### 6.2.3.5 Phase 5: Review of (sub-)themes and categories

I conducted a review of the initial themes and sub-themes to audit their consistency and fit with the data, important aspects of validity in qualitative analysis (Cohen et al., 2011). I re-read all the detailed descriptions to assign open codes and themes consistently, sometimes re-playing relevant segments to ensure the interpretation was sound.

#### 6.2.3.6 Phase 6: Researcher triangulation

The triangulation was conducted with a fellow Spanish-speaking PhD candidate knowledgeable about the research. It involved examining six video segments where all sub-themes were represented. We considered their definitions, fit with the data, and organisation. Suggestions were made about some initial themes leading to their refinement. Some themes were renamed (2, 2.5, 2.6, and 8 in Table 6.4) while others were re-organised or reformulated (1.3, 3.1 and 2.7 in Table 6.4). The detailed suggestions and decisions are documented in Appendix 15. These adjustments required revisiting all relevant segments to apply the new themes and finalise the study coding matrices (see Appendix 16).

## 6.3 RESULTS

### 6.3.1 What activities were implemented in the TPD meetings?

#### 6.3.1.1 Activity types and their duration

The tasks included in the session plans were reflected in the activities identified in Phase 2 of analysis (see Section 6.2.3.1.2). Their occurrence and average duration are depicted in Table 6.5. The table shows that introductions and instructions were very common although brief, indicating that facilitators followed the session plans to provide guidance. Closure was only

observed in Araucaria School, since videos were incomplete in Boldo. Presenting was somewhat frequent and happened in short segments that usually alternated with discussion-based tasks.

**Table 6.5. Activity presence and average duration**

Main activity formats	Specific activity formats according to their goals	Araucaria School		Boldo School		Overall Mean duration (min)
		N segments	% segments	N segments	% segments	
<b>1. Set-up activities</b>	Introducing sessions	7	6.3	6	12.2	2.0
	Giving instructions for an activity	19	17	6	12.2	1.2
	Session closure	5	4.5	0	0	1.6
<b>2. Presentations</b>	Presenting or introducing TPD contents	10	8.9	3	6.1	1.4
<b>3. Discussion-based activities</b>	Joint task	8	7.1	7	14.3	3.5
	Recapping	2	1.8	2	4.1	2.7
	Commenting other's videos	7	6.3	4	8.2	3.4
	Commenting or presenting own's videos	6	5.4	0	0	8.0
	Open discussion	6	5.4	0	0	8.1
<b>4. Video observation</b>	Observing other teachers' videos	7	6.3	2	4.1	5.0
	Observing teachers' own videos	5	4.5	0	0	9.2
<b>5. Individual writing activities</b>	Writing video accounts	5	4.5	2	4.1	5.3
	Completing individual worksheets	2	1.8	1	2	6.9
<b>6. Lesson planning</b>	Collaborative lesson planning	2	1.8	3	6.1	13.8
	Individual lesson planning	1	0.9	0	0	6.1
<b>7. Reading</b>	Silent reading	5	4.5	1	2	8.7
	Shared reading	6	5.4	7	14.3	7.6
<b>8. Other</b>	Organising and coordinating	8	7.1	4	8.2	3.5
	Off-task talk	1	0.9	1	2	6.7
<b>Total</b>		<b>112</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>4.4</b>

Discussion segments differed across schools: Only in Araucaria School had lengthier open discussions or commentaries of participants' videos. This might be partly due to the unavailability of Boldo School's videos from later sessions, when such discussions were planned. However, in Araucaria open discussions were observed as early as Session 2. This indicates that the facilitators allowed for more open and lengthy conversations to occur, sometimes going slightly off topic to focus more broadly on their teaching practices.

Other activities (5 through 7) put participants in a more passive role. They were lengthy and frequent, especially in Araucaria School. Participants mentioned these tasks as a cause of dissatisfaction with the programme (see Chapter 5), indicating that the meetings became tedious at certain points. Finally, it is worth noting that Araucaria regularly conducted organisation segments leading to perhaps less productive time use.

### *6.3.1.2 Observed variations in activities and materials*

Schools occasionally introduced variations in the original session plans and use of materials, some substantial and some more limited. In terms of the former, Boldo School met on more occasions, usually devoting two meetings to work on the tasks planned for one session. Although this was not initially planned in Araucaria School, they did take two meetings to work on the tasks of Session 4 (planning the negotiation of ground rules) and Session 5 (reading about dialogue and adjusting lesson plans to include dialogue). This was in part due to the materials being extensive, but mostly because they lacked clarity about what to do. They even mistakenly re-read a previous text from Session 3 in Session 5 instead of the assigned and more applied “Dialogic teaching: tools and goals” and thus had to repeat this session<sup>36</sup>.

More limited modifications were also observable in Araucaria School, including doing most of the activities as a whole group instead of the occasional suggested pair or individual work. Additionally, in Session 2 they were meant to finish the first video-observation activities by agreeing on ground rules for video observation, and they omitted this activity and instead engaged in a third round of observation using the same video clip, which was not planned.

Considering the incomplete videos from Boldo School, such changes cannot be discarded or assumed. However, there was one interesting case in their fourth meeting (Session 2 materials), where P15-F created an activity to help her colleagues practise the descriptive video observation mode by showing them the video again and stopping every few seconds to jointly produce descriptions, distinguishing them from judgements. This activity responded to the session aims and was well-received (an excerpt can be found in Figure 6.12).

In terms of the materials, aside from the mentioned changes, the use of ‘Personal work’ worksheets is worth examining. These consisted of reflective tasks (e.g. self-audits and reflection templates with questions) to give participants some continuity between sessions, considering that meetings were usually 3-4 weeks apart, and were a means of increasing the time devoted to the TPD. Distributing them was the final task in facilitators’ guidelines. However, they did not seem to use them or at least facilitators were never seen distributing or commenting on them. The reason for this omission was not addressed by facilitators, but two explanations appear to be plausible. First, it was evident that facilitators (especially in Araucaria School) experienced some issues with the order of their materials (see Chapter 5, Section 5.3.1.4). Additionally, they might have deemed this extra work unnecessary or inappropriate considering participants’ excessive

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<sup>36</sup> Unfortunately, P10-F was absent in the third meeting, when they read this text for the first time, and P14-F was absent in the fifth one, when P10 gave it to participants again. A few months had passed in between, and participants did either not notice or not bring it up.

workload. Indeed, most participants praised the fact that the TPD work was manageable since it was circumscribed to the meetings (Chapter 5, 5.3.2.1).

### 6.3.2 What actions were characteristic of facilitators in leading the TPD meetings?

The account of meeting activities provides the context to answer the research questions about the facilitators' role in the TPD sessions. As explained in Section 6.2.3.1.2, three activity types were selected for further analysis based on their higher level of interactivity: set-up, presentation and discussion based. The final categories and themes are depicted in Figure 6.2.

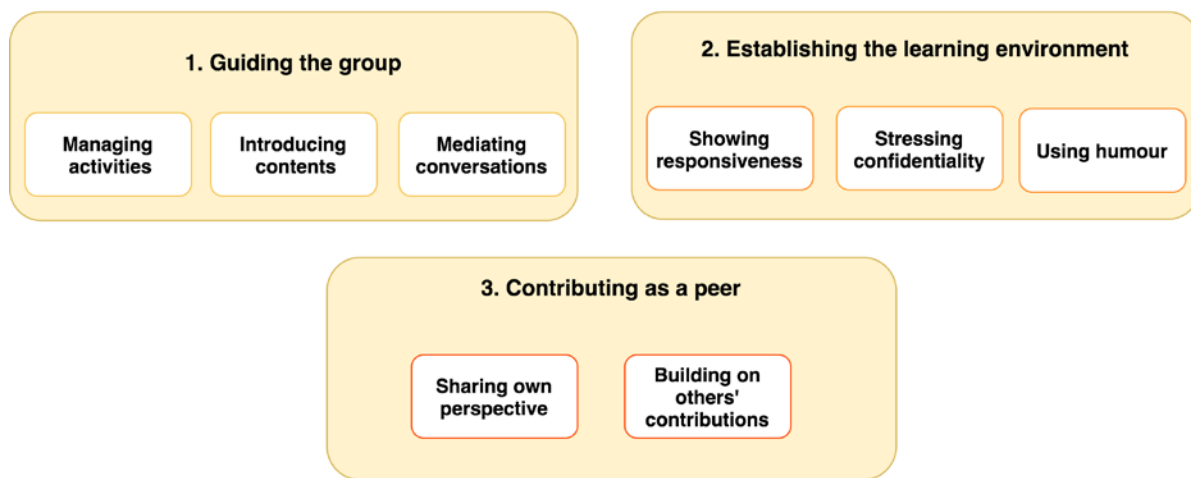


Figure 6.2. Categories and themes describing facilitators' actions

#### 6.3.2.1 Guiding the group

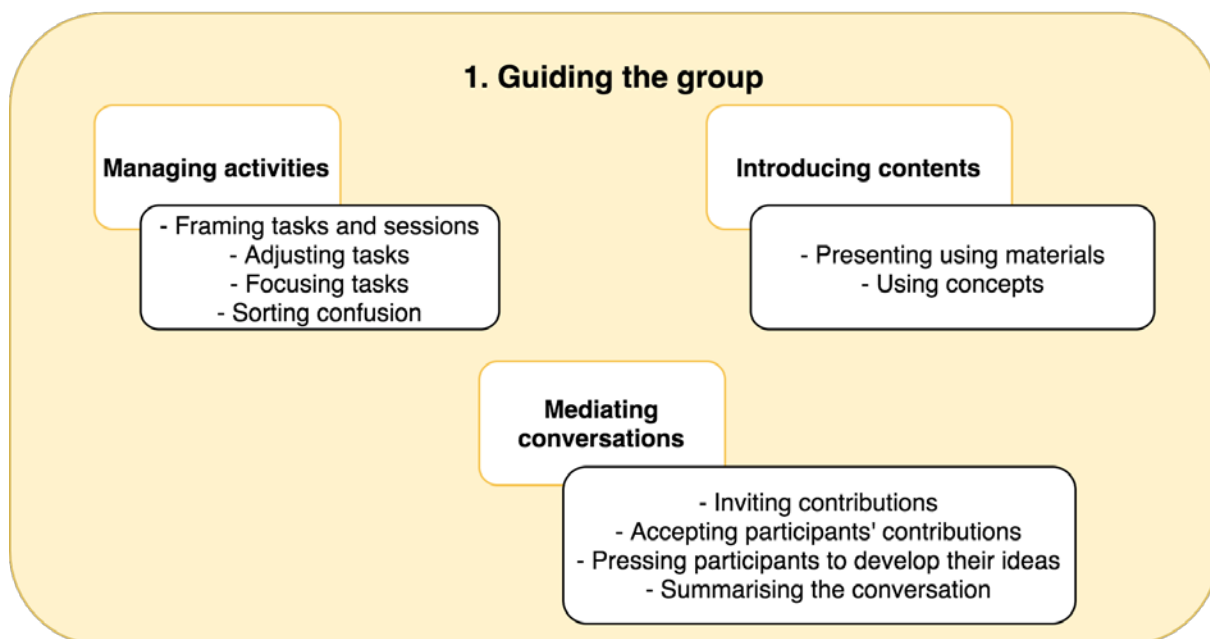


Figure 6.3. Themes in category 1, Study 2



Facilitators engaged in numerous actions aimed at steering the group with respect to the activities, the TPD contents and their conversations in response to the proposed activities (see Figure 6.3). It is worth noting that, in the vast majority of cases, participants were willing and even keen to respond to facilitators' guidance, so that most of their actions appeared as initiations and sometimes responses to participants' requests. Meanwhile, other possible actions such as repairing communication or dealing with conflict were never observed.

#### 6.3.2.1.1 Managing activities

Facilitators often directed participants' attention and actions toward the proposed session activities. They did this, first, by *framing tasks and sessions*, marking their beginning and end, but also providing more details or establishing links between previous sessions or activities with the current one. Additionally, at the beginning of some activities, facilitators were seen *adjusting tasks*. Namely, they altered elements of the activities in three different ways. Firstly, they sometimes introduced suggestions for how participants should complete them, such as making notes or focusing on aspects of a lesson video; secondly, they gave participants options to complete the tasks, for instance by deciding roles in shared reading; and thirdly, in a more intensive modification, they occasionally changed the format and/or purpose of activities.

Facilitators also managed activities once these had commenced, in two distinct ways. When the conversation appeared to have gone too far from the proposed topic, facilitators tried *focusing the tasks* to steer the conversation towards its intended purpose. However, this was done in subtle rather than direct ways, such as re-introducing the purpose or original question, or making a task-related contribution. Finally, and only in Araucaria School, facilitators sometimes had to *sort out confusions* when there was a mix up with the materials or they lacked clarity about the session goals. This is indicative of their lack of preparation time and it continued to happen even after we agreed that I would email them the session materials before each session to make facilitators' guidelines more accessible (see Chapter 5).

#### 6.3.2.1.2 Introducing contents

Even though facilitators were not experts, drawing on materials and their own knowledge they sometimes introduced the TPD contents representing an external, authoritative perspective (which they did not always equate to their own). The most obvious way was by *presenting contents using materials*. This was done as part of the rare planned presentation segments (in Sessions 1 and 2), for which I prepared PowerPoint presentations, which facilitators usually read out loud. But also, they brought up contents when answering participants' questions about the TPD and praising aspects of the programme, its applicability and productiveness. Another way of introducing contents was through *using concepts*. On occasions, they did this by modelling how the

tasks should be completed. More frequently, however, they employed concepts such as ‘video observation modes’ and ‘dialogue tools’ during discussions.

An important point to note here is that although their use of concepts was mostly correct, some misuses were unfortunately observed. The confusions related mainly to video observation modes (as explained in Chapter 4), especially the meaning of *descriptions* and *honest questions*. Descriptions are detailed objective accounts of what is observed. Practising this is the first step in observation, helping participants to have evidence-based discussions instead of jumping to conclusions. However, in School A P10-F accepted her peers’ and her own judgmental observations as descriptions. An illustrative excerpt appears in Figure 6.11.

Honest questions are a tool to develop an inquiry focus avoiding making quick and uninformed evaluations about a teacher and her practices based on a few minutes’ worth of video. They invite observers to consider what they do not know and pose genuine questions about this, which is crucial when observing each other’s practices. Instead, in Araucaria School questions such as ‘why was the teacher so directive?’, which carried negative evaluations, were accepted as honest questions. In Boldo School, although they were assessed more accurately, P15-F explained that they were meant to be ‘nice’ questions to avoid hurting the videoed teacher (as can be observed in the excerpt in Figure 6.12). While this was in part the purpose of the questions, it seemed that the participants did not perceive that this might be achieved through acknowledging one’s lack of information, rather than being pleasant.

#### 6.3.2.1.3 Mediating conversations

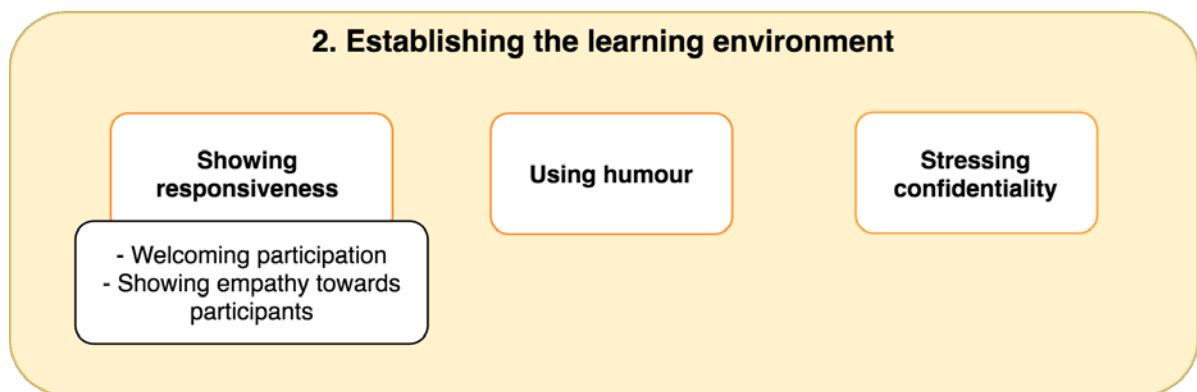
Many of the TPD activities were discussion-based, and facilitators were active in mediating the conversations, guiding their direction to some degree. This was done, first, by *inviting contributions*, managing the floor to ensure broad participation. Also, in Araucaria School where sessions using participants’ videos were available for analysis, facilitators (especially P14-F) asked their colleagues numerous ‘honest questions’ about their videos and teaching practices.

As well as inviting, facilitators often responded to their peers’ contributions taking a stance. Sometimes this involved *accepting participants’ contributions*, signalling agreement or paraphrasing them and re-introducing them in the conversation. Other times, they responded by *pressing participants to develop their ideas* further. This involved asking follow-up questions inviting building or explanation, or challenging or rejecting contributions, often providing grounds for these. It is worth noting that some topics in the TPD were more open-ended, whereas the initial sessions sought to establish certain distinctions with regards to video analysis. On these occasions, in Araucaria School facilitators sometimes agreed with contributions that did not match the intended concepts, thus reinforcing an incorrect understanding that appeared as part of using

concepts (see Section 6.3.2.1.2). The final sub-theme is *summarising the conversation*, whereby facilitators synthesised what was just discussed before moving forward.

### 6.3.2.2 *Establishing the learning environment*

Some of the facilitators' actions can be linked to building and maintaining a positive environment based on trust and respect among colleagues (see Figure 6.4).



**Figure 6.4. Themes in category 2, Study 2**

#### 6.3.2.2.1 Showing responsiveness to participants

Facilitators acted in various ways to signal that they *welcomed participation* of their colleagues by encouraging them verbally and non-verbally as they spoke, showing responsiveness towards their contributions (with short interjections), and praising or thanking participation more generally. When colleagues shared difficult experiences, facilitators sometimes responded with *empathy towards them*, shown by acknowledging their colleagues' impressions of difficulties, offering help or sharing their own struggles to normalise the situation. This was especially observed after viewing P11's video in Araucaria School, in which she struggled with serious misbehaviour. The facilitators acted to make her feel secure and welcome, with other participants following suit. They did not do this at the expense of asking her questions and analysing her practice.

#### 6.3.2.2.2 Stressing confidentiality

This was a key aspect of the TPD design, especially since participants were meant to show their own videos. Facilitators tried to *stress confidentiality* by reminding and reinforcing relevant agreements. The topic was often brought up in Araucaria School, even before the video recordings began and it seemed to be a shared cause of concern.

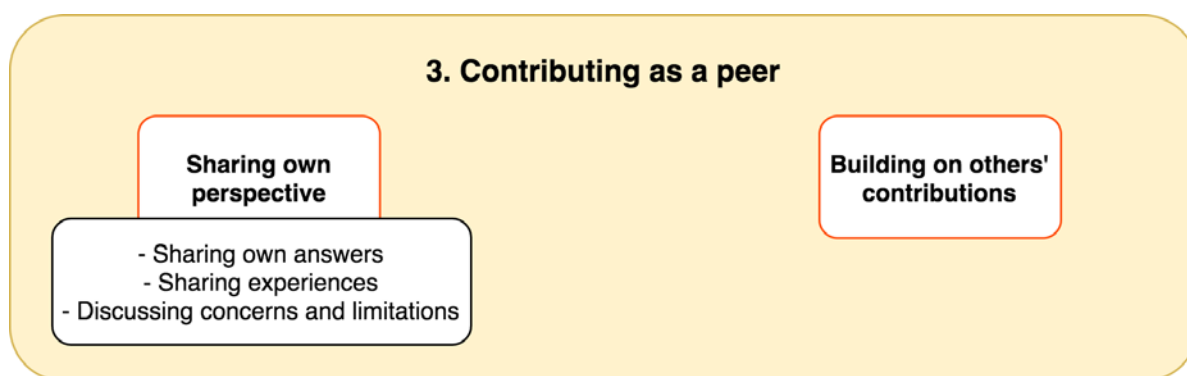
#### 6.3.2.2.3 Using humour

A final aspect of maintaining a trusting and relaxed environment was *using humour*, observed only in Araucaria School. This emerged especially when potentially uncomfortable topics such as

confidentiality surfaced, and when discussing classes or children considered difficult. Also, when facilitators were beginning to assume their role, P10-F used a playful tone when engaging in actions that are typical of facilitators (e.g. introducing contents), causing others' laughter. Participants in this group were responsive and active with regards to humour.

### 6.3.2.3 Contributing as a peer

The two preceding categories might suggest that facilitators greatly distanced themselves from other participants by assuming a completely different role. This was not entirely the case, as this category depicted in Figure 6.5 shows.



**Figure 6.5. Themes in category 3, Study 2**

#### 6.3.2.3.1 Sharing their own perspective

Oftentimes, facilitators contributed to the conversation by sharing their own thoughts and ideas, especially in more open-ended activities. In doing this, they could be seen as positioning themselves as learners in three different ways. The first was *sharing their answers* to written exercises or oral tasks. Interestingly, they usually did this only after having invited other participants first. The second one was *sharing their experience* as teachers, thus relating the topics under discussion with their own practices beyond what was prescribed in the tasks. Finally, facilitators *discussed concerns and limitations* of the application of dialogue and of the TPD design in their context. This was especially observed in Araucaria School and did not only emerge when observing their own videos, which could have reasonably raised questions about applicability, but also early on in the programme. All other participants also referred to these issues.

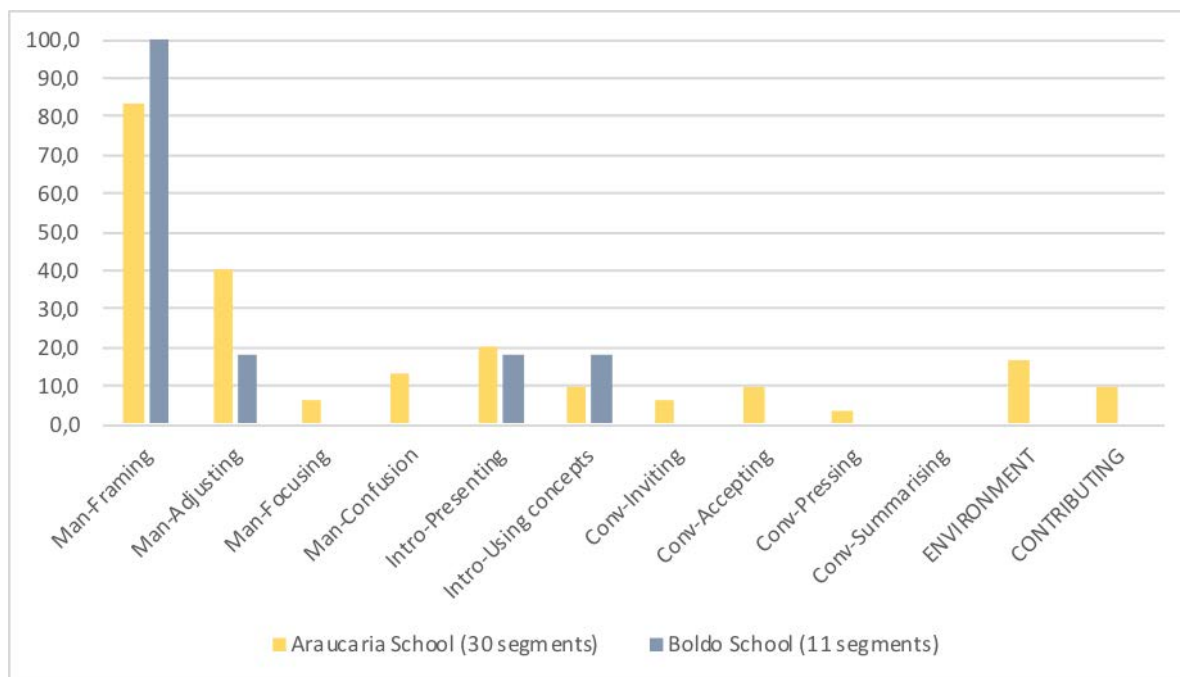
#### 6.3.2.3.2 Building on others' contributions

Another way in which facilitators took part in conversations was by building on or developing their colleagues' ideas, just like others did: sometimes talking over each other and even interrupting someone else's turn. This could mean extending someone else's contribution, giving an example or linking them to their own idea.

### 6.3.3 Did facilitators' actions differ across activities and schools?

The set-up, presentation and discussion-based segments amount to 95 segments lasting 2.9 minutes on average (69 in Araucaria's nine sessions and 26 in the fragments of Boldo's six sessions). Facilitators' actions were examined, and illustrative segments were chosen.

#### 6.3.3.1 Facilitators' actions in set-up segments



**Figure 6.6. Facilitators' actions in set-up segments<sup>37</sup>**

The *set-up segments* include those introducing sessions or tasks and closing sessions (the latter only observed in Araucaria School). Figure 6.6 shows that the three themes that correspond to *guiding* predominated, whereas *environment* and *participating* themes occurred sparsely.

Unsurprisingly, *Framing* was the most common way of managing tasks in both schools. This was sometimes done by referring back to previous activities, as the example in Figure 6.7 shows. However, in Araucaria School facilitators tended to rely on reading the guidelines out loud and stating the steps and duration of activities (in 50% of segments) whereas in Boldo School, the facilitator emphasised the rationale and aims, usually relying on her own formulation (81.8% of segments, versus 27.3% in which she read). Another interesting difference between schools is that *adjustments* were far more common in Araucaria School, like the example in Figure 6.8 illustrates.

<sup>37</sup> In this chart and the next ones, categories are distinguished from themes using capital letters in their labels.

## Framing by focusing on the aims and linking with previous learning

The facilitator gives instructions by saying:

**1. P15-F: The previous session all we did was observe and write the first thing that we saw, right? (...) we learnt about what these four concepts are about, referred to the observation mode to watch videos. In understanding what each concept means, we're supposed to gain clarity about how to observe a video in a better way. Of course, we're not yet experts at doing this. We'll learn to do it session by session and sharpen our observation skills. To do this the idea is for you to rework your written account and order it according to the four concepts. Who wants to start and share their description?**  
(School B, meeting 4, segment 6).

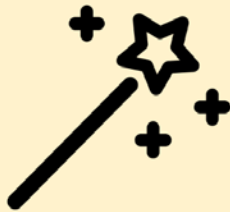


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Figure 6.7. Excerpt: framing in an instruction segment<sup>38</sup>

With regards to *introducing contents*, some form of *presentation* took place in around 20% of set-up segments across schools, whereas the *use of concepts* was more common in Boldo School (18.2%) than in Araucaria School (10%), which may relate to the way in which P15-F explained tasks in her own words including concepts. Meanwhile, actions related to *mediating conversations*, *establishing a learning environment* and *participating* appeared in some segments in Araucaria School, especially in the 'closure' segments, which tended to be more interactive.

## Adjusting by adapting different aspects of activities



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### **Example 1 - changing activity format**

P14-F is reading the guidelines at the beginning of the session and states:

**1. P14-F: we've got (...) 20-25 minutes to do the silent reading. Now, if you like, so that it's more engaging, we can do it out loud reading a page each because it's quite a lengthy text.**

(School A, meeting 3, segment 1)

### **Example 2 - changing participant structure**

**1. P10-F: we could do it as a group instead, what do you think?**  
**2. P14-F: yeah, these come as activities to do in sub-groups but we shouldn't (...).** (School A, meeting 4, segment 5)

Figure 6.8. Excerpts: adjustments during instruction segments

### 6.3.3.2 Facilitators' actions in presentation segments

Ten *Presentation* segments were observed in Araucaria School and three in Boldo school<sup>39</sup>, for the most part in the first two meetings. They had a clear lecturing-style pattern, with

<sup>38</sup> In the excerpts, speakers are identified, and facilitators' turns are in bold to distinguished them from participants' turns.

*introducing contents* appearing in all segments. *Guiding* was observed in just over half the instances, but only through *framing* and *adjusting*. Conversely, and as would be expected during monologic segments, there were almost no signs of facilitators *mediating* conversations or *contributing as participants*. Again, confidentiality and humour appeared in Araucaria School (in 10% and 20% of the segments, respectively), showing the importance of these aspects in their meetings.

An interesting segment was observed in Boldo School (see Figure 6.9) when the facilitator presented the planning template for teachers to include dialogue in their lesson plans. She took care in modelling its completion with examples from her practice and using concepts.

**Presenting learning materials (planning template)**


*P15-F introduces the planning template, hands it out to colleagues. She gives detailed instructions about how to complete it:*

- 1. P15-F: "it is like a planning template and the idea is to write here what you already have in your planning, but selecting some of these goals that appear here in the document. What questions could you use, for instance, if you're working on fractions with equal denominators, which one of the questions in these strategies could you use to include dialogue in your lesson?"**
2. P16: to achieve one of these goals?
- 3. P15-F: right, it can be one or more**
4. P16: because I thought that these goals were in a progression
- 5. P15-F: not necessarily**

*P15 then explains that if you want to include all of them you do it in order, but otherwise, you can pick and choose and insert dialogue in some parts of the lesson only.*

*She continues to read out loud the components of the planning template, for instance: "the Learning Objective here, for instance, I'm working on LO 12 in geometry", and explaining that the sample lesson has four activities "you don't need to do four activities in the lesson if you've got one you just complete the table for one activity."*

(Boldo School, meeting 10, segment 10)



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from Noun Project

**Figure 6.9. Excerpt: presenting using concepts and examples from practice**

### 6.3.3.3 Facilitators' actions in discussion-based segments

Discussion-based activities were included in all sessions. A majority of these segments (30 in total), while based on open questions, had a more *structured* character, including joint tasks (sharing written answers or answering questions together), summarising previous discussions or sessions, and observing unknown teachers' videos with the aim of practising observation modes. *Semi-structured discussions* included commenting on participants' videos and more open

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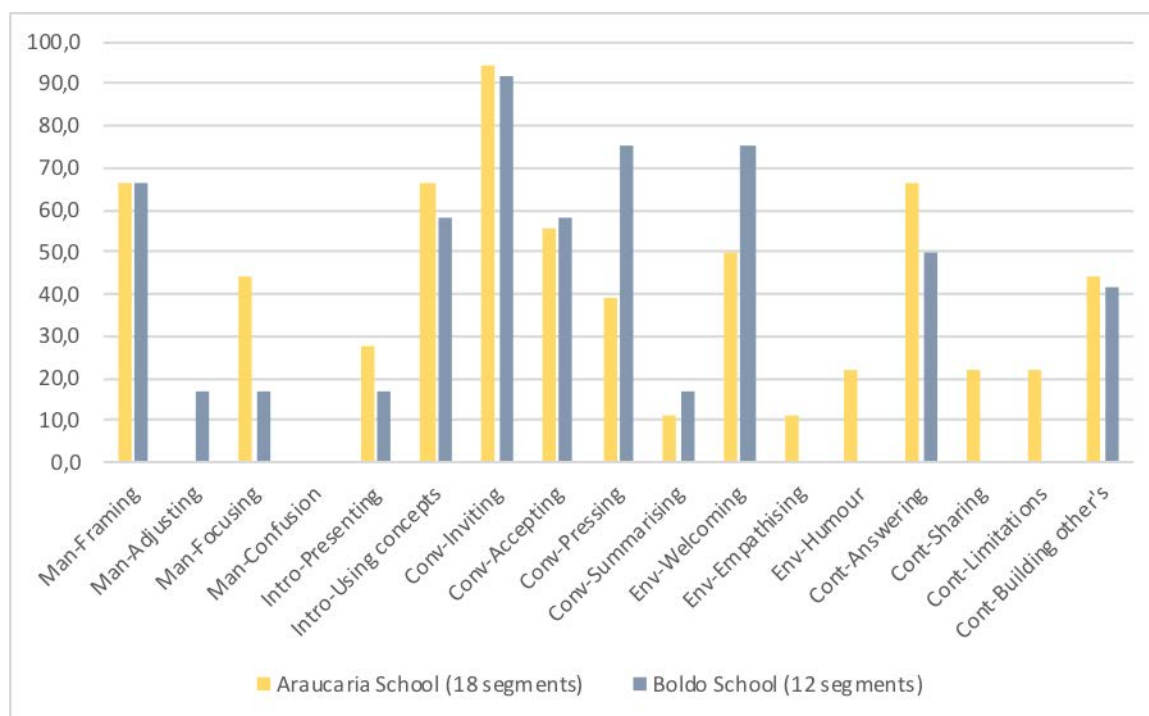
<sup>39</sup> The low frequencies observed in Boldo make the use of a bar chart inappropriate, and thus the observed results are only discussed in writing.



conversations (planned or spontaneous). This type of discussion was observed only in Araucaria School on 13 segments. This was mainly because they were common from Session 6 onwards, for which no Boldo School videos were available. But also, in Araucaria some semi-structured segments were observed in meetings 2 and 4, whereby after completing a proposed task the conversation became more open and deviated somewhat from the initial task<sup>40</sup>.

#### 6.3.3.4 Structured discussion segments

The more *structured tasks* offer a chance to contrast facilitators in the two schools (see Figure 6.10). In both contexts, they were active in managing the conversations and their contents (captured in the *guiding* functions), especially *framing*. In Araucaria, *focusing* the discussion was also common, whereby facilitators brought the conversation back on track after (slight) digressions. The *use of concepts* was the most common way in which facilitators *introduced contents*, which happened in the context of them sharing their own perspectives in a content-informed fashion (see Figure 6.12), and sometimes by clarifying their meaning or use.



**Figure 6.10. Facilitators' actions in structured discussion tasks**

Moving on to the *mediating* categories, *inviting participation* was the most common facilitator move, showing that they managed turns drawing more colleagues in. Otherwise, *accepting* and agreeing with participants' contributions was the second most common action in Araucaria, while

<sup>40</sup> Given that Boldo's earlier session recordings are incomplete, the fact that such semi-structured discussions are not present in the video does not imply necessarily that they did not take place at all.



P15-F in Boldo engaged more in *pressing* her peers through follow-up questions, challenges and invitations to engage with each other. The latter form of pressing was not observed in Araucaria, where follow-up questions seeking clarifications or extensions were more common. While pressing, P15-F also established a safe environment by frequently *welcoming participation*, showing support for her colleagues' engagement in the discussions. *Contributing as a peer*, this was more frequent in Araucaria school (83.3%) than Boldo (66.7%). *Building on others' contributions* and *sharing their own answers* to the tasks were common across schools. However, in Araucaria facilitators also tended to *share their own experiences* and *discuss limitations* of dialogue in their context, which were not observed in Boldo. Two meeting segments from Session 2 illustrating the same video-viewing task showcase some of the outlined differences between the schools.

### Different ways of mediating discussions in structured tasks (1)

#### **Example 1 - opening, accepting and pressing with follow-up questions**

*Having watched a video (1st grade - the birthday problem) for the third time and completed a written account, this time using a structured template, P10-F opens up the discussion*

**1. P10-F (invites all participants): what changed now with respect to what we did before?**

2. P13: I think we completed the steps with more awareness, I mean even the description was richer in detail, well, some of the factors are that we watched the video three times, we already knew what was coming, we added more detail maybe, we paid attention to things that were more relevant, which perhaps the first time around was not as meaningful (...)

**3. P10-F: did you (plural) manage to make honest questions and arrive at an interpretation?**

4. P13: Interpretation is the hardest bit

5. P12: I think I did

**6. P10-F: yeah**

7. P12: because one tends to fall into making judgements, but

**8. P10-F: Precisely! The questions, (to P12) (...) one or two of the questions that you came up with.**

9. P12: ok, how to make questions or comments that motivate kids to reflect? and what other motivating strategies could be used with this content in 1st grade?

**10. P10-F: ok, P13? (pause) and you (P12)... did you manage to find any answers?**

11. P12: uhm... clearly the use of manipulatives or audiovisual materials, through play

**12. P10-F: yeah (the conversation continues with P13's questions)**  
(School A, meeting 2, segment 27)



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**Figure 6.11. Excerpt: Facilitators' mediating structured discussions (example 1)**

In Figure 6.11, from Araucaria School, P10-F asks questions opening the floor to all participants and she accepts their answers (e.g. turns 6, 8 and 12). Following P12's comment she asks her to share her examples (turn 8), accepting them although they are not exactly what was intended (see Section 6.3.2.1.2). She then follows up again (turn 12), asking P12 if she found

answers to these questions, and accepting her response. This again is not an evidence-based description of the video, since P12 refers to what the teacher should have done instead of what she did. The conversation seems to happen between the facilitator and each participant in an additive manner and without participants reacting to each other's ideas, in what resembles cumulative talk (Mercer & Littleton, 2007).

### Different ways of mediating discussions in structured tasks (2)

#### **Example 2 - opening, accepting and pressing by inviting others and challenging**

They are re-watching a video (1st grade - the birthday problem) to practice making evidence-based descriptions. P15 stops the video and makes a description, modelling the kinds of aspects she could include and distinguishing it from judgement. She plays the video and participants continue writing. She then stops the video at a point where the teacher has just repeated what the question in the maths problem is, and says: Matias, if you ask for the floor I'll invite you to answer (short pause) Matias?

**1. P15-F: What questions could I ask the teacher here?**

2. P18: I posed a question here

3. P17: me too

**4. P15-F: ok, what questions did you (plural) ask?**

5. P18: did the teacher only give the floor to the best students?

6. P17: I put 'was the lesson prepared?'

7. P18: I said 'teacher, did you only give the floor to the best students so that they answered?'

**8. P15-F: Ok (not affirmative)**

9. PX: I put are all participants considered to participate in the lesson?

**10. P15-F: Ok (not affirmative), P16?**

11. P16: Why is she inducing Matias to answer?

**12. P15-F: P17, have you got one?**

13. P17: yeah, I put 'was the lesson prepared?'

**14. P15-F: I mean, there, this question, what connotation does it acquire?**

15. PV: judgement

16. P18: judgement

17. PV: no, no, the other way around

18. P18: a question... an honest question?

19. PV: no, no (1) no

**20. P15-F: I feel, I mean, that's just me, I don't know what your opinion is, that this is a judgement because if I ask the teacher, picture this: you and I are chatting 'did you prepare this lesson especially for the video recording?' how would the teacher feel?**

21. PV: we have to turn it around, the question

**22. P15-F: right, it needs to be transformed**

23. PV: yeah, it needs to be transformed

**24. P15-F: that's a judgement, it needs to be transformed. Do you think that it was necessary for this lesson to take things this way, so that it didn't look so prepared, I don't know perhaps, I can suggest so that it's not so evident, the way you nominate Matias, because you name him before starting...**

25. PV: yeah,

**26. P15-F: we need to transform judgements into ideas that are softer, like...**

27. P16: but, maybe, maybe at some point earlier [in the lesson] Matias wasn't given the floor

**28. P15-F: that's something we're interpreting, we don't know how that was because this is the middle of the lesson**

(she continues giving a definition of an honest question in response to a question from P17)

29. P18: what question would P17 have to ask to find out whether the lesson was prepared?

**30. P15-F: it's just that, obviously all lessons are prepared, that's why we plan them, there's no point in**

31. P18: (overlapping) there's no point in asking that

**32. P15-F: yeah, in this case.**

33. P18: now, why did she nominate Matias in this case?

**34. P15-F: let's see what we can find out (plays video again)**

(School B, meeting 4, segment 9)



Created by Shocho  
from Noun Project

Figure 6.12. Excerpt: Facilitators' mediating structured discussions (example 2)

In the second excerpt (see Figure 6.12), P15-F also starts by inviting participation. After a few answers have been shared, she presses participants to respond to P17's contribution asking them about the connotation of the question (turn 15), and later shares her own view that challenges the contribution by indicating it is judgemental. The conversation continues, and in turn 29, P18 asks how they could have formulated the question in a different way and P15-F responds by challenging that it can be posed as an honest question altogether. Throughout the segment she draws on the concept's definitions. The example shows how, in part prompted by the facilitator, participants are trying to grapple with these concepts, reacting to each other's ideas (turns 18, 19, 20, 29) and asking the facilitator questions (turns 29 and 33). These features make it more akin to exploratory talk in which ideas are put forward, justified and critiqued (Mercer & Littleton, 2007).

#### 6.3.3.5 *Semi-structured discussion segments*

Araucaria School's sessions included 11 segments with *semi-structured discussions*. Facilitators remained active in *framing* and *focusing*, and mainly in *inviting* their peers to contribute to the conversation (over 80% of segments). More so than in semi-structured discussions, they often *pressed* their peers to develop their own ideas, but not necessarily to react to others' contributions (54.5% of segments). *Establishing a safe environment* remained important and *empathising* appeared more relevant than in other activities. This was observed in 36.4% of segments when participants' videos and practices were being discussed and support was offered by indicating that struggles were shared and/or providing advice. *Contributing as peers* was even more common here than in other discussions, showing that they took part more symmetrically (90.9% of segments). Facilitators did this by *sharing their own experiences* of teaching as well as usually discussing their concerns about the *limitations* of dialogue.

Araucaria's participants often discussed *limitations of dialogue* in relation to aspects such as their classes being too numerous and/or difficult and the school and curricular goals clashing with dialogic practices, among other restrictions. However, in some cases this was balanced by the facilitators with comments praising the project's strategies and materials (part of *introducing contents*). The selected excerpts (see Figure 6.13) show how facilitators, and especially P14-F, focus on the TPD's potential and its limitations, coinciding with their peers (as in Example 2) but also contributing with their own thoughts about it (as in Example 1).



## Contributing by praising the TPD and stressing the limits of dialogue

### Example 1

After reading about negotiating and sustaining ground rules in the previous segment, P14 starts discussing the researcher's agenda and ideas about what mathematics teaching is like

1. P14-F: she [the researcher] formulates a hypothesis whereby she thinks that mathematics lessons, considering what's usually said, what's being said, are not... let's see, some videos were shown and in the videos
2. P10-F (interrupts): they are not based on dialogue
3. P14-F (continues): one gives them the answer because you haven't got the time, because you have a pile of activities to go through
4. P13: yes
5. P14-F: and perhaps it'd be best to go through the contents with only one exercise... let's say with the geometric figures, and you put the triangle, and you make only one shape on the board and from that triangle go through all the contents, as long as you've got enough time, so that it's the students themselves who discover, from the questions they pose, you follow up and probe and someone else adds and you construct learning. I think that in reality as teachers we fall in these ways [of teaching] say, how is the perimeter calculated? we know that the triangle is a-b-c until they don't say 'a+b+c' we're even punitive, but I think that happens to us because we're running against the clock here
6. P10-F: that's what I was going to say, there are all these LOs and contents that we've got to deliver, so we don't really stop to...
7. P14-F: this session tells us how to conduct our practices in a good class environment  
*The discussion continues for a few minutes, focusing on how much silence is necessary in a dialogic lesson versus the expectations at the school of classes being completely quiet*
8. P14-F: the school leaders and I were discussing the other day about these materials being marvellous, fantastic, for the teacher evaluation, but what doesn't fit in my view is... impulsiveness, how is that accounted for here? when you've got in your classroom a mass of... if you have 37-38 students that are all different and that cannot self-regulate and are just not capable
9. P11 (interrupts): yes
10. P14-F: I mean I ask them 'can you control your self?' they say 'yes' 'ok, then, come back' but happens when I'm with a group and go to the next one and I'm on my own in the classroom and they... because between them there's no respect, we'd have to start by educating that first.  
*The discussion continues for a few more minutes. (School A, meeting 4, segment 4)*



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### Example 2

*They are commenting on what they gained from observing their videos in the previous session, and the strategies that they could implement next (only loosely based on the TPD proposals). P13 has an idea about starting the lesson from a broad topic and arriving at the learning objectives through students' contributions. All participants develop the idea and P13 says this is difficult because as teachers they tend to be directive instead of being a mediator. P14 responds.*

P14-F: the thing is that one comes with previous training, and it's very hard to shake it off, especially when you've been working for so many years, which puts a weight on your shoulders, and you've been working on those lines, you see? Only nowadays this is being implemented... and what I found really great, I found it fantastic and I loved being able to observe you (...) I think that's what I appreciate the most about this work, honestly, having seen you (plural) on video.

*P14 continues the discussion inviting P11 to comment on her previously shown lesson.  
(School A, session 9, segment 4)*

Figure 6.13. Excerpts: potential and limits of the TPD in unstructured discussions

## 6.4 DISCUSSION

### 6.4.1 Methodological considerations and study limitations

The detailed analysis of the TPD meetings opened a window into the design put into practice. With an original sample of four schools at the beginning of the study, the initial plan was to examine this data source only in one of the schools due to time restrictions. The inclusion of two schools has proven important to understand aspects that can vary across settings, which can inform the design of induction and support processes for TPD implemented by local leaders, crucial when scaling up (Borko, 2004). Even with its limited data set, the inclusion of Boldo's meetings was highly informative and relevant differences with Araucaria School could be delineated.

The analytical choices made carry advantages and drawbacks as well. With regards to the corpus I decided to analyse videos rather than working from transcripts. This was due to the lack of time or resources to produce transcriptions in the first place. In this case, I produced written accounts of the selected segments to proceed with analysis, since they could be examined side by side to generate themes (as opposed to video). Moving away from the original data in this way posed risks of misrepresentation and misinterpretation, thus threatening internal validity (Cohen et al., 2011). Nonetheless, I mitigated this through constant comparison, frequently revisiting the video segments and the written accounts (Taylor et al., 2015). When using transcriptions alone analysts may be less prone to revisit videos, and thus working with transcriptions and videos simultaneously was likely to be the best combination, keeping the analysis detailed and close to the data. In addition, I included a phase of researcher triangulation (as detailed in Section 6.2.3.6), reviewing the consistency of themes and their match with video exemplars to increase internal validity (Creswell & Miller, 2000).

A further analytic strategy which would have been of great value would be some form of respondent validity (Cohen et al., 2011), consulting with facilitators themselves about their actions. Beyond validation, this would have permitted higher-inference categories to result from analysis, tapping into facilitators' motivations, intentions and difficulties. Interestingly, an under-discussed aspect of many expert facilitation studies is that they are usually part of the analysis team, so that their point of view is available throughout (e.g. van Es et al., 2014).

Given the relative novelty of the design and analysis there were not many available tools or coding frameworks to draw on, with Asterhan and Babichenko (2019) and Borko et al. (2014) being notable exceptions but appearing unsuitable. I thus decided to employ thematic analysis (Braun & Clarke, 2006) which allowed for the combination of an inductive logic, by creating

themes from the data, and a deductive logic, by using an existing coding scheme to segment the videos and applying themes previously drawn from interviews in Study 1.

The convergence between participants' perceptions of facilitators' actions (as described in 5) and the analysis of their videos in this chapter is a significant result, offering validation through triangulation between datasets and analytical processes (Creswell & Miller, 2000). This is an important strength of multi-method research (Symonds & Gorard, 2010; Teddlie & Tashakkori, 2008). Now, the meeting analysis provided a level of detail as well as an external perspective on facilitators' actions that cannot be expected from interview analysis, warranting the need for the present study to be conducted in the first place. Since the research question focused on facilitators rather than other participants, and on their actions and strategies rather than the contents of the sessions, these aspects were not prioritised in the analysis. Their consideration would undoubtedly add further insights into the affordances of the identified facilitators' actions and their potential for learning.

## 6.4.2 Key dimensions of expert and peer facilitation

The literature on TPD facilitation focuses for the most part on retrospective examination of expert facilitators' actions, seeking to account for what appear to be more productive forms of conversation. It should come as no surprise that many of these findings – e.g. the importance of scaffolding evidence-based discussions or the centrality of a trusting environment – can be linked to aspects of dialogic teaching in the schooling context, since they both focus on what Zhang et al. (2011) term 'learner-centred discourse'. In an attempt to systematise productive features of discourse in community-based TPD that are conditions learning, Asterhan and Babichenko (2019) propose three overarching dimensions: *participation* and interactivity, *inquiry into each other's ideas*, and *content* (discussions about teachers, students, subject matter contents, and their interactions). The way in which facilitators' actions might have supported each of these aspects is examined next.

### 6.4.2.1 Facilitating participation and engagement

Considering the study results, the category *establishing the learning environment* and its themes reflected this aspect of facilitators' actions. These were found especially in the discussion-based tasks, where they *welcomed participation*, sometimes *showed empathy* and, in Araucaria School, used *humour* and emphasised *confidentiality*. Thus, facilitators seemed apt in generating a positive learning environment for their peers. These themes overlap with facilitation categories in expert-led programmes, such as joking, providing positive feedback, offering support (Zhang et al., 2011) and validating participants' ideas (van Es et al., 2014). Furthermore, an environment of

cordiality and collaboration was observable in participants' willingness to contribute as required and share their own practices with others. Similarly, establishing such a supporting environment has been found as one of the more manageable aspects for researcher facilitators (Alles et al., 2019) and facilitators who were educators (Borko et al., 2014).

In addition, Zhang et al. (2011) consider facilitators *sharing* their own experiences as part of building a community. However, this was the case in an expert-led context, in which disclosure can be seen to harness a sense of symmetry. While this has been considered as a goal in expert-led contexts (Sherin & Han, 2004), it should be understood differently in peer-led settings. For once, peer-facilitators inevitably need to distance themselves from their peers to some degree to manage the learning context, and dealing with this new position of authority is not without challenges (Segal et al., 2018). Indeed, P10-F in Araucaria School responded to this new distance through humour.

More importantly, in this case, the TPD programme was meant as a development instance for facilitators as well, who just like their peers needed to participate in discourse to advance their learning. Thus, here *sharing own views* and *building on other's ideas* are part of facilitators *participating as peers*, although they lacked the occasional feedback that they were able to provide for their colleagues. Another aspect was that facilitators in Araucaria school regularly joined their peers in talking through the multiple *limitations* that their context imposed on dialogic teaching, which is not usually expected from an external expert. However, exploring the possibilities and limitations in participants' own realities can be seen as an important aspect of learning new teaching practices and changing existing aspects of local culture (as long as it does not become paralysing), which facilitators would need to experience. Going back and forth between roles was not always seamless. The most telling example is that in Araucaria School, facilitators (especially P14-F) were active in mediating discussions about their peers' videos. However, when the time came to present their videos, P14-F dominated the conversation about hers completely, instead of P10-F taking the lead. When P10-F's video was observed, there was so little time left that they exchanged a few words between facilitators and moved on. The importance of these aspects of facilitators as learners in harnessing productive discussions and learning of all involved needs to be explored further.

#### 6.4.2.2 *Facilitating inquiry discourse*

The second aspect highlighted by Asterhan and Babichenko (2019) is a discourse of inquiry into each other's practice. This dimension has been explored in detail in different TPD contexts, such as video clubs and problem-based cycles (van Es et al., 2014). The *mediating conversations* theme captures some of the productive discourse features, with facilitators being observed

*inviting, accepting, pressing* and *summarising*. The fact that they engaged in a variety of mediating actions is encouraging and points to the potential of peers supporting rich discussions in a peer-led context. Nonetheless, not all actions were equally common, with *pressing* and *summarising* being less frequent.

Considering the TPD design, problems of practice were more likely to be discussed during observations of teachers' videos and open discussions. In such semi-structured discussion segments (Araucaria School only), facilitators were seen contributing with their own ideas (92% of segments) and accepting contributions (61% of segments) more often than they pressed others (54% of segments). In the structured discussions, Araucaria's facilitators maintained this trend (sharing in 77% of segments, accepting contributions in 54% and pressing in 35%). P15-F in Boldo School acted somewhat differently, pressing her colleagues on 75% of segments, whereas she contributed in only 50% (and accepted contributions in 42% of segments). She could be thus seen assuming a role that is closer to an expert facilitator's style.

The relatively infrequent use of *pressing* when mediating conversations is potentially problematic, since expert-led contexts have shown that this function is important in sustaining the group's inquiry stance and fostering the emergence of productive disagreements about problems of practice (Dobie & Anderson, 2015; van Es et al., 2014). On the other hand, it is hard to judge what an adequate frequency of challenge is in abstract, since as a function, pressing makes sense in a linguistic and interactional context, and pressing when there is no need for it would be pointless. Indeed, at least in classrooms it has been found that too much challenging will hinder the positive effects of other dialogic features (Howe et al., 2019). Therefore, this aspect would have to be studied further qualitatively.

#### 6.4.2.3 *Facilitating content-focused discussions*

The *content* of discussions was not the focus of this analysis. However, it is worth considering given its importance. Borko et al. (2014) pay attention to this aspect, assessing peer-facilitators' strategies in supporting teachers' discussions covering specialised content knowledge and pedagogical content knowledge (in selecting video clips and mediating related discussions). They find that facilitators struggled more with the knowledge aspects compared with their success in establishing a positive workshop culture. In this study, the relevant themes that emerged related to contents are *introducing contents*, as well as *mediating conversations*, especially the *pressing* aspect through which facilitators could challenge participants' contributions and shape the contents of discussions. Although in most cases P10-F, P14-F and P15-F put forward the intended concepts and ideas in these ways, they occasionally made mistakes (like the conceptual problems with descriptions and honest questions as video observation modes) or failed to



maintain a focus on the evidence from practice by letting the video-based discussions become too broad.

It is in examining this dimension that facilitators' knowledge comes to the fore. Beyond these specific cases of them making mistakes, a deeper question stands with regards to the depth of knowledge and understanding of the discussion goals that is desirable from peer facilitators in order to mediate productive discussions, and how this can be achieved. As is the case with mediating the (inquiry-based) conversations, promoting the discussion of certain contents requires that facilitators themselves understand and hold certain goals so that they can steer conversations accordingly. It appears that, instead, in these meetings, the more open discussion segments and the discussion of participants' own videos tended to be broad and facilitators became 'one of the bunch' as P14-F put it (see Section 5.3.2.2.1). It could be argued that the brief induction and light-touch support were insufficient, but Borko et al. (2014) spent 2½ years working with their teacher leaders (with decreasing support) and still found that they struggled with the knowledge aspects of facilitating discussions.

Therefore, it is worth considering whether it is reasonable or desirable to impose external expert facilitation criteria to the rather different setting of (novice) peer facilitation. In this debate, it is important to disentangle the expertise level from the professional background (researcher or educator versus schoolteacher), too. One way of addressing the problem is thinking that peer facilitation should resemble that of external experts as much as possible and prepare teachers accordingly. To some extent, this was the approach that I took in this study during the induction and in the built-in guidance, although the induction was short enough that expertise was not expected. Alternatively, the peer-led context could be seen as a different learning setting in its own right, which would lead us to see these learning and mediating processes in a different light. This position is probably closer to a sociocultural understanding of the situation considering how participants and peer facilitators already share established practices and norms.

Building on Lefstein and Snell (2011b), the problem could be framed in terms of different professional visions, that is, what ways of knowing and acting are more common to each profession. In this case, it would mean considering what local teachers can bring to the table instead of assuming the predominance of researchers' vision over that of teachers. From this study, potential advantages of teacher facilitation included their closeness to and knowledge of practice, and their ability to establish a symmetric learning environment, to name two that are highlighted in the literature. The predominance of these aspects in other peer-facilitated programmes as well as their potential to support teacher professional growth should be the focus of future research. A complementary approach could be to question whether the necessary

probes and challenges can come from a different source. Namely, future research could explore how materials could include tools (e.g. questions, sentence stems, criteria for observation, discussion protocols) that aimed at generating the kinds of questions and challenges that facilitators struggle to provoke. However, previous attempts have shown that appropriation of such discussion protocols is far from straightforward (Segal et al., 2018).

#### 6.4.2.4 *The invisibility and importance of management tasks*

An important aspect of the findings is overlooked by Asterhan and Babichenko's (2019) literature-driven domains of effective facilitation: The *managing tasks* theme with its functions. When managed by researchers who know the programme design and materials by heart, these actions are less visible and hardly ever discussed in the literature, but these results have shown that they should not be taken for granted. It was this aspect that was subject to the practical issues of design that can go astray, especially if they are overly complicated (Fullan, 2016). In this study instances of confusion about tasks were observed in Araucaria School, which made it necessary to repeat some activities wasting precious TPD time. The confusions experienced around materials indicated that facilitators did not have enough preparation time but can also signal that the guidelines or even the design itself might have been too intricate. Furthermore, there were no indications in the videos or interviews of facilitators actually relying on the built-in scaffolds for mediating the discussions that I included in their guidelines. Negotiating more preparation time would be advisable. Notwithstanding, even with more available time, the challenge remains to design tasks that are simpler to implement so that misunderstandings are minimised, while also rich and self-sustaining enough that their productiveness does not depend on an external and/or a seasoned leader.

During the meetings, facilitators engaged in different forms of management (*framing, adjusting, focusing, and sorting confusions*) to make activities possible, and these actions reclaimed their time and attention, while they helped them build their position as leaders instead of peers. The ways in which they enacted these functions also varied, with P15-F showing more ownership of activities and their goals than P14-F and P10-F, who usually relied on reading guidelines. It was through these actions that facilitators could be seen as beginning to differentiate themselves from their colleagues and assume a role of authority. This happened smoothly in both schools, but it is not difficult to envision that they could have been met with more resistance. Indeed, in anticipation of this, I included guidelines for facilitators to deal with difficult dynamics.

In this design, guidance was concentrated in facilitators' guidelines, but it is worth considering whether similar or complementary instructions could be included in participants' materials or booklets as well, to distribute this aspect of the role. Thus, the burden that

management involves, the confidence facilitators feel in carrying it out, and the different ways in which it can be enacted appear to be important elements in peer facilitation that deserve consideration.

## 6.5 CONCLUSIONS

The chapter provided a detailed examination of facilitators' actions in the meetings, that went beyond asserting that the programme was viable to show how it was implemented. It established that the majority of the learning tasks took place and was supported by rich peer facilitation. Some of facilitators' actions coincided with those of expert facilitators: establishing a learning environment, inviting participation and sustaining tasks. But, different from them, they were seen contributing to the conversation as peers and challenging their colleagues only on occasions (whereas this is one of the main actions of expert facilitators). The implications of these findings are further discussed in Chapter 9. The next results chapters focus on the programme's impact on target outcomes, including teachers' ability to notice dialogue and changes in their practices.

# 7 FINDINGS III: TEACHER NOTICING CLASSROOM DIALOGUE: EXPLORING THE CONCEPT AND TRACING TPD IMPACT

## 7.1 INTRODUCTION

Teacher noticing has been conceptualised in this study as a key aspect of teaching practice (see Section 2.3.1.2). It refers to what and how teachers attend to in their professional activity, highlighting certain phenomena and relegating others to the background amidst the complexities of classroom life. Some authors include a decision-making component (Sherin et al., 2011b), and situate it in teachers' research of their own practices (Mason, 2002). Noticing has been researched extensively in the context of video-based TPD, since videos open a window into classrooms while affording for re-plays and several observers to be present at once (Borko et al., 2008; Sherin, 2007). Furthermore, it has been emphasised that merely using classroom videos without harnessing noticing skills may not be as productive, making the inclusion of viewing guidelines, protocols or principles desirable (Borko et al., 2011).

Through video observation tasks and readings, Sessions 2 and 3 in the TPD built on the noticing literature and covered aspects of observational stance, emphasising evidence-based interpretations, and noticing focus, introducing key aspects of dialogue. The goal was to establish shared practices for reflective video observation during the TPD using unknown teachers' videos before moving on to observing participants' videos, which can be a threatening experience (Borko et al., 2008). The topic of noticing does not often feature in TPD for dialogic teaching, despite its reliance on classroom videos. In this programme, I considered that developing noticing skills focused on dialogue would be potentially beneficial to teachers' ability to engage in classroom dialogue in two complementary ways, stressed in the noticing literature (Sherin et al.,

2011b). First, through an increased awareness of aspects of classroom discourse that normally go unnoticed, and subsequently, by supporting in-the-moment decision-making, in this case, about classroom talk. Therefore, assessing what teachers noticed when observing videos before and after taking part in the programme was vital.

This chapter addresses *RQ2.1 Does the programme have an impact on teachers' noticing of classroom dialogue?* This was a measure of the programme's impact in outcomes that were directly addressed (Wayne et al., 2008) and assessed through pre-post measures of teachers' video observations. The analysis process is described in detail, given its novelty in the field.

## 7.2 DATA ANALYSIS

### 7.2.1 Data

As described in the Methodology chapter (see Section 3.3.2.2), participants were shown two short video clips from Chilean classrooms produced as part of a video-based pre-service teaching initiative (Martínez et al., 2016) and completed pre- and post-tests consisting of written video observation protocols in March and December 2017. The videos were chosen because they differed with regards to how dialogic they were, with Video 1 [hereon V1] being more dialogic than Video 2 [hereon V2]. Figure 7.1 contains a synthesis of each clip. The pre-test data included 18 teachers, nine that finished the TPD, and nine from Canelo School that dropped out. This resulted in the exclusion of their data. Therefore, pre-post responses of nine teachers formed the final corpus. Teachers' responses were fairly succinct, with a median wordcount of 161 words in total in the pre-test, and 148 in the post-test.

### Clip 1

3<sup>rd</sup> grade (8-9 year-olds) lesson, 6-minute clip

The lesson goal is written on the board and states 'solving problems that require multiplication and division'. Projected on the board there is a picture of a cardboard box and next to it 5 stacks of cans with 4 cans each. The task states 'A box can fit five cans. How many boxes are needed to store 65 cans?' At the start of the clip, the teacher asks who has come up with a possible solution. Three students share different strategies involving counting in fives, dividing by 4 and dividing by 13. With each student, the teacher asks further questions such as 'how did you come up with that strategy? How did you decide to divide by that number?'; to which the students answer, sometimes with extended explanations. With the second student who suggests dividing by 4, the teacher suggests reading the statement again and the student realises it should have been 5. The teacher then invites a few classmates to say which strategy they prefer and asks one of them to state the strategy in their own words. She then invites the class to develop the first strategy and they count in fives together, checking how this matches the question and writing ' $5 \times 13 = 65$ ' on the board. They then move on to the second student's strategy, which was dividing 65 by 5, for which she invites a student to the board. He solves it pictorially, drawing 5 groups and distributing 65 dots into the groups. While he is doing this and after he is finished, the teacher asks other students what the student is doing and then to predict how many dots will be in each group. They verify the answer together and she writes ' $65 : 5 = 13$ ' on the board.



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from Noun Project

### Clip 2

4<sup>th</sup> grade (9-10-year-olds, all boys class) 4-minute clip

The top left-hand side of the board states three things (1) revision perimeter (2) group work and (3) plenary. Throughout the clip, to invite students' contributions there is a hands-up policy and the teacher addresses most students by their last names (rather than their first names). The interactions are focused on three pictures that the teacher hangs successively at the board: a cross that has a length of measuring units written underneath, an oval with a measuring tape around it, and a square that indicates its sides are 9 cm long. The teacher asks a series of factual questions about these figures and their perimeter, such as what they are, kinds of lines they are formed of and how their perimeter could be calculated. Several students raise their hands after each question and she selects from them. Responses are usually one or two words and the teacher responds by accepting the answers and sometimes providing additional information (e.g. a student says they need to count the sides and the teacher replies 'we will only count the lines around the figure because we are working on perimeter, which is the sum of the?' students reply 'sides'). Interactions follow this logic with two exceptions. One is that when discussing the oval, two students' comments on the measurement instrument, naming other kinds (e.g. measuring rope and carpenter's measuring tape) and the teacher agrees, saying there are several kinds of measurement instruments. After this, a student asks what the oval represents, and the teacher says it is just any oval. The student replies he thought it was an island and the teacher responds 'I doubt there such perfectly shaped island could exist'.



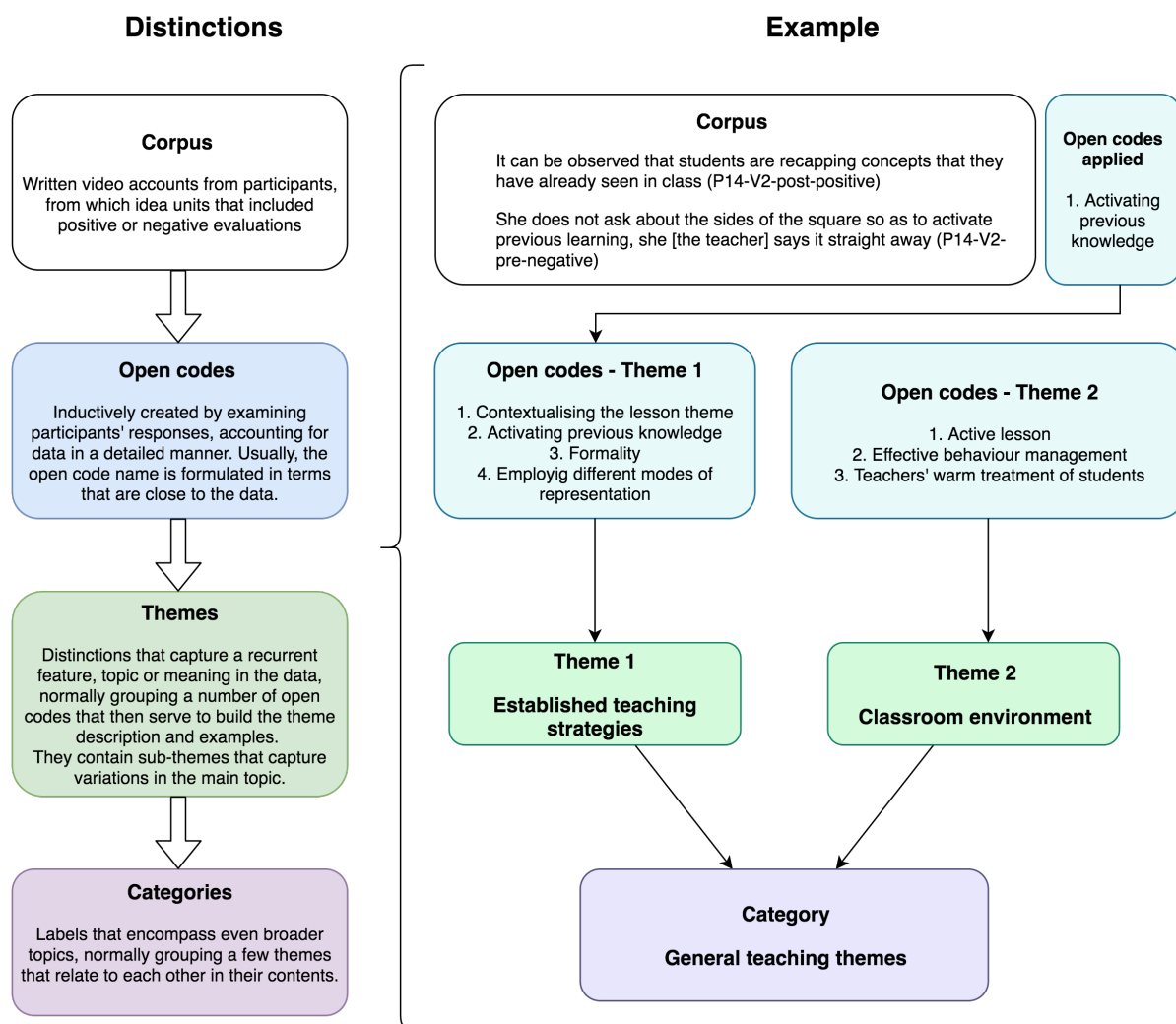
Created by glyph.faisalovers  
from Noun Project

Figure 7.1. Descriptions of the video clips employed

## 7.2.2 Analytic approach

Usual measures of noticing focus on teachers' accounts of students' mathematical thinking, for which there are well-established analytical categories (van Es & Sherin, 2008). These include

*focus* (stressing a shift from focusing on teachers and general pedagogy to focusing on students' mathematical thinking), *stance* (descriptions, interpretations and evaluations), and *specificity* (stressing more specific, evidence-based observations). Stockero & Rupnow (2017) distinguish three common forms of measuring, which typically employ the mentioned categories in some form: (a) categorisation of instances; (b) points or rating systems; (c) assessment against a framework or standard.



**Figure 7.2 Data analysis – distinctions and examples**

As established in Section 2.3.1.1, the construct's application to dialogic pedagogy is uncommon, with some exceptions (Grau et al., 2017; Lefstein & Snell, 2011b). Even then, authors draw on existing categories rather than proposing a dialogue-specific framework. In this study, by contrast, I intended to retain the focus on dialogue in the analysis, due to its importance in the TPD. Given the novelty of the analysis, an initial exploratory approach was considered necessary instead of the more structured existing alternatives.

Therefore, the initial phases of thematic analysis were employed and the process started with open coding, creating relevant categories that were then applied systematically (Braun & Clarke, 2006). Since the focus was on assessing changes pre and post, themes were later quantified and compared, following the logic of ‘categorisation of instances’ (Stockero & Rupnow, 2017). In sum, a sequential mixed methods strategy was employed, with thematic analysis followed by quantitative comparisons (Tashakkori & Teddlie, 1998). As with previous studies, Figure 7.2 depicts the main distinctions in thematic analysis and how they were employed in this study.

To ensure the quality of analysis, considering its fidelity to the data, comprehensiveness and depth (Cohen et al., 2011), I coded the whole of the dataset together with one of the research assistants. Joint coding and systematic checks were employed throughout the process, resolving differences through consensus. Rather than employing inter-rater reliability, this approach was chosen partly because we produced categories inductively and did not employ a pre-existing coding scheme that makes this strategy advisable (Hayes & Krippendorff, 2007). Additionally, larger datasets sometimes make reliable independent coding necessary (Stemler, 2004). Meanwhile, in this study it was feasible to jointly conduct the analytical phases.

### 7.2.3 Phases of analysis

#### 7.2.3.1 *Phase 1: Familiarisation and selection of analytic units*

The pre-test data from 18 participants were screened independently by the two coders to familiarise ourselves with the data, an important analytical step (Braun & Clarke, 2006). Through this, it became apparent that, as in previous studies, evaluative comments were found in the data (e.g. Muller et al., 2013). However, in previous studies, modes or stances of observation (usually distinguishing between description, evaluation and interpretation) are analysed separately from the topics addressed in the comments (van Es & Sherin, 2008). On the contrary, given that in this study the interest was in promoting a specific way of teaching, the *contents* of teacher noticing were of particular importance, more so than the relative presence of observational stances. That is, the fact that teachers highlighted certain aspects of classroom video in negative or positive light was taken as a sign of what they noticed *and* saw as valuable.

After determining the focus, the unit of analysis was defined as an ‘idea unit’ (van Es & Sherin, 2008): a series of words that ended when teachers changed the topic they were writing about, which could vary from a few words to a few sentences. In this case, idea units with evaluative character were selected. Answers to the two protocol questions were considered, given that both presented evaluative comments cases, and that teachers (especially in the pre-test) commented on topics broader than talk in response to the second (talk-specific) question.



**Table 7.1. Examples of evaluative comments**

Evaluation	Positive	Negative
<b>Explicit</b>	<p>‘the teacher is a facilitator of [students]’ learning’ (P16-V1-pre)</p> <p>‘[talk] goals are used to make all students participate in the classroom (P15-V1-post)</p>	<p>her tone of voice [the teacher’s] seems overbearing and lacks empathy’ (P12-V2-pre)</p> <p>‘The Lesson Goal cannot be observed (maybe she [the teacher] says it)’ (P18-V2-post)</p>
<b>Implicit</b>	<p>‘All the students were well-behaved and listened attentively to what the teacher said’ (P17-V1-pre)</p> <p>‘The teacher invites students to think of different solutions, receives and verbally repeats all the contributions, then she charts [their answers] and listens to each of the solutions and shares the strategies provided by the students’ (P14-V1-post)</p>	<p>‘the ‘circle’ that is used in the example is actually an oval’ (P10-V2-pre)</p> <p>‘The teacher presents an image and she is the one who talks so that students finish the [her] idea’ (P14-V2-post)</p>

In examining idea units to select those with evaluative character, four categories were created to reflect the direction of the evaluation and different degrees of explicitness. Namely, *Explicit evaluations* contained positive or negative language (mainly adjectives or adverbs) or signalled the absence of certain features. *Implicit evaluations* were defined as either (a) ideas referred to the teacher had an evaluative connotation in the context of the response or of the TPD topics, or (b) evaluative ideas referred to students, in which teachers’ qualities or actions could be inferred (see examples in Table 7.1). These categories drew in part on a previous noticing of metacognition and self-regulation that we conducted in Chile (Preiss, Grau, et al., 2015).

The research assistant and I jointly read each response and selected ideas according to each category. At this point, some ideas were considered ‘non-evaluative’ (e.g. ‘[the teacher] chooses two ideas and uses them with the whole class’ (P13-V1-pre); ‘[the teacher] Presents geometric figures and their characteristics’ (P11-V2-post) and discarded from further analysis. The research assistant then conducted a first check, collating evaluative comments and ensuring correct classification.

### 7.2.3.2 Phase 2: Open coding and drafting codes

The selected evaluative comments were re-read and open coding was employed to capture the topics of teachers’ evaluations (Cohen et al., 2011). These ideas came from positive and negative evaluations, but codes were named in positive terms, considering we were building an image of ‘valued’ teaching. For instance, the second example in Figure 7.2 was coded *Activating*

*previous knowledge* because it implies that teachers should indeed do this through questions. The process resulted in 33 initial codes and all selected evaluative ideas were jointly coded. After this round, the research assistant conducted a second check to ensure systematicity in coding. Minor issues were identified, discussed and solved through agreement. Phases 1 and 2 were first conducted with the pre-test data and repeated when the post-test responses were collected.

#### 7.2.3.3 Phase 3: Consolidating codes

The list of themes was adjusted and finalised after analysing post-test responses. Because nine teachers dropped out after the pre-test, four codes that had appeared only in their responses were dropped. Additionally, in the post-test we observed some ideas that had not appeared before, creating eight new codes. Other existing codes appeared to overlap or were very infrequent, which led to refining and merging some of them (Braun & Clarke, 2006). After these adjustments, a final list of 27 codes was obtained. I conducted a second round of checks to apply the new and revised codes to the pre-test data and ensure their systematic use throughout the dataset. Again, identified issues were discussed and resolved through consensus.

#### 7.2.3.4 Phase 4: Grouping codes into themes

To synthesise the 27 codes, I looked for links creating eight overarching themes, which were then checked by the research assistant. She suggested one change (moving *Mistakes as learning opportunities* from Student-dialogue to Teacher-dialogue). We then grouped the themes, according to their focus, into *General teaching themes* and *Dialogue-focused themes*.

#### 7.2.3.5 Phase 5: Quantifying coding to conduct statistical analyses

Finally, coding was transferred to Excel sheets to obtain frequencies (see coding matrices in Appendix 17). Previous studies have assessed changes in professional vision by comparing the pre-post shifts in all participants' aggregate percentage of responses per category (van Es & Sherin, 2008). Nonetheless, the total number of codes that was applied to the responses of each teacher varied substantially (from five to 17) and considering responses aggregately could have led to overrepresenting some teachers. To represent them fairly, pre- and post- percentages were calculated for each code and teacher taking as 100% the total number of codes applied to each participant's responses across the two videos, separately for pre-post responses.

Comparisons were conducted examining raw frequencies and percentages. Given the small sample size, non-parametric tests were considered appropriate, and Related Samples Wilcoxon Signed Rank tests - the alternative to dependent samples t-test - were conducted on SPSS v25. This test focuses on median differences in two related or paired samples. Thus, descriptive statistics are reported in terms of median and median differences.

## 7.3 RESULTS

### 7.3.1 What did teachers notice and write about the videos?

#### 7.3.1.1 Categories and themes noticed by teachers

The eight themes are described and exemplified on the section's tables. When writing about the two videos, teachers referred to aspects of dialogue as well as to other elements of the observed lessons, which is expected given that there are many potentially salient features of teaching that could be evaluated.

##### 7.3.1.1.1 Themes related to general teaching

There are three themes grouped as *General teaching*, containing a total of 10 lower-level codes, and that signal the aspects of practice that teachers valued that were not directly related to dialogic teaching but had the centrality of the teacher and her authority as a common theme.

The first, *Teacher as authority* (see Table 7.2), refers to elements that have in common the view that the teacher is meant to exert authority in the classroom, both in terms of communication (consider use of voice) and the contents (clarity and authoritative role).

**Table 7.2. Theme G.1 Teacher as authority**

G.1. <b>Teacher as authority:</b> evaluations that emphasise the teacher's authority as the figure possessing and transmitting knowledge		
Code	Example – positive	Example - negative
<b>1. Teacher clarity</b> - Refers to teacher's precision in delivering contents and/or explanations	I liked it (...) she was clear in expressing ideas (P18-V1-pre)	For children who are concrete the scheme representing the cans is not clear, it should depict the 65 cans arranged in groups with 5 units each. (P10-V1-pre)
<b>2. Adequate use of voice</b> - Different aspects of teacher's voice such as tone, modulation or pronunciation	The teacher uses a good tone of voice (P15-V1-post)	The teacher speaks too quickly and has a poor modulation, it is not possible to understand her explanations (P18-V2-pre)
<b>3. Teacher's authoritative role</b> - Mentions of teacher's role as a voice that can be a source of knowledge, also emphasising the use of vocabulary	The teacher leads [students] to learning using an adequate vocabulary to explain and solve the proposed [mathematical] problem. (P11-V1-pre)	The students use mathematical vocabulary, which is sometimes correct and sometimes incorrect, but the teacher does not link the two uses (...) (P15-V1-pre)

Table 7.3 shows the *Classroom environment* theme, that focuses on the lesson working climate, commenting on the adequacy of behaviour management and level of interactivity, which relates to whether lesson environment makes teaching possible at all. They paint a picture which is centred on formal aspects of managing the classroom and where the teacher’s role is central and were thus not consider specifically dialogic. They include agile interactions framed by questioning or tasks, where the students are characterised as being ‘active’, and the climate should be orderly, marked by students’ attentiveness. Interestingly, the Theme *Teacher’s warm treatment of students* was only alluded to by participants when they found it lacking.

**Table 7.3. Theme G.2 Classroom environment**

G.2. <b>Classroom environment</b> (teacher-led): codes related to the working climate in the classroom, emphasising aspects related to behaviour and the form of interactions and the role of the teacher		
Code	Example – positive	Example - negative
<b>4. Active lesson</b> – Valuing the amount and/or form of participation in the lesson, considering the teacher or students. The accent is on students being active, stressing the format of interaction, rather than commenting on the quality or aims of such participation.	[There is] a lot of student participation (most of them raise their hands) (P10-V2-post)	This is a lecture-style lesson with scarce student participation (P13-V2-pre)
<b>5. Effective behaviour management</b> - Refers to teacher’s ability to manage students’ conduct and establish a positive classroom environment	She succeeds in making students pay attention to the lesson (P11-V1-pre)	The students are distracted and do not pay attention (P16-V2-pre)
<b>6. Teacher’s warm treatment of students</b> - References to the way in which the teacher conducts herself with the students, especially with regards to being warm	--	The [teacher’s] treatment of students is cold, addressing them by their last name (P15-V2-post)

*Established teaching strategies* (see Table 7.4) contains aspects of teaching that are seen as ‘good practice’, such as contextualising the lesson theme and linking it to students’ everyday knowledge or activating previous knowledge. As with other themes in *General teaching*, these strategies tend to be teacher-led and they do not relate to or rely on dialogue. Given their ‘good practice’ quality, it is of interest that themes 7 and 9 only appear in negative form, that is, teachers commented on these topics only to flag their absence.

**Table 7.4. Theme G.3 Established teaching strategies**

G.3. Established teaching strategies: aspects of teaching or instructional strategies that are deemed ‘best practices’		
Code	Example – positive	Example - negative
<b>7. Contextualising the lesson theme</b> - The teacher tries to link the lesson theme with students’ everyday experiences	--	There was a lack of connection between the content (perimeter) and students’ everyday life experiences (P15-V2-pre)
<b>8. Activating previous knowledge</b> - Refers to recapping with students about content that has been previously learnt, especially in the beginning of the lesson	It can be observed that students are recapping concepts that they have already seen in class (P14-V2-post)	She does not ask about the sides of the square so as to activate previous learning, she [the teacher] says it straight away (P14-V2-pre)
<b>9. Formality</b> - Elements of the lesson structure or organisation that are considered key.	--	The lesson objective was not written on the board (P17-V2-pre)
<b>10. Employing different modes of representation</b> - Refers to using a variety of representations to depict mathematical situations, specially concerning the concrete, pictorial and abstract	To solve [the problem] they employ diverse resources, both concrete and abstract (P18-V1-pre)	The explanation of the sequence counting with her fingers, [doing it] mentally and out loud is fine, but she should have used graphic representations or manipulatives to make it more concrete and help children who struggle (P10-V1-pre)

### 7.3.1.1.2 Themes related to dialogue

The five *Dialogue* themes and their 17 lower-level codes relate to diverse aspects of dialogic pedagogy and its application in mathematics. Four of the five categories and most of the codes already appeared in the pre-test responses, showing that at least some teachers made evaluations focusing on aspects that can be linked to classroom dialogue and its promotion.

*Dialogue participants* captures comments that focus on dialogue (or lack thereof) emphasising if this is a teacher-student exchange or between students (Table 7.5). Although this aspect might seem basic, noticing and evaluating whether teacher-student and student-student interactions are taking place and favouring dialogue can be thought of as a steppingstone for promoting richer learning interactions.

**Table 7.5. Theme D.1 Dialogue participants**

D.1 Dialogue participants: mentions of how dialogue is organised, emphasising who takes part		
Codes	Example – positive	Example - negative
11. Dialogue between teacher and students	The teacher addresses the proposed [mathematical] situation through a dialogue with her students (P17-V1-post)	Dialogue is scarce, given that the teacher is lecturing and giving the answers herself (P12-V2-post)
12. Dialogue between students	(...) [answers employing different strategies] are discussed among the students, checking the results (P18-V1-post)	There is little interaction between students (P10-V1-post)

Two themes focus on participants' roles and actions in promoting and sustaining interactions that relate to dialogue, from the teacher's and the students' standpoint. The former (*Promoting dialogue – teacher's role* on Table 7.6) includes four codes. One of them refers to the role that the teacher can assume to promote dialogue (Teacher as monitor/facilitator) and the other three refer to productive forms in which the teacher can deal with students' ideas (inquiring, treating mistakes as opportunities for learning and building on students' ideas).

**Table 7.6. Theme D.2 Generating dialogue - teacher's role**

D.2 <b>Generating dialogue - teacher's role:</b> references to sustaining classroom dialogue from the standpoint of the teacher and his/her actions		
Code	Example – positive	Example - negative
<p><b>13. Teacher's role as mediator/facilitator -</b> Evaluations of teachers' actions centred on students' learning, emphasising a mediating and supportive role that allows students to be protagonists</p>	<p>The teacher facilitates learning (...) writes down different solutions (...) is always positive and facilitating (P16-V1-pre)</p>	<p>The teacher steers students to the answers she wants to hear (...) she is the one who speaks and leads the lesson (P17-V2-post)</p>
<p><b>14. Mistakes as learning opportunities –</b> Teachers' acceptance and use of students' errors as part of the learning process</p>	<p>Students participate actively, without fearing to make mistakes because the teacher does not punish them for their answers (P16-V1-pre)</p>	<p>The ideas the teacher selects are the correct ones, dismissing the wrong answers (P13-V1-pre)</p>
<p><b>15. Exploring students' ideas -</b> The teacher follows-up a student's contributions, probing or enquiring further</p>	<p>[the teacher] enquires about the problem-solving strategies that students propose (P14-V1-post)</p>	<p>She does not follow-up after the student [shares his] doubts regarding measurement instruments (P13-V2-post)</p>
<p><b>16. Teacher building on students' ideas -</b> The interaction is driven by students' contributions, which the teacher elaborates or draws on to continue the dialogue and help students' understanding</p>	<p>She [the teacher] does not propose the answers, but works and systematises [the answers] based on students' suggestions (P12-V1-post)</p>	<p>When students ask about other things, measuring instruments, she does not build on the topic as a learning opportunity, it is apparent that she wants to get back on track immediately (P13-V2-post)</p>

Table 7.7 shows the theme D3, which relates to teachers' and pupils' actions that are centred around the latter. Three of them reflect conditions for student participation (17, 18 and 20), whereas the *Promoting students' agency* focuses on promoting children's active role in thinking and expressing their ideas.

**Table 7.7. Theme D.3 Generating dialogue - students' role**

D.3 <b>Generating dialogue - students' role:</b> references to sustaining classroom dialogue in terms of student involvement in it, including how the teacher enables their agency to take part		
Codes	Example – positive	Example - negative
<b>17. Promoting inclusive participation</b> - Efforts (or their results) to include all students, in terms of drawing more students into the dialogue, listening to a broad range of perspectives or including specific groups of students that may otherwise be marginalised	All the [students'] reflections are listened to and she probes the problem-solving strategies provided by the students (P14-V1-post)	The same students participate over and over (P15-V2-post)
<b>18. Opening up space for students</b> - Relates to allowing time and room for students to express their ideas and genuinely listening to them	The teacher opens up space for students to participate, commenting and 'exploring' the proposed solutions (P12-V1-post)	Students try to find alternative solutions, but they are not listened to (P16-V2-post)
<b>19. Students' agency</b> - References to the promotion or expression of students' autonomous and self-driven thinking	The teacher facilitates learning (...) Students, meanwhile, participate by creating problem-solving strategies (P11-V1-pre)	There is student participation, but this is driven by the teacher, [it is] not really autonomous (P13-V2-post)
<b>20. Respect among students</b> - Positive attitudes among students that facilitate their involvement in dialogue	They [students] do not discredit each other (P12-V1-post)	[Need to] develop or promote tolerance and patience among children (P12-V1-pre)



A fourth dialogue theme is called *Talk tools* (see Table 7.8) and comprises two codes that explicitly mention the strategies to promote dialogue that were part of the TPD and appeared in the reading “Dialogic teaching: goals and tools” (see Chapter 4). Specifically, one of the codes relates to employing strategies for managing turn-taking, and the other one includes references to talk goals and tools (Chapin et al., 2009). The latter only appeared in positive terms.

**Table 7.8. Theme D.4 Talk tools**

D.4 <b>Talk tools</b> : references to tools that promote dialogue and inclusive participation		
Code	Example – positive	Example - negative
<b>21. Strategies for turn-taking -</b> Techniques to manage the floor that were part of the TPD programme (e.g. using lolly sticks to avoiding self-selection)	On some occasions [participation] is not voluntary but randomly determined, giving an opportunity to those that do not get involved (P12-V1-post)	There is no strategy regarding participation, it is just [left to] chance (P15-V2-post)
<b>22. Goals and tools for dialogue -</b> Specific aims and strategies proposed by Chapin et al, (2009)	[the teacher] gives those who participate thinking time and time to and reply (P15-V1-post)	--

The fifth and final theme displayed in Table 7.9 – *Oral mathematics* – reflects evaluative ideas that are specific to, or have a particular flavour in, dialogue in mathematics teaching. Two of the codes depict how tasks are approached, suggesting public and open-ended aspects of mathematical activity (encouraging different ways to solve a problem and jointly checking results). *Withholding evaluation* focuses on the teacher avoiding stating whether answers are right or wrong, which can support the former two aspects of mathematical activity by sustaining rather than shutting down discussion. Two further codes reflect specifically on students’ part in mathematical discourse (students’ justifications and peer support in mathematics).

**Table 7.9. Theme D.5 Oral mathematics**

D.5 Oral mathematics: aspects of dialogue that relate to mathematical discourse, with a degree of subject specificity		
Code	Example – positive	Example - negative
<b>23. Promoting various ways of solving problems</b> - Highlights interactions focused on exploring, comparing and/or valuing the different alternatives that students propose in response to a mathematical task	Strategies are shown side by side and compared at the board, proving that both lead to the right solution (P14-V1-post)	(...) the teacher gives all the answers [about] what things are and how they are done, and she only offers one way of solving [the calculation] (P16-V2-post)
<b>24. Students' justifications</b> - Focuses on going beyond the solution and focusing on students' accounts of their reasoning and arguments	She asks for explanations (...) the students are not afraid to explain, they are capable of analysing the solutions' (P16-V1-post)	I am missing the question "why?" [to students] (P12-V1-pre)
<b>25. Teacher withholds evaluation</b> - Relates to the teacher avoiding the assessment of students' responses to avoid shutting down the interaction	[the teacher] does not reject any of the answers, nor accept any of the [proposed] results (P16-V1-post)	She modifies [students' answers] or hints that students' answers are wrong (P12-V2-post)
<b>26. Peer support in mathematics</b> - emphasises students' joint mathematical thinking	[students] support one another in search for a solution (P15-V1-post)	--
<b>27. Jointly checking results</b> - refers to examining collectively whether a given strategy and/or solution is correct	The students write the suggested answers on the board, that is, peers check or verify if the calculations are done correctly (P17-V1-post)	The teacher leads students to the answers she wants to hear. Responses are not checked, no calculations are performed (P17-V2-post, negative)

*7.3.1.2 Distribution of teachers' ideas across themes and codes*

The identified themes and codes show the variety of aspects that teachers noticed when observing and evaluating the selected video clips. However, the themes were not evenly identified across test instances, direction of evaluations or videos, nor did all the teachers notice the same topics. Table 7.10 and Table 7.11 depict the distribution of teachers' comments across themes and codes in the pre- and post-test. It is noteworthy that all teachers noticed at least some aspect of *dialogue* and of *general teaching* in the pre and post-tests. To give an overview of the presence of each code, the frequency of themes by all participants was added together, and the percentage out

of the total number of codes applied across teachers was calculated (72 codes in the pre-test and 109 in the post-test). Additionally, the number of teachers that noticed each code is included in the right-hand side, providing a sense of the breadth of the theme across participants.

**Table 7.10. Pre-post distribution of General teaching themes**

Themes and codes	Aggregate frequency across participants		N° of teachers (N=9)	
	pre	post	pre	post
<b>G.1 Teacher as authority</b>	<b>11 (15%)</b>	<b>6 (6%)</b>	5	4
1. Teacher clarity	4	2	3	2
2. Adequate use of voice	5	2	4	2
3. Teacher's authoritative role	2	2	2	1
<b>G.2 Classroom Environment</b>	<b>13 (18%)</b>	<b>11 (10%)</b>	7	5
4. Active lesson	6	5	4	4
5. Effective behaviour management	4	4	3	3
6. Teacher's warm treatment of students	3	2	3	1
<b>G.3 Established Teaching Strategies</b>	<b>9 (13%)</b>	<b>6 (6%)</b>	7	3
7. Contextualising the lesson theme	3	0	3	0
8. Activating previous knowledge	1	3	1	2
9. Formality	2	1	2	1
10. Employing different modes of representation	3	2	3	2
<b>Overall – General teaching</b>	<b>33 (46%)</b>	<b>23 (21%)</b>	9	9

Examining the General teaching themes, it can be seen that *Classroom Environment* was the most frequent and widespread theme across tests, especially code 4. This theme reflects participants' interest in the lesson climate being appropriate for teaching, without necessarily focusing on the quality or content of the interactions. The fact that the majority of teachers commented on this aspect, which might seem basic, could relate to the difficulties that teachers face with establishing such a working climate in the classroom in the country.

Considering the *Dialogue* categories, mentions of D.1 *Dialogue participants* became more prominent after the programme, especially for Code 11, shifting from none to six teachers pre-post. This is positive considering this was the focus of the TPD over and above student-student dialogue (Code 12). Something similar happened – although to a lesser degree – with D.4 *Talk tools*: in the post-test three teachers identified and commented on aspects of the videos mentioning strategies that came from the TPD materials.

D.2 focuses on *teacher's role in promoting dialogue* and the most frequent code pre- and post-test was *Teacher as a mediator/facilitator*, showing that teachers remained attentive to teachers' place in shaping classroom interactions. *Teacher building on students' ideas*, appeared only at the end of the

programme. This is especially relevant for dialogic teaching, depicting an action that shifts the focus to students' thinking, by noticing it and developing it further. The relative frequency of D.3 *Students' role in promoting dialogue* increased too. Specifically, Code 18 *Opening up space* was the most common across instances, indicating the importance participants assigned to the instances in which students were (or not) given a chance to express their ideas. This relates to establishing a dialogic ethos whereby students feel that their ideas are welcome.

**Table 7.11. Pre-post distribution of Dialogue themes**

Themes and codes	Aggregate frequency across participants		N° of teachers	
	pre	post	pre	post
<b>D.1 Dialogue Participants</b>	<b>3 (4%)</b>	<b>13 (12%)</b>	<b>2</b>	<b>6</b>
11. Dialogue between teacher and students	0	9	0	6
12. Dialogue between students	3	4	2	2
<b>D.2 Promoting Dialogue - Teacher</b>	<b>16 (22%)</b>	<b>18 (17%)</b>	<b>7</b>	<b>7</b>
13. Teacher's role as mediator/facilitator	8	9	5	7
14. Mistakes as learning opportunities	5	1	4	1
15. Exploring students' ideas	3	2	3	2
16. Teacher building on students' ideas	0	6	0	4
<b>D.3 Promoting Dialogue - Student</b>	<b>16 (22%)</b>	<b>28 (27%)</b>	<b>7</b>	<b>8</b>
17. Promoting inclusive participation	3	6	3	4
18. Opening up space for students	7	12	5	6
19. Students' agency	4	8	4	6
20. Respect among students	2	2	1	1
<b>D.4 Talk Tools</b>	<b>0 (0%)</b>	<b>5 (5%)</b>	<b>0</b>	<b>3</b>
21. Strategies for turn-taking	0	2	0	2
22. Goals and tools for dialogue	0	3	0	2
<b>D.5 Oral Mathematics</b>	<b>4 (6%)</b>	<b>22 (20%)</b>	<b>3</b>	<b>8</b>
23. Promoting various ways of solving problems	2	6	2	6
24. Students' justifications	1	3	1	2
25. Teacher withholds evaluation	1	6	1	3
26. Peer support in mathematics	0	1	0	1
27. Checking results	0	6	0	4
<b>Overall - Dialogue themes</b>	<b>39 (54%)</b>	<b>86 (79%)</b>	<b>9</b>	<b>9</b>

D.5 *Oral mathematics* was rarely mentioned in the pre-test and a stark increase in the post-test was observed, which points to teachers noticing and evaluating subject-specific aspects of dialogue. This is really significant, given the TPD's proposed links between general and subject-specific aspects of dialogue. After the programme, participants focused especially on three codes:

23 and 27, which refer to how the mathematical tasks can be managed differently to make the mathematical activity more public and the thinking processes visible. The third one was Code 25 (*teacher withholds evaluation*), which highlights an aspect of teacher discourse that can facilitate dialogue.

### 7.3.2 Changes in teacher focus: what did teachers notice before and after the TPD?

Teachers attended to a wide range of aspects when writing about the chosen video clips. Hence, an important question is if they noticed or focused more on certain aspects of these clips before taking part in the project and how this changed. Using participants' raw frequencies and percentages as outlined in Section 7.2, Related Samples Wilcoxon Signed Rank tests were conducted on SPSS v25 to examine each category.

General variables that aggregate all responses and General versus Dialogue themes showed some important shifts. Firstly, all teachers increased their number of codes, with a median difference of 4 from the pre-test ( $Mdn= 8$ ) to the post-test ( $Mdn= 12$ ,  $z= 2.670$ ,  $p= .008$ ). This was accounted for by a significant increase in the number of themes focused on *Dialogue*, with a median difference of 5 codes ( $Mdn\ pre\text{-}test= 3$ ,  $Mdn\ post\text{-}test= 9$ ,  $z= 2.558$ ,  $p= .011$ ), while *General teaching* remains constant ( $Mdn\ pre\text{-}test= 4$ ,  $Mdn\ post\text{-}test= 3$ ,  $Mdn\ difference= -1$ ,  $z= -1.360$ ,  $p= .174$ ). Hence, it is not that teachers stopped noticing and evaluating other aspects of the videos that were relevant to them: they continued to do so while substantially increasing the aspects of dialogue they identified and comment on.

Examining the themes in more detail, two aspects of dialogue increased significantly (see Table 7.12). These are D.1 *Dialogue Participants*, with a median difference frequency of 1 and of 5%, with five teachers showing positive differences, and D.5 *Oral mathematics*, also with a median difference of 1, and of 9%, with eight out of the nine participants showing a positive difference. Additionally, the percentage of teachers' codes corresponding to G.3 *Established teaching strategies* decreased significantly, with a median difference of -7% and six teachers reducing their mentions of this theme.

These shifts were highly positive considering the TPD focus, showing that in the post-test teachers often started their commentary by establishing the observed arrangement of participants (oftentimes mentioning the presence of teacher-student dialogue and the absence of dialogue between students). They then depicted specific aspects of talk, mainly referred to mathematics. The increase in the overall number of mentions of *Promoting dialogue – students' role* (from 16 to 28) was not significant when comparing individuals' coding pre-post. This may be explained by the

distribution of differences: while five teachers increased their mentions of the topic, three remained the same and one decreased.

**Table 7.12. Pre-post teachers' observations of each category**

Number of codes (N = 9)	pre		post		comparison		
	min-max	Median	min-max	Median	Median difference	$\zeta$	$p$
G.1 Teacher as authority	0-3	1	0-2	0	0	-1.289	0.197
G.2 Classroom Environment	0-3	1	0-3	1	0	-0.259	0.796
G.3 Established Teaching Strategy	0-2	1	0-3	0	0	-1.000	0.317
D.1 Dialogue Participants	0-2	0	0-4	1	1	2.06	0.039*
D.2 Promoting Dialogue - Teacher	0-5	1	0-4	2	-1	0.184	0.854
D.3 Promoting Dialogue - Student	0-4	2	0-8	3	1	1.687	0.092
D.4 Talk Tools	0-0	0	0-3	0	0	1.633	0.102
D.5 Oral Mathematics	0-2	0	0-7	2	1	2.588	0.010*

Percentage of codes (N = 9)	pre		post		comparison		
	min-max	Median	min-max	Median	Median difference	$\zeta$	$p$
G.1 Teacher as authority	0-50	20	0-33	0	0	-1.753	0.08
G.2 Classroom Environment	0-38	20	0-50	10	-8	-0.772	0.44
G.3 Established Teaching Strategy	0-29	13	0-27	0	-7	-2.036	0.042*
D.1 Dialogue Participants	0-17	0	0-36	8	5	1.992	0.046*
D.2 Promoting Dialogue - Teacher	0-50	20	0-31	14	-17	-1.007	0.314
D.3 Promoting Dialogue - Student	0-43	25	0-47	27	10	0.059	0.953
D.4 Talk Tools	0-0	0	0-20	0	0	1.604	0.109
D.5 Oral Mathematics	0-17	0	0-50	17	9	2.524	0.012*

### 7.3.3 Observations of Video 1 and Video 2: how did teachers react to different teaching practices?

The purpose of choosing two videoclips showing different practices in relation to dialogue was to establish how teachers reacted to them, on what grounds, and whether these impressions changed after the TPD. To assess this, pre-post comparisons were conducted for each video, comparing the frequencies and percentages of comments that teachers made in each test. The median number of codes in the pre-test was 4 for V1 (50% of codes) and 3 for V2 (50% of codes). In the post-test, the median for V1 was 7 codes (62% of codes) and for V2 it was 4 codes (38% of codes).

Examining the coding distribution across positive and negative evaluations, two relevant pre-post differences emerged, as shown in Table 7.13. In V1, the median difference in the number of positive comments focusing on *Dialogue* themes was 5, which represents a significant increase in the median number of codes (the percentage of comments, in turn, came close to

significance with a median difference of 34%). Indeed, all but one of the teachers increased their number of such comments. For V2, in turn, there was a significant decrease in the percentage of Other-negative codes with a median difference of -17% and seven teachers showing a negative difference (the decrease in frequency came close to significance). Additionally, the difference of negative comments focused on Dialogue came close to significance.

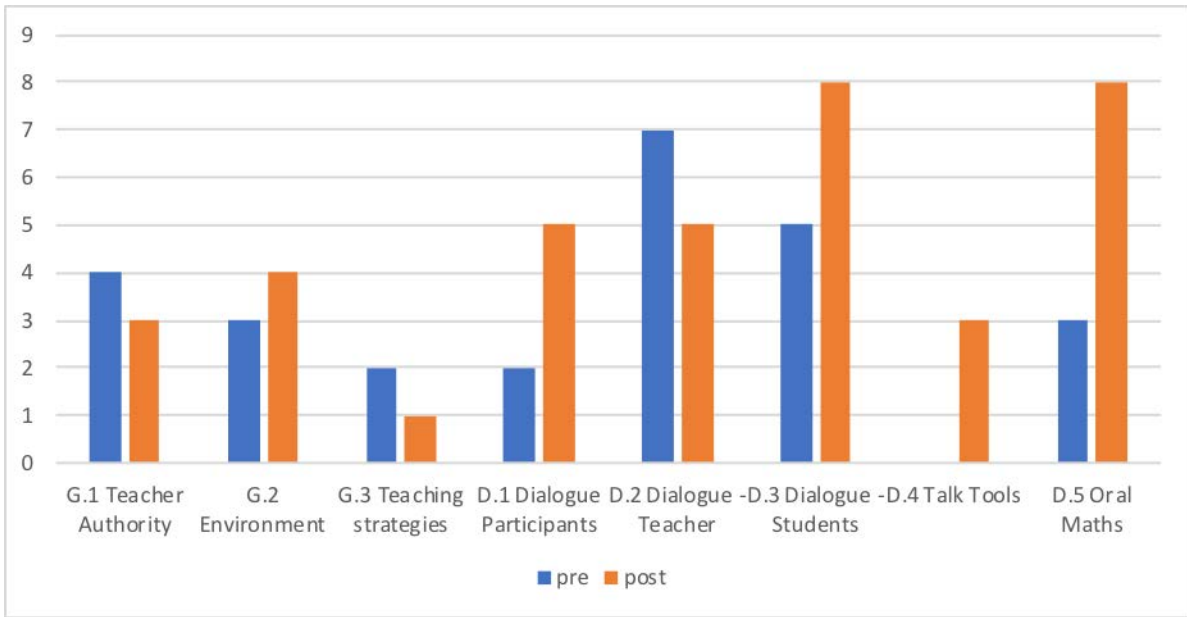
**Table 7.13. Teachers' pre-post observations of each video**

Number of codes (N = 9)	pre			post		comparison		
	Video	min-max	Median	min-max	Median	Median difference	$\zeta$	$p$
General - positive	1	0-3	1	0-3	1	0	-0.322	0.748
General - negative	1	0-2	0	0-1	0	0	-1.732	0.083
Dialogue - positive	1	0-3	2	1-13	6	5	1.374	0.018*
Dialogue - negative	1	0-4	0	0-3	0	0	-1.095	0.273
Other - positive	2	0-2	0	0-3	0	0	1.414	0.157
Other - negative	2	0-3	2	0-3	0	-2	-1.869	0.062
Dialogue - positive	2	0-0	0	0-1	0	0	1.000	0.317
Dialogue - negative	2	0-5	1	0-9	3	2	1.916	0.055

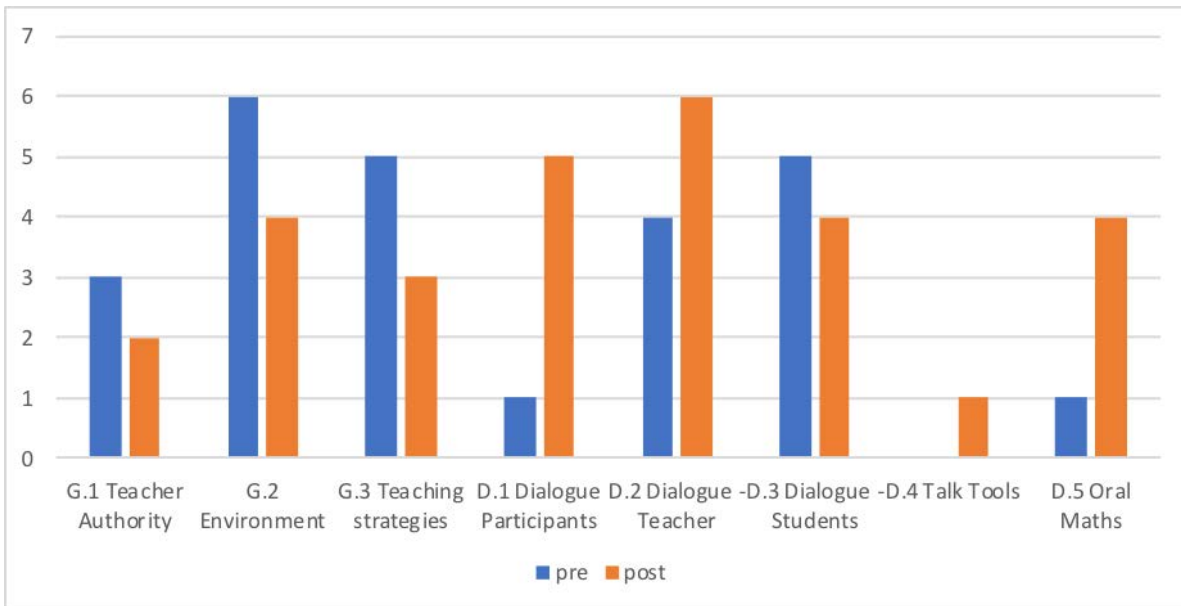
Percentage of codes (N = 9)	pre			post		comparison		
	Video	min-max	Median	min-max	Median	Median difference	$\zeta$	$p$
General - positive	1	0-50	17	0-50	7	0	-0.734	0.463
General - negative	1	0-25	0	0-9	0	0	-1.604	0.109
Dialogue - positive	1	0-60	20	9-76	50	34	1.955	0.051
Dialogue - negative	1	0-40	0	0-27	0	0	-1.095	0.273
General - positive	2	0-25	0	0-33	0	0	1.335	0.176
General - negative	2	0-50	17	0-30	0	-17	-2.243	0.025*
Dialogue - positive	2	0-0	0	0-9	0	0	1.000	0.317
Dialogue - negative	2	0-43	17	0-64	24	8	1.183	0.273

Overall, these results indicate that evaluations for V1 became more focused on dialogue with comments that evaluated this positively, and in the case of V2, less focused on other aspects. These changes were in the intended direction, considering V1 had been chosen because it featured aspects of dialogue and the opposite was true for V2. Furthermore, looking across categories in the pre-test, the assigned codes were distributed across general and dialogue-focused positive evaluations of V1 and negative evaluations of V2. This was no longer the case in the post-test, where two categories concentrated most of the comments: positive comments about elements of Dialogue in V1 ( $Mdn= 50\%$ ), and negative evaluations focused on Dialogue in V2 ( $Mdn= 27\%$ ). This shift suggests that teachers came to identify more aspects of dialogue after the TPD and focused an important part of their writing on positive features of dialogue in V1.



**Figure 7.3. Number of teachers noticing each theme in Video 1 (N = 9)**

To provide a sense of how teachers' mentions of the categories spread across videos and in time, Figure 7.3 and Figure 7.4 depict the number of teachers whose responses were coded with them (regardless of the coding frequency). It is apparent that the observed shifts concentrated in: V1 regarding Oral mathematics, and also D.3 and D.1. Smaller but similar shifts were observed in V2 for D.1 and D.5, but not for D.3.



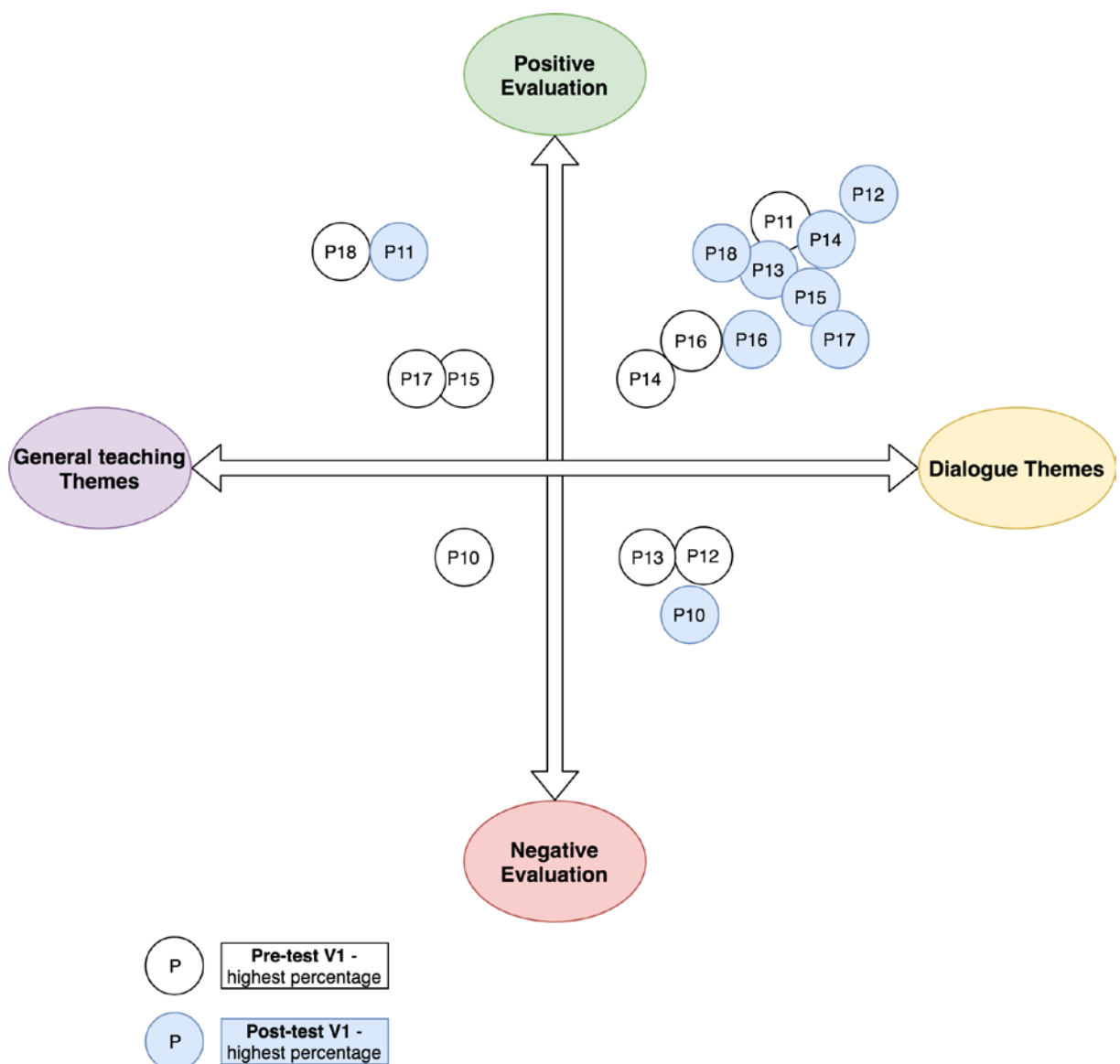
**Figure 7.4. Number of teachers noticing each category in Video 2 (N = 9)**



### 7.3.4 How did individual teachers shift their views on the Videos?

The median differences show the overall trend among participants. To assess individual trajectories, participants' highest percentage of codes for each video was identified in the pre and post-test and located along the two considered dimensions: focus on Dialogue versus General themes and positive versus negative evaluations. The four resulting quadrants resulting were depicted and participants' locations charted, with the distance from the origin signalling the magnitude of the percentage<sup>41</sup>. Note that desired direction of change would be towards the Dialogue-positive quadrant in V1 and towards Dialogue-negative in V2.

#### 7.3.4.1 Video 1: positive shifts in evaluation and focus



**Figure 7.5 Participants' perceptions of Video 1 (pre-post)**

<sup>41</sup> Equal percentages were found in V2 for P12, who had 17 per cent of her initial comments coded as Dialogue-negative and 17 per cent as Other-negative. The participant's location was thus represented on the axis.

Focusing on the pre-test (white dots on the charts), Figure 7.5 shows that participants were spread across all quadrants, although only three teachers had a mostly negative evaluation of the video (P10 focusing on General teaching and P12 and P13 on Dialogue). Meanwhile, the majority of participants had a favourable view, three of them even focusing on dialogic aspects (P11, P14 and P16).

The post-test reflects important changes in the desired direction: aside from P14-F and 16, who remained in the same quadrant, another five teachers had the highest proportion of codes applied to V1 in the Dialogue-positive quadrant. Two teachers were exceptions. First, P10-F, who did not have a favourable view of the video in the beginning, maintained the negative evaluation but now focused on dialogue. Second, P11 had a positive initial evaluation focusing on dialogue in the beginning, mentioning *teachers' and students' role in dialogue* (D.2 and D.3) and an emphasis in participation and agency. In the post-test, she came to be more focused on General teaching, mentioning *classroom climate* and *teacher's authority* while maintaining a positive view.

#### 7.3.4.2 Video 2: positive trend with some exceptions

Teachers' perceptions about this video painted a less clear picture. When examining Figure 7.6, it can be seen that in the pre-test eight teachers had a predominantly negative evaluation of the video. Among them, four focused on General themes, three paid more attention to aspects of Dialogue, and P12 focused both on Dialogue and General aspects to make negative comments. One teacher had a positive view focused on General themes (P11). In the post-test, the majority followed the expected trend: two teachers remained in the Dialogue-negative quadrant (P13 and P16), while P12, P15-F and P17 moved into it.

Three teachers behaved differently: two of them were the same outliers as with V1. First, P11 remained in the Positive-Other themes quadrant in the pre and post-tests, mentioning aspects of Classroom environment (active participation) in both instances. Second, P10-F focused more on General teaching themes in both instances, with her pre-test focusing on negative evaluations of the *Teacher as authority* and mentioning teachers' lack of empathy (part of *Classroom environment*). The post-test contained more positive evaluations of *Active teaching* (also part of *Classroom environment*), and *Established teaching strategies*. Finally, P14-F was an interesting case, because she shifted from the intended Negative-Dialogue quadrant, where she mentioned teachers' and students' roles in the pre-test, to the Positive-General one. In her final video protocol, she focused on positive aspects of *established strategies* while still providing a negative evaluation of teachers' role in dialogue.

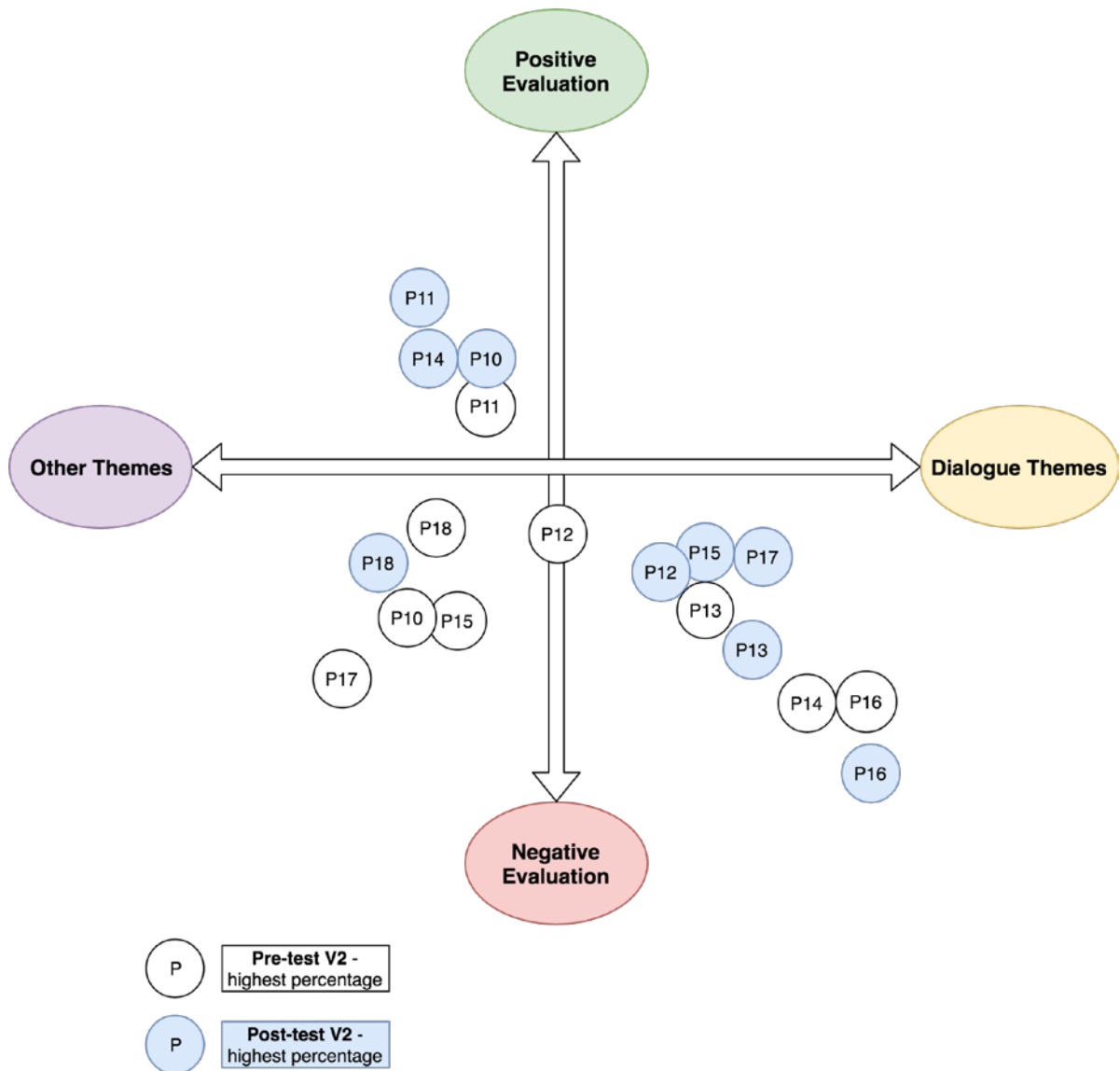


Figure 7.6 Participants' perceptions of Video 2 (pre-post)

## 7.4 DISCUSSION

### 7.4.1 Methodological considerations and study limitations

The design of this study and the mixed methods analysis produced rich information about teachers' noticing of classroom dialogue. The video observation and written response technique focusing on noticing students' (mathematical) thinking had proved useful in the past (Jacobs, 2017). However, the topics of noticing and professional vision are usually absent from dialogic teaching TPD programmes, and this study contributes by exploring the applicability of noticing measures in this field, which had not been considered in the past.

There are methodological limitations that are worth considering. Regarding the procedures, while it is common for noticing studies to use the same videos in pre-post measures to maximise comparability, this means that in the final data collection participants will have seen the clips. This could facilitate noticing more or different aspects. Previous studies have not encountered such issues with reusing clips, especially if measures are months apart (van Es & Sherin, 2008). In turn, the written-response format is common and was successful in producing responses, but it has known shortcomings (Stockero & Rupnow, 2017). Indeed, some participants gave rather short responses, thus providing limited evidence. More importantly, there was no chance to probe their answers, which could have been beneficial to extend and clarify teachers' responses, reducing to some extent the uncertainty of the interpretations in the analysis of potentially ambiguous statements. The inclusion of two coders and constant checks was a response to this problem.

A further limitation came from the small number of participants, which was an unfortunate result of sample attrition, although studies of noticing with similar numbers of participants are not uncommon (e.g. Stockero & Rupnow, 2017). The richness afforded by employing mixed methods and multiple representations of the data allowed to answer the research question about impact on teacher noticing (Symonds & Gorard, 2010; Tashakkori & Teddlie, 1998). Notwithstanding, a more established noticing dialogue framework would benefit from including more participants and other school subjects (Nickerson et al., 2017).

The novelty of the measure to dialogic teaching and its application in Chile as an understudied context generated some challenges that are akin to those found by Nickerson et al. (2017), who considered secondary mathematics teacher noticing in the USA as a relatively underexplored context compared to primary. They experienced difficulties regarding the availability of videoed practices featuring examples of students' thinking. In this project, the same was experienced with respect to examples of dialogic whole-class teaching. However, the existing book and videos by Martínez and colleagues (2016) provided excellent examples which, although not originally produced to feature dialogue, demonstrated authentic local practices. It was fortunate that such examples had been developed in Chile to support teacher development, but availability of more video exemplars of dialogic interactions across subjects would be beneficial.

Two further challenges identified by Nickerson and colleagues (2017) are the lack of interpretive frameworks to gauge levels of expertise and the relative absence of more experienced noticing in the secondary mathematics teaching population, creating the need to document learning trajectories and endpoints. These issues also emerged in applying the ideas of noticing to dialogic teaching. Addressing them required a number of decisions about data analysis that were novel in the noticing literature and are discussed in what follows.

With regards to the analytical focus, instead of employing an existing noticing framework, I decided to build categories anew and considered their relationship to dialogic teaching in mathematics. This made the qualitative phase of analysis more extensive and detailed than is usual in noticing studies (e.g. Teuscher et al., 2017), following the guidelines of thematic analysis rather than the customary content analysis (Braun & Clarke, 2006).

Moving from the initial codes to the more overarching themes already considered whether the themes could be interpreted as being aligned with dialogic pedagogy (in the programme context) or just signalled more general teaching practices. Thus, classification combined inductive and deductive, literature-driven criteria, as is usually the case in thematic analysis (Braun & Clarke, 2006). It could be argued that the codes could have been organised in a number of different themes, which made the transparency of the category-building process and the illustration of emerging themes a necessity. This was especially so since the theme level was considered when moving onto the quantitative phase. The themes proposed in this study could serve as a starting point for a framework focused on noticing dialogue, contributing to the literature by addressing the second challenge outlined by Nickerson et al. (2017).

Of special interest in this sense is the fact that teachers in this study noticed subject-general and subject-specific aspects of dialogue, as well as general aspects of teaching. Therefore, exploring noticing measures of dialogue in other subjects and establishing differences and commonalities is a logical next step. Similar to what was found here, noticing studies in the context of mathematics teaching also identify subject general aspects including pedagogy and classroom environment, which are part of participants' 'default' focus and are expected to change (e.g. Santagata & Angelici, 2010; van Es & Sherin, 2008). However, their intended direction of change is towards subject specificity, specifically increasing teacher noticing of students' mathematical ideas. In the case of dialogic teaching, and as the results of this research suggest, the study of noticing is likely to value a balance between the subject-general and subject-specific aspects of dialogue (see Chapter 2).

A further consideration regarding the outlined challenges (Nickerson et al., 2017) is that, in this case, the aspect of observation stance typical of noticing-focused TPD was not directly adopted. Oftentimes, such studies classify teachers' stance as descriptive, interpretive or evaluative, stressing descriptions and interpretations as key to evidence-based reflection (e.g. Santagata & Angelici, 2010). In this case, and given that the TPD had a different goal, after examining teachers' responses through thematic analysis, evaluation was considered a key aspect in participants' noticing, representing their attention and understanding and especially their *positioning* towards the targeted innovative pedagogical approach. This is another way in which this

study was unique, and the merits of focusing on evaluation when promoting a form of teaching should be confirmed by further research.

Finally, this analysis combined aspects of noticing that are usually assessed in parallel by charting change in the observational foci separately from the observation stance use of evidence (Muller et al., 2013; van Es & Sherin, 2008). Instead, I considered the observational stance (positive and negative evaluations) together with its contents (what was being evaluated, synthesised in themes) and with the context of observation (i.e. each video). This approach offered a more integrated and nuanced picture of teachers' reactions and how these views may have changed in time. As shown in this chapter, these decisions proved fruitful in documenting teacher noticing and its shifts.

#### 7.4.2 Enriching teacher noticing through dialogue-focused TPD

Considering the emerging themes noticed by participants, *General teaching* themes were prominent in the pre-test, especially regarding classroom environment. The salience of this aspect of classroom life for participants not only featured while observing others. It will be seen in Chapter 8 that this was an important aspect in teachers' videoed lessons as well as their interviews. In fact, negative classroom climate reportedly affected teachers' adoption of dialogic practices. Aside from mentions of *General teaching*, it is of interest that a substantial number of the codes in the pre-test already fell into the *Dialogue* themes category. The initial focus was mainly on teachers' and students' roles that could be conducive to dialogue, especially the teacher as a facilitator and opening up space for students, each mentioned by five teachers. This indicates that at least some aspects of dialogic teaching were visible and appealing for participants before engaging in the project.

These initial aspects of noticing may have created a fertile soil for promoting more specific aspects of dialogue. Considering what these themes pointed to, both had a student-centred flavour to them and stressed the role of the teacher in securing space for students to be involved, without necessarily indicating what the specific aims or contents of this participation are. This initial positive attitude towards more student-centred teaching may have a correlate in evidence from teaching practices in the country. In previous observational studies we have found that teachers tend to promote student participation without necessarily exploiting these instances to generate more cognitively-demanding interactions (Preiss et al., 2014, 2018). More widely, and as discussed in Chapter 2, interactivity alone has been considered a surface feature of dialogic teaching which is valuable in the context of other dimensions such as norms that support participation and relationships that sustain inclusive and critical discussions (Calcagni & Lago, 2018; Kim & Wilkinson, 2019).

In the post-test, all participants still mentioned *General teaching* themes indicating that they continued to notice and value aspects of practice with a more teacher-centred perspective. This appeared to be a part of their professional expertise, which this project aimed to enrich, not replace, as argued by Lefstein and Snell (2011b). In the *Dialogue* categories, teachers often mentioned themes related to space for students to contribute in a lesson. However, they added more specific comments regarding aspects of organising dialogue and its occurrence in mathematics, indicating a significant shift in the intended direction. The Oral mathematics category deserves attention, in that it captured many of the aspects related to reform-oriented mathematics teaching discussed in Chapter 2. In it, making students' thinking visible and the importance of collective thinking and justifications in subject-specific discourse are promoted (Ball, 1991; Chazan & Ball, 1999; Schonfeld, 2011). On the one hand, these aspects are harnessed by aspects of talk which closely link to dialogic teaching, as the theme and codes illustrated. On the other, they link to debates about what the discipline of mathematics is, and arguably align with sociocultural views of the subject (Alrø & Skovsmose, 2002; Sfard, 2008).

The emergence of the *Talk tools* theme in the post-test is noteworthy, however, only three teachers mentioned this theme. This might have been because they did not observe Talk tools in the videos, but they could have written about the absence of the topic, like they did with other negative evaluations. Thus, it is more likely that teachers did not appropriate this kind of technical vocabulary enough to apply it in new settings.

Regarding observations of each video, changes were observed for most teachers in the intended directions for V1 and V2. Considering the teachers that did not align with the trend, it is worth noting how these results may have interacted with the way in which video observation was treated in the corresponding TPD sessions (see Chapter 4). Teachers were encouraged to moderate their tendency to pass overly-critical and unfounded judgements, which has been observed in other video-observation contexts (Hammer & van Zee, 2006). On the contrary, focusing on evidence present in the video and posing questions, interpretations and sometimes evaluations were promoted. Additionally, they worked on focusing on aspects of dialogue while observing video, refining their focus. One possible interpretation of clearer positive shift for V1 than V2 is that the desired direction for V1 (Dialogue-positive) was easier for teachers to engage in because it involved identifying target practices while complying with the 'avoiding (negative) judgement' mandate. V2 might have been more challenging, since the desired trend (Dialogue-negative) involved moving beyond 'avoiding judgement' to feeling comfortable producing evidence-based evaluations of the non-dialogic character of the interactions. Considering that teachers P10-F, P11 and P14-F fall in the Positive-General teaching quadrant for V2-post, it may be that they preferred to be appreciative of positive non-dialogic aspects rather than engaging in

what they might have felt was unfair criticism of a videoed colleague. Both videos came, after all, from a platform that showcased these as good teaching practices.

## 7.5 CONCLUSIONS

To summarise, this chapter illustrated the successful application of teacher noticing measurement in the context of dialogic teaching. Employing well-established data collection techniques and a novel analytical process and focus, the study maps aspects of teacher noticing as a key component of teachers' domain of practice (D. Clarke & Hollingsworth, 2002). It showed that they attended to diverse features of teaching, some of which relate to dialogue. The qualitative results were then quantified and contrasted employing non-parametric tests that revealed a number of differences in the desired direction. Thus, after a year of involvement in the project, the teachers more readily noticed and reacted favourably to aspects of dialogue, specifically related to teacher-student dialogue and of subject-specific aspects of dialogue.

These results are even more relevant considering the domains of teacher professional growth (D. Clarke & Hollingsworth, 2002). Anticipated links included that directly promoting noticing of dialogue (an external stimulus) could impact on participants' noticing, situated in the domain of professional experimentation. Furthermore, such noticing would be enriched by changes in teachers' knowledge and beliefs about classroom dialogue (personal domain) also promoted in the TPD, which could be seen in the shifts towards specific aspects of dialogic teaching. These changes in teachers' noticing could, in turn, contribute to dialogic teaching becoming part of their practices, while also helping them identify students' ideas which could have a positive impact in the domain of salient outcomes. The next chapter examines whether such practices and observed outcomes did indeed change after teachers' involvement in the TPD.



# 8 FINDINGS IV: IMPACT OF THE TEACHER PROFESSIONAL DEVELOPMENT PROGRAMME ON TEACHERS' PRACTICES AND UNDERSTANDING

## 8.1 INTRODUCTION

### 8.1.1 Promoting dialogic teaching

Dialogic teaching has been conceptualised in this work as multi-layered, including interrelated aspects of classroom teaching and learning, the way that teachers design instruction and how they view learning situations. This relates to a broader understanding of teacher growth as complex and means that assessing progress in dialogic pedagogy should include a range of evidence of professional practice (Opfer & Pedder, 2011).

The previous chapter showed that, after taking part in the project, teachers demonstrated an increased and more refined attention towards classroom talk, which was identified as a step to support teachers' engagement in dialogue. This study entered participants' classrooms as it dealt with changes in practice after taking part in the TPD to answer two subsidiary questions of RQ2: 2.2 *Does the programme have an impact on participants' teaching practices with regards to dialogue?* and 2.3 *What are teachers' understandings of dialogue after taking part in the programme?*

Employing a convergent mixed methods design, parallel quantitative and qualitative strands were developed and brought together in the interpretation phase (Guetterman et al., 2017). The quantitative strand comprised pre-post comparisons of teachers' and students' engagement in classroom dialogue in a pre-experimental design without a control group or randomisation (Cohen et al., 2011). The qualitative strand focused on teachers' perceptions, understanding of dialogue and self-reported change through individual interviews. These served to triangulate the observations while expanding the realm of examined impact outside the classroom. Interviews and videoed lessons are considered informative and potentially valid forms of researching TPD (Desimone, 2009).

Participants were the nine teachers that completed the programme in two schools, and one more teacher that became involved in the second semester of the TPD and was interviewed at the end (P19, Boldo School). The analysis, rationale and results are described with regards to each dataset in the following sections and the integration between strands is done in the discussion.

## 8.2 DATA ANALYSIS

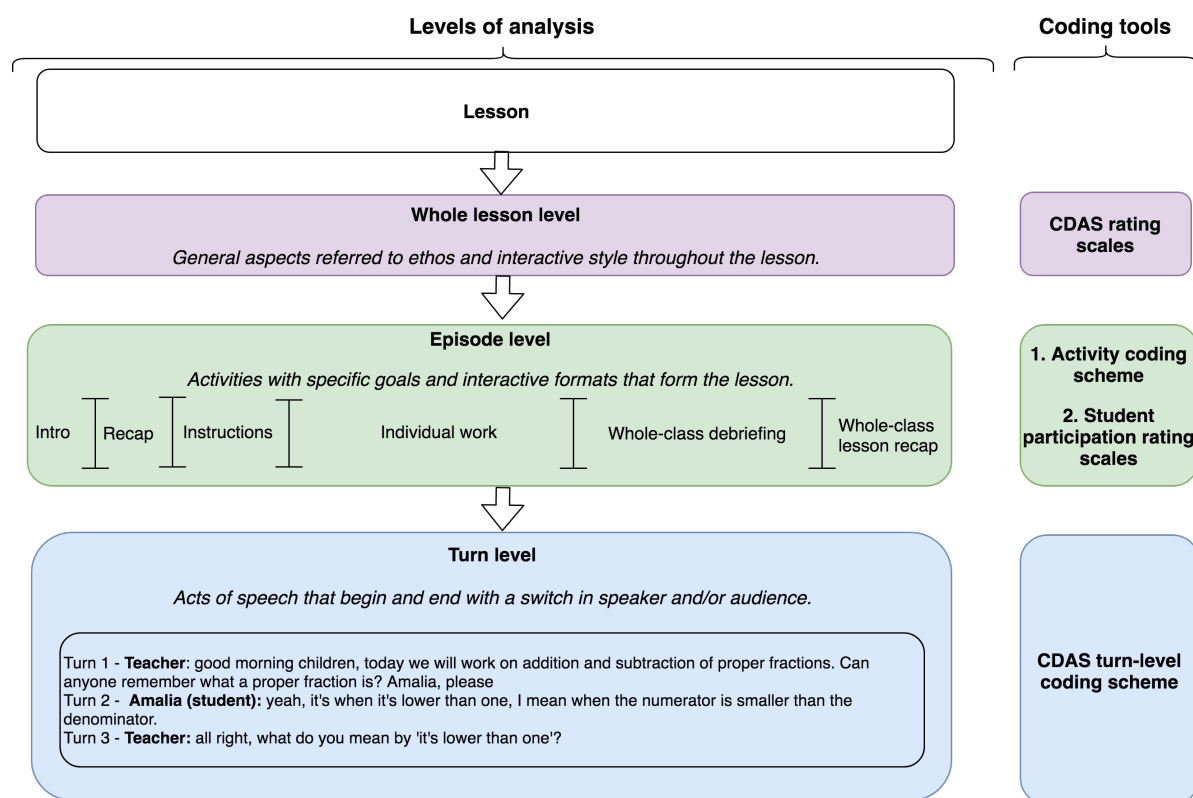
### 8.2.1 Analysis of classroom videos

#### *8.2.1.1 Levels of analysis and rationale*

The analysis of classroom videos requires the selection of (1) meaningful units of analysis ranging from the occurrence of words to whole-lesson indicators (Hennessy, 2020); and (2) analytic strategies, ranging from qualitative and interpretative to quantitative (Mercer, 2010). After examining available options, I decided to include units of analysis in three levels: turn, episode and lesson (see Figure 8.1). These can be linked respectively to the nested levels proposed by Hymes (1972) as Communicative Act, Communicative Event and Communicative Situation, which have been deemed relevant in the analysis of classroom dialogue allowing to capture its details and put them in context (Hennessy, Rojas-Drummond, et al., 2016).

The analysis of turns is commonly found in classroom talk research, defined as 'chunks' of oral communication demarcated by switches in speaker and/or audience (Vrikki, Wheatley, et al., 2019). Studies often focus on: (1) the structure of turns and distribution between speakers (2) the function of talk, that is, what utterances intend to achieve; and/or (3) the content of talk (Mercer, 2010). Given that the TPD aimed to promote the inclusion of dialogic goals, such as inviting pupils to build on each other's ideas, focusing on (1) was paramount. Oftentimes, students' contributions to classroom talk are neglected in research (Hardman, 2019; Webb et al., 2014); either they are not analysed, or they are considered with less-refined categories (e.g. Lefstein et al.,

2015). Notwithstanding, it was important for the study to analyse teacher and student talk with the same level of detail, pointing to the success or failure of teachers' attempts at engaging students in dialogue. This made dimension (2) important as well.



**Figure 8.1. Levels of analysis employed to analyse videoed lessons**

While the chosen turn-by-turn analysis offered a detailed picture of the functions of talk, there are aspects of dialogic pedagogy that go beyond this level to include other phenomena (Kim & Wilkinson, 2019; Lefstein, 2010). In this case, since the TPD programme focused on whole-class dialogue, it was important to contextualise turns by attending to episodes or Communicative Events (Hymes, 1972), documenting the kind of activity that was taking place. Additionally, especially considering aspects of classroom ethos and the relational aspect of teaching, other qualities were assessed at the whole-lesson level (Howe et al., 2019).

Having defined the units of analysis, I considered systematic quantitative classroom observation to be best suited to chart change using methodical observation (Desimone, 2009; Mercer, 2010; Wragg, 1999). However, its validity depends heavily on the quality of the observation tools and the adequacy of the observers' training (Wragg, 1999). I therefore decided to work with coding schemes that had been previously developed by or under the supervision of expert researchers, and where I had been involved in the development and/or trial process. Interrater reliability procedures were conducted to assure coding consistency and accuracy (Stemler, 2004; Tashakkori & Teddlie, 1998). Reliability indicates that a coding system is

applicable and precise, and can be employed consistently by independent judges (Hayes & Krippendorff, 2007). The coding tools and reliability procedures are described next.

### 8.2.1.2 Coding tools

#### 8.2.1.2.1 Overall lesson rating scales

I employed the rubrics from the Cambridge Dialogue Analysis Scheme [CDAS], developed in the ESRC-funded dialogue project mentioned earlier (Vrikki, Wheatley, et al., 2019) that were developed to analyse lessons from Year 6 (age 10-11) classrooms in England. These rubrics cover overall features of dialogue in lessons as described in Table 8.1. As for content validity (Teddlie & Tashakkori, 2008), these scales were developed by experts building on relevant dialogue literature (Howe et al., 2019). Regarding reliability, I worked as a research assistant on a team of four coders, and after months of training, reliability was assessed using alternating pairs analysing twelve lessons drawn randomly from the project sample. Rating scale consistency was judged using percentages (see Table 8.1).

**Table 8.1. CDAS rating scales**

Descriptors	Definition	Agreement (%)
<b>Aims and objectives</b>	The extent to which the lesson aims and objectives are explicit, teacher-led and/or student focused.	75
<b>Monitoring and guidance</b>	The extent to which monitoring and guidance is provided by the teacher throughout the lesson, and the quality of this.	83
<b>Reflection on learning process</b>	The extent to which reflection on learning processes takes place, either being reported by the teacher or discussed with the students.	75
<b>Focusing on talk rules</b>	The extent to which a focus on rules for talk (if present) is introduced by the teacher or negotiated with the students.	92
<b>Student participation</b>	The extent to which students are given the opportunity to express their ideas publicly and engage with other ideas.	92
Rating	Definition	
0	The aspect is not observed	
1	The aspect is present in a teacher-led form	
2	The aspect is present with substantial student involvement	

Source: Adapted from Vrikki, Wheatley et al (2019, p. 92)

### 8.2.1.2.2 Student participation rating scales

The ESRC project results showed that *student participation* had a statistically significant relationship with student attainment and attitudinal outcomes (Howe et al., 2019), in interaction with at least one of two turn-level elements (querying/challenging and elaborating/clarifying). Promoting student participation and engagement with other’s ideas is an important feature of accountable talk and the related talking goals that were part of the TPD programme (Chapin et al., 2009). Therefore, I developed a more detailed rubric to examine teaching activities and capture variability *within* lessons (see Appendix 18 for detailed rubric and rating rules).

To adapt the scale, I examined my data using the original rubric. It became apparent that there were two main aspects in the original scale – *lengthy contributions*<sup>42</sup> and *engagement with ideas* – that could occur independently, for instance, if a teacher asked students to engage with others by stating agreement or disagreement giving short responses. I thought it could be important to distinguish activities in which only one aspect was accomplished, making the measure more sensitive (see Table 8.2). I then applied these dimensions to whole-class teaching segments (see details about activity segmentation in Section 8.2.1.2.3).

**Table 8.2. Student participation rating scales**

Descriptor	0 (Not observed)	1 (Observed)	Krippendorff's Alpha and N° of coded units
<b>Lengthy student contributions</b>	There is maximum one lengthy student contribution in whole-class exchanges.	<b>At least two instances</b> of students expressing their ideas publicly <b>at length</b> (4+ words) in whole-class exchanges.	.872 (56 units)
<b>Engagement with other's ideas</b>	Students who contribute to the public exchange do not engage with other students' ideas.	When contributing to a public discussion, at least one student <b>engages with another student's idea</b> .	.851 (62 units)

An interrater reliability process was conducted with a research assistant. Krippendorff's alpha (2011) was used and following his guidelines, the recommended number of decisions for two coders, two values (0-1), a minimum accepted alpha of .800 and 95% confidence was 52 units. We analysed four lessons, achieving acceptable confidence levels for lengthy contributions ( $\alpha = .872$ , 56 units) and engagement with ideas ( $\alpha = .851$ , 62 units).

<sup>42</sup> The decision concerning contribution length was based on a Chilean study by Radovic and Preiss (2010). They found that, in upper-primary mathematics, students' turns were, on average, between one and two words long. Thus, three and four words were trialled as possible 'lengthy' contributions, and the latter was considered more adequate and suited to make distinctions. Anecdotally, most of the observed lengthy contributions were in fact longer than four words.

### 8.2.1.2.3 Activity analysis

To describe the lesson activities, I employed Amodia-Bidakowska (n.d.)’s scheme, described in detail in Chapter 6, Section 6.2.3.1.1. Table 8.3 lists categories.

**Table 8.3 Activity coding scheme**

1. Organisation of Participants		
OP-1 Individual	OP-2 Group	OP-3 Whole-class
2. Activity Function		
AX-1 Organising	AX-2 Introducing new content	AX-3 Evaluating/ Commenting/ Interpreting
AX-4 Recounting/ Recapping/ Reporting	AX-5 Generating/ Constructing	AX-6 Investigation/ Inquiry
AX-7 Skills practising		
3. Activity Format		
AF-1 Direct Instruction/ Lecturing	AF-2 Exchange	AF-3 Table work
AF-4 Collaborative Construction	AF-5 Presenting	AF-6 Practical
AF-7 Reciting/ reading		

Source: adapted from Amodia-Bidakowska (n.d.)

### 8.2.1.2.4 Turn-level analysis

I employed the CDAS turn-level scheme devised to be applicable across subjects (Vrikki, Wheatley, et al., 2019) to analyse turns in detail. It focuses on the presence of dialogic functions within turns of speech of teachers and students that were outlined in Chapter 2 (Howe et al., 2019), which are defined in

(see also Appendix 19 for detailed definitions and coding rules). It considers the functions of building on and developing ideas (EL-I and EL codes), justifying or making reasoning explicit (RE-I and RE codes), establishing links with the wider context (RB and RW) and challenging (Q), as well as considering non-dialogic invitations (OI) and leaving other contributions Uncoded. Some of these functions have the form of invitations, some consist of contributions, and yet others (rarer in frequency so undifferentiated) can have either form (RB, RW and Q). I excluded four of the original codes: three that referred to coordination of perspectives and were rarely

observed, and an agreement code that was considered too broad to serve a specific dialogic function (Vrikki, Wheatley, et al., 2019).

**Table 8.4. CDAS turn-level codes and reliability figures.**

Codes	Definition	Cohen's Kappa
<b>Elaboration invitations (EL-I)</b>	Invites building on, elaboration, evaluation, clarification of own or another's contribution. <i>E.g. Is your idea similar to Manuel's?</i>	.62
<b>Elaboration (EL)</b>	Builds on, elaborates, evaluates, clarifies own or other's contribution. <i>I've got an idea that no-one has mentioned yet. We could present the household expenses using fractions.</i>	.63
<b>Reasoning invitations (RE-I)</b>	Explicitly invites explanation, justification of a contribution or speculation (new scenarios), prediction or hypothesis. <i>Chloe found the value for X, she's said it's 2. I know she's correct, but how do I know that Chloe is correct?</i>	.73
<b>Reasoning (RE)</b>	Provides an explanation or justification of own or another's contribution, or speculates, predicts, hypothesizes with grounds given. <i>I turned the fractions into decimals because that way I could compare them easily</i>	.80
<b>Querying (Q)</b>	Doubting, full/partial disagreement, challenging or rejecting a statement. <i>E.g. 'Do you really think these angles are the same?'</i>	.62
<b>Reference back (RB)</b>	Introduces reference to previous knowledge, beliefs, experiences or contributions (includes procedural references) that are common to the current conversation participants. <i>Jamie has a brilliant method for calculating volume of this shape (cone + 1/2 sphere)... his method is a real application of our previous topic on simplifying surds.</i>	.62
<b>Reference to wider context (RW)</b>	Making links between what is being learned and a wider context by introducing knowledge, beliefs, experiences or contributions from outside of the subject being taught, classroom or school. <i>E.g. Can you think of a situation in which you could need to know the exact measure of a surface?</i>	.58
<b>Other Invitations (OI)</b>	Invitations of all kinds of verbal contributions (e.g. opinions, ideas, beliefs), except for those coded as EL, REI or CI. This includes invitations on a new topic if this does not fall in another invitation code, and procedural questions. <i>E.g. What do we call the number at the bottom of the fraction?</i>	.72

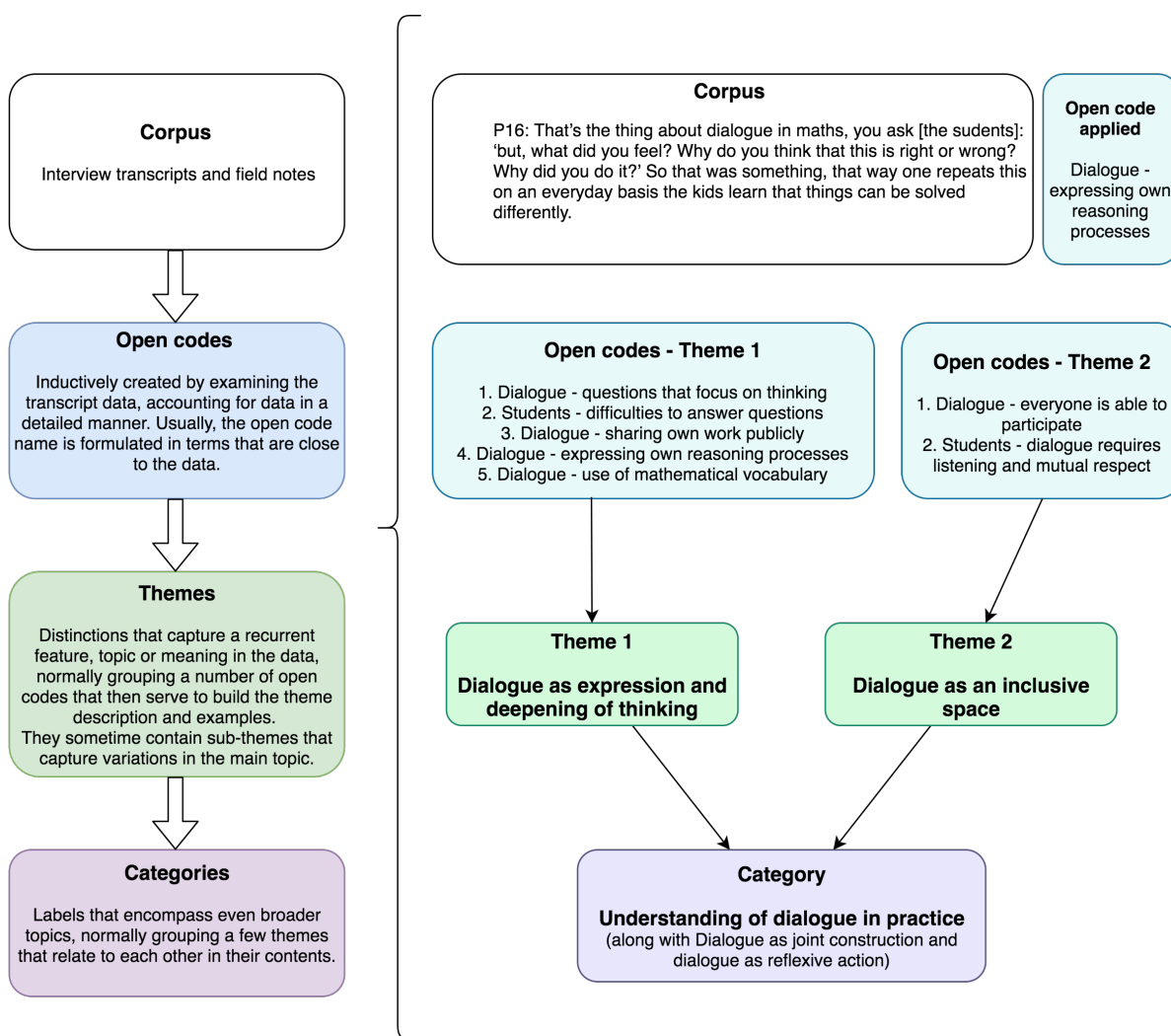
Source: adapted from Vrikki, Wheatley et al (2019, p. 91)

It is worth noting that occasionally, turns could be assigned multiple codes, dialogic and non-dialogic functions. Consider the following hypothetical turn: *"I disagree with Peter, because yesterday when we worked out the area of the carpet, we said that it was height times width, and now he's just*

adding them together.” This turn represents Q in showing disagreement, RE because grounds are provided, and RB in mentioning shared knowledge from the previous day.

As mentioned earlier, I was a research assistant for the project, which involved taking part in the interrater reliability process, first using transcripts of 12 lessons coded in alternating pairs employing Cohen’s Kappa and reaching moderate to substantial levels of agreement (see Table 8.4) and then coding directly from video using the aforementioned software Elan. With my own data, I continued with the latter method given that transcribing was unfeasible in terms of time and costs. In employing the scheme in Chilean classrooms and a wider age range, I was mindful of emerging applicability and translation issues, but the scheme proved entirely usable.

### 8.2.2 Analysis of participants’ and facilitators’ interviews



**Figure 8.2. Analytic categories and examples**

Thematic analysis (Braun & Clarke, 2006) was employed to analyse facilitators’ and teachers’ interviews from Araucaria and Boldo Schools. The phases outlined in Chapter 5 were



completed employing QSR-NVivo 11<sup>43</sup> and constant comparison performed (Taylor et al., 2015). Memos were written in each phase to record the process and assist interpretation. Details about the analytic process are outlined in what follows and depicted in Figure 8.2.

#### 8.2.2.1 Phase 1: Familiarisation and open coding

As stated in Chapter 0, the interviews focused on implementation, viability and learning. In the familiarisation phase, I read through the entire interview corpus twice and labelled interview sections with descriptive phrases (open codes). They referred to aspects of learning, such as reported changes or lack thereof in teachers and students, and indications of participants' understanding of dialogue like the one in Figure 8.2. Considering comments about lack of change was important for validity purposes, producing disconfirming evidence that could help map the scope of change (Creswell & Miller, 2000). This phase resulted in 117 open codes. Since this number was more manageable than Study 1's 260 codes (see Chapter 5), in this case I undertook the following phases without eliminating or merging open codes first.

#### 8.2.2.2 Phases 2: search for themes

**Table 8.5. Preliminary broad topics**

Preliminary topics	N° of open codes
Factors	23
Concept of dialogue	45
Changes in practice	26
Effects of Dialogue	21
Wrong understanding of the term	2
<b>Total open codes</b>	<b>117</b>

In this phase I printed the open codes and searched for commonalities, initially creating five preliminary 'piles' with broad topics to facilitate collating the open codes (see Table 8.5). I re-read each pile of codes, grouping the ones that had similar, more specific topics which resulted in the creation of 24 final themes. For instance, Theme 1 in Figure 8.2 groups open codes that refer to ways of understanding of dialogue that relate to *sharing and deepening thinking*, including aspects of form (e.g. *with difficulty, publicly*) and content (*focusing on thinking, sharing own reasoning, using mathematical vocabulary*). Subsequently, I digitised the themes on NVivo by merging the corresponding open codes.

<sup>43</sup> <https://www.qsrinternational.com/nvivo/home>

### 8.2.2.3 Phase 3: Review of the themes and categories

I re-read the coded extracts in each theme, un-coding and re-coding some to maximise internal consistency and difference across themes. I then created theme descriptions and selected quotes to be translated as illustrative examples to form a full code book (see Appendix 20). Noting that some of the 24 themes had commonalities, I then grouped them accordingly creating five overarching categories. Interestingly, some of the categories closely matched the preliminary topics (*Factors*, *Changes in practice* and *Effects*), whereas *Concept of dialogue* and *Wrong understanding* came to form *Views of dialogue* and *Understanding of dialogue in practice*. The structure of the coding scheme was then depicted using thematic maps (see Section 8.3.2.1).

### 8.2.2.4 Phase 4: researcher triangulation

Three research assistants conducted an external audit of the final themes and coded sources in their entirety. Each checked the consistency and clarity of roughly a third of the themes and the pertinence of coded sources within themes (Creswell & Miller, 2000). No major changes to the themes were suggested. Rather, their comments pointed to the refinement of a few theme descriptions and the re-coding or un-coding of a few interview extracts. The decisions are reported in detail in Appendix 21.

## 8.3 RESULTS

### 8.3.1 How effective was the TPD in impacting teachers' enactment of classroom dialogue?

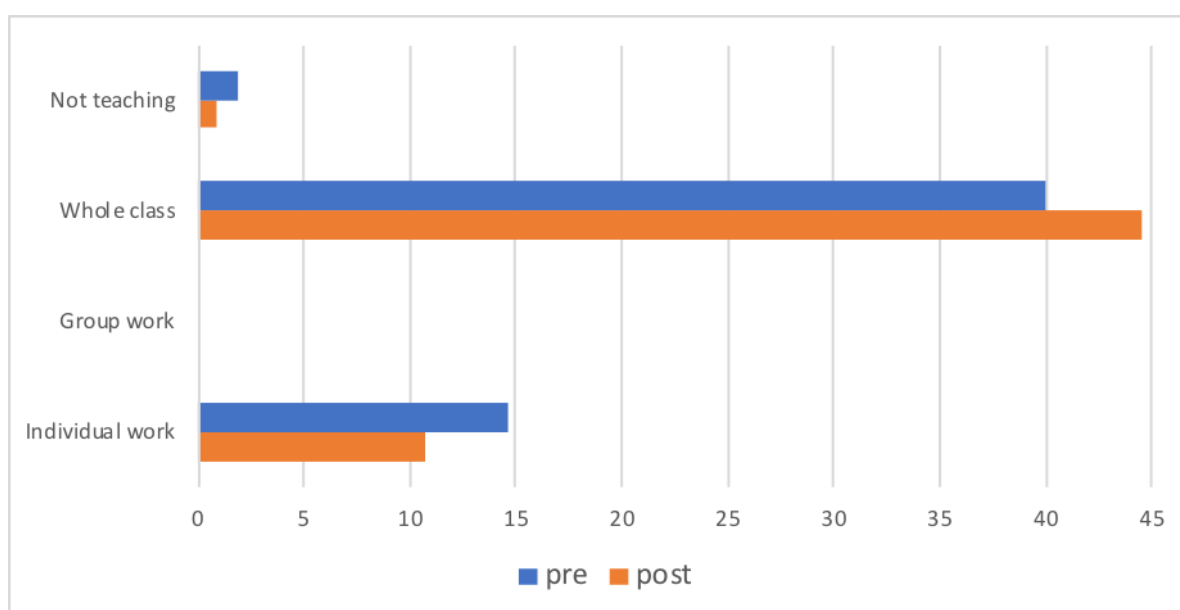
The observational tools resulted in pre- and post- quantitative measures that provide accounts of the lessons, their activities and talk turns. Related Samples Wilcoxon Signed Rank tests - the alternative to dependent samples t-test that compare the median - were conducted on SPSS v25. Thus, pre-post comparisons are reported using median and median differences.

#### 8.3.1.1 Lesson and activity levels

##### 8.3.1.1.1 Observed activities and use of lesson time

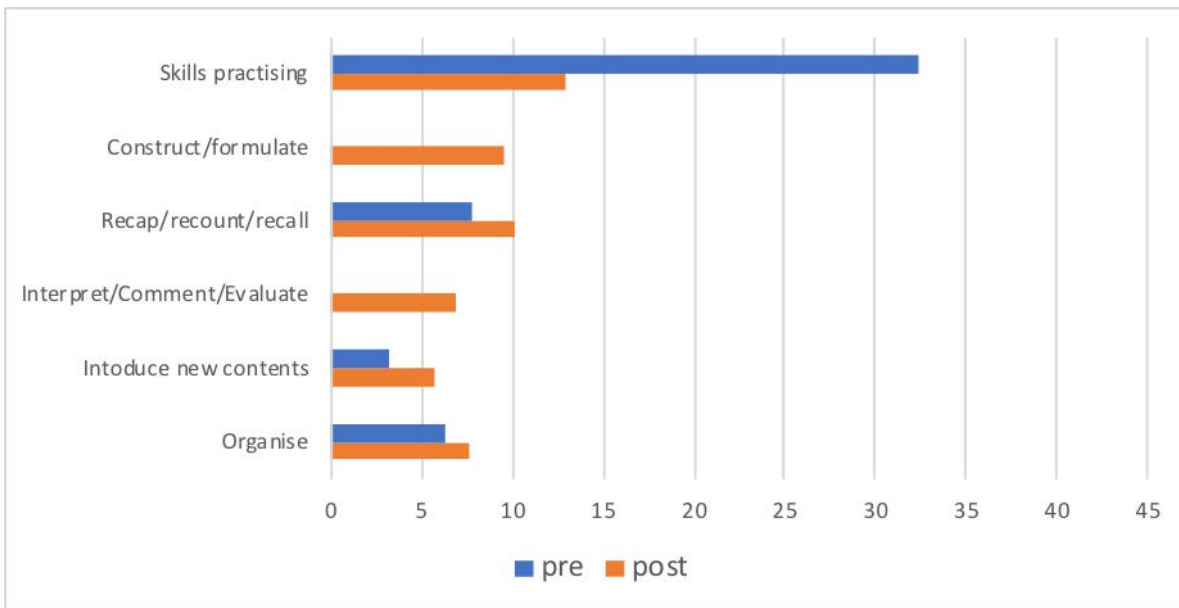
The average lesson duration in the pre-test was 69.8 minutes ( $SD= 10.90$ ), ranging from 48 to 84 minutes. In the post-test, average lesson duration was 74.7 ( $SD= 9.19$ ), ranging from 52 to 82 minutes. The median number of activity segments per hour was 21.74 in the pre-test and 21.48 in the post test, and their duration ranged from under a minute to over 20 minutes. To enable comparisons across lessons, segment length was corrected by transforming their duration into minutes out of a 60-minute lesson.

Regarding Organisation of Participants, *whole-class plus the teacher* was the predominant arrangement (see Figure 8.3), confirming its importance in the Chilean context, which I anticipated when deciding to focus the programme on whole-class dialogue (see Chapter 4). *Individual work* segments were also common, although usually shorter, whereas *Group work* was rare (only observed in 2 pre- and 3 post-lessons). *No teaching time* was marginal in most cases, but due to students' misbehaviour it occupied between 4.5 and 17.7 minutes in three classrooms (P10, P11 and P13, grades 1, 2 and 3 in Araucaria School). In the P11-post case the recording had to be repeated for this reason and still almost a third of the final lesson consisted of no teaching time.



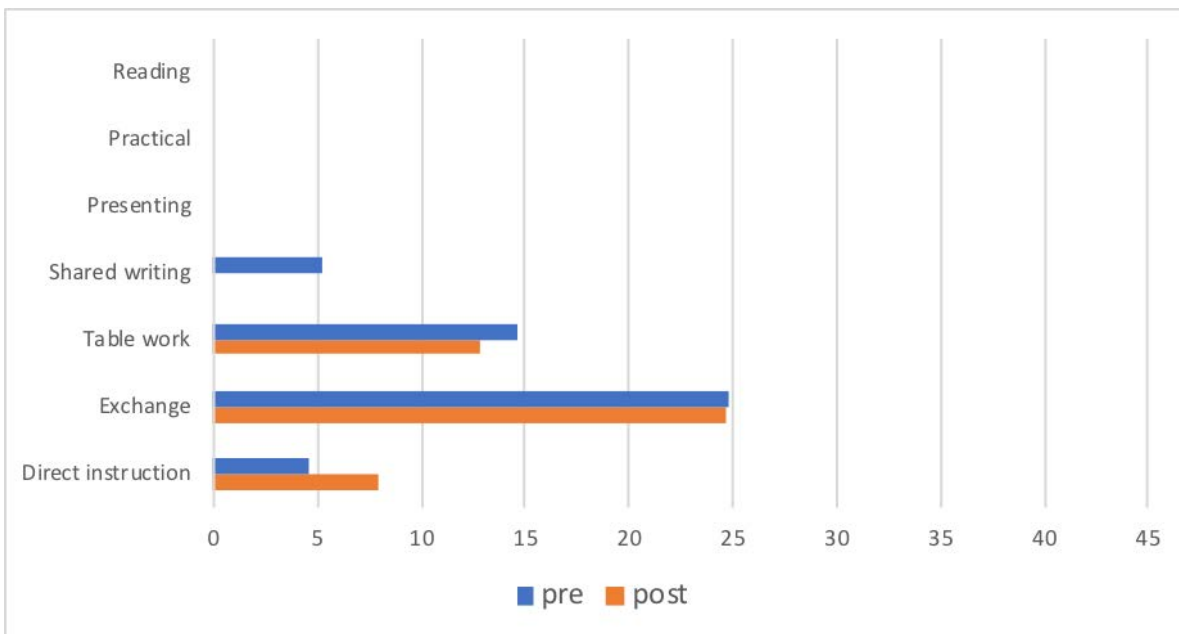
**Figure 8.3. Pre-post median time use in the OP dimension (N=9)**

There were important changes over time with regards to Activity Function (see Figure 8.4). First, *skills practising* was the dominant function, however, it decreased significantly in the post-test (*Mdn difference*= -15.3,  $\xi$ = -2.547,  $p$ = .011). *Interpret/comment* and *construct/formulate*, while rare in the pre-test, took up substantial lesson time in the post-test. This amounted to a significant median difference of 5.1 minutes for *construct/formulate* ( $\xi$ = 2.366,  $p$ = .018), but not for *interpret/comment* (*Mdn difference*= 4.1,  $\xi$ = 1.120,  $p$ = .263). *Organising* and *recap/recall* segments were commonly found without taking substantial lesson time.



**Figure 8.4. Pre-post median time use in the Activity Function dimension (N=9)**

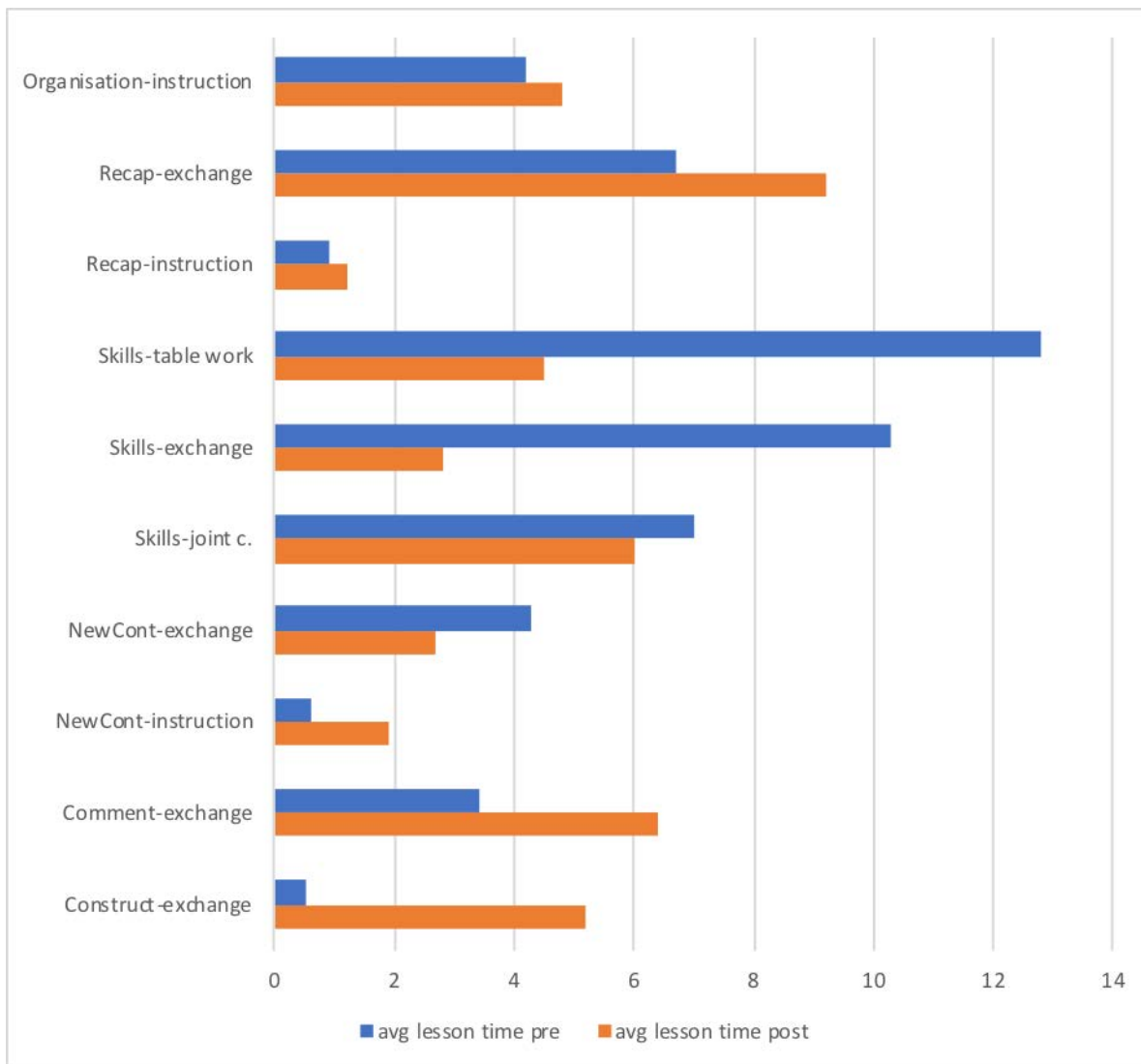
The Activity Format dimension, depicted in Figure 8.5, was stable over time: *exchange*, *table work*, and *direct instruction* were observed in practically all lessons, with *exchange* predominating. *Inquiry* was not observed and *presenting* and *practical* were rare, suggesting these may be less traditional formats.



**Figure 8.5. Pre-post median time use in the Activity Format dimension (N=9)**

It is of interest to examine how these dimensions were combined to understand the types of tasks used by teachers. Compound variables recording the three simultaneously were created accordingly. 36 different combinations were found in total: 6 for individual work; 4 for group

work and 26 for whole-class work. However only ten combinations accounted for over 80 per cent of the observed activity segments. The combinations and their presence pre- to post-lessons are described in what follows, arranged by their function. Their median pre-post duration is depicted in Figure 8.6.



**Figure 8.6 Time (min.) spent in the most common activities (N=9)**

- (1) *Organisational activities*: set-up activities were found in all lessons, using the combination whole-class work – organising – direct instruction (3-1-1).
- (2) *Recap and recount activities*: a common way of starting and ending lessons, these segments were found in two formats in the *whole class* context, namely through lengthier question-and-answer *exchange* (3-4-2) segments, and shorter *direct instruction* (3-4-1) segments to remind students of useful information.
- (3) *Skills practising activities*: this was the most common function in the pre- and post-tests It was found in *individual work - table work* (1-7-3), commonly using worksheets, normally

found in 2-3 lengthy segments in the middle of the lesson and in the *whole class*, focused on public appropriation of skills and procedures through *Exchange* (3-7-2) or *Joint construction* (3-7-4). Interestingly, the first two formats took up substantial lesson time in the pre-test, later showing an important decline. The latter remained constant, indicating that collaborative skills practising was prioritised over other formats.

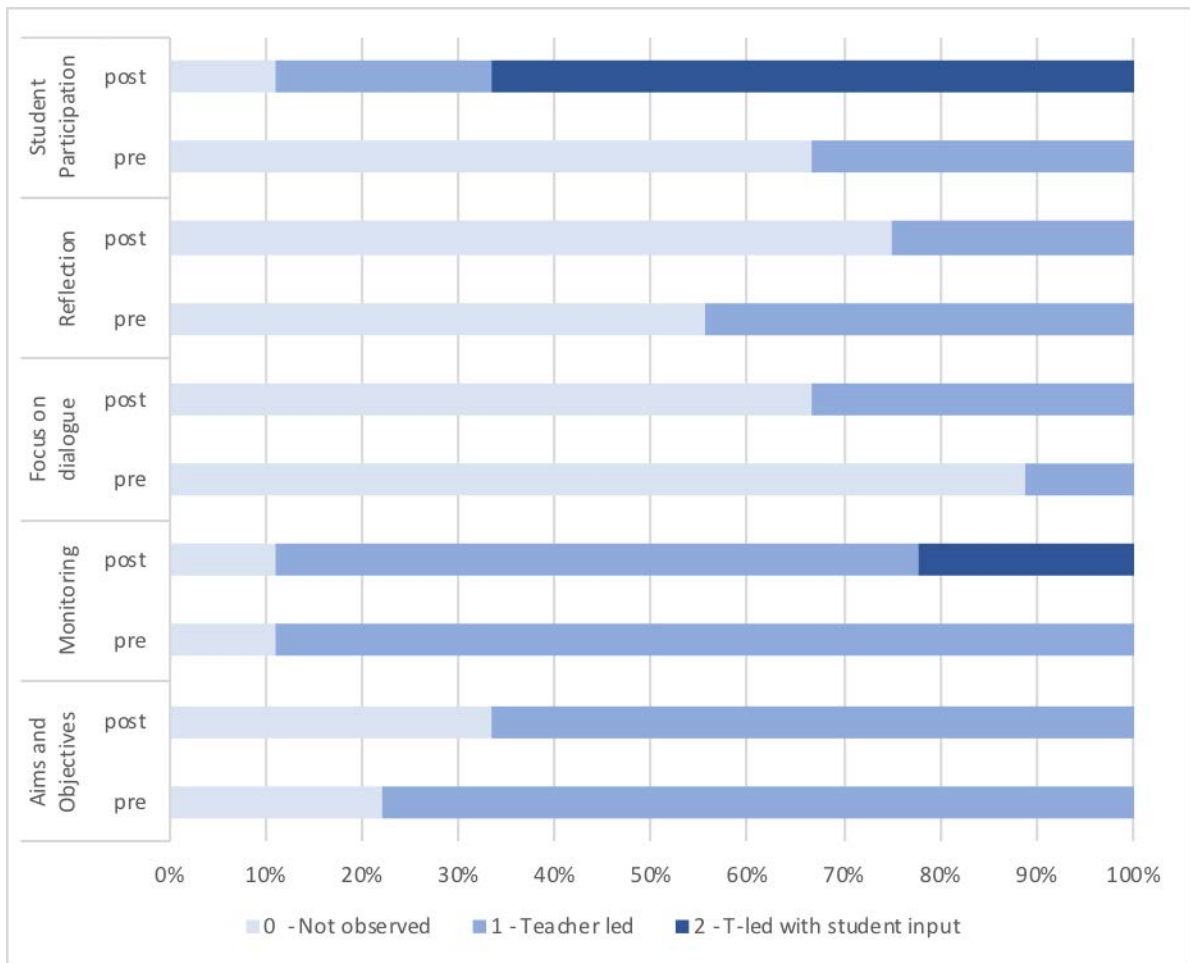
- (4) *Activities introducing new content*: such segments were common in the *whole-class* setting, without a clear pattern in terms of the moment of the lesson. Average lesson time spent on these segments was relatively low, and they were observed in two formats: *exchange* (3-2-2) and *direct instruction* (3-2-1).
- (5) *Constructive and interpretative activities*: while skills practising activities declined in the post-test, two types of tasks increased importantly in terms of lesson time and number of classrooms. They were both *whole-class* tasks conducted through *exchange*. The first aimed to *interpret/comment/evaluate* (3-3-2) by publicly commenting on a pupil's thinking processes or results, being found in different points in the lessons without a clear pattern. The second one, *generating/constructing* (3-5-2), consisted of lengthy problem-solving or constructive tasks found in the middle section of lessons.

#### 8.3.1.1.2 Lesson rating scales

The rating scales were devised to reflect lesson-level aspects of dialogue indicative of a dialogic ethos. It is worth noting that, of the five dimensions, only *Focusing on dialogue* and *Student participation* were explicitly addressed in the programme. Although the other three were not targeted, I included them to examine potential transfer of the programme goals to these aspects of teaching.

Considering the two targeted aspects of practice (see Figure 8.7), one teacher did *focus on dialogue* commenting on such rules in the pre-test, and only three teachers explicitly promoted this in the post-test in a teacher-led form. *Student participation*, in turn, showed a more favourable picture with an observed increase of three to six teachers with the maximum score ( $Mdn_{pre}=0$ ,  $Mdn_{post}=2$ ,  $Mdn_{difference}=1$ ,  $z=2.598$ ,  $p=.009$ ).

Of the three remaining dimensions, *Aims and objectives* and *Monitoring* were generally present in a teacher-led form in the pre-test. This remained the case for the former, whereas the latter showed a non-significant increase. *Reflection* was rare, becoming even less frequent in the post-test. Since one score was applied to each lesson this measure was fairly crude, especially when only one lesson was observed pre and post. Therefore, these results should be taken with considerable precaution. A more fine-grained exploration of *Student participation* follows.



**Figure 8.7 Percentage of teachers scored at different levels**

#### 8.3.1.1.3 Student participation in whole class

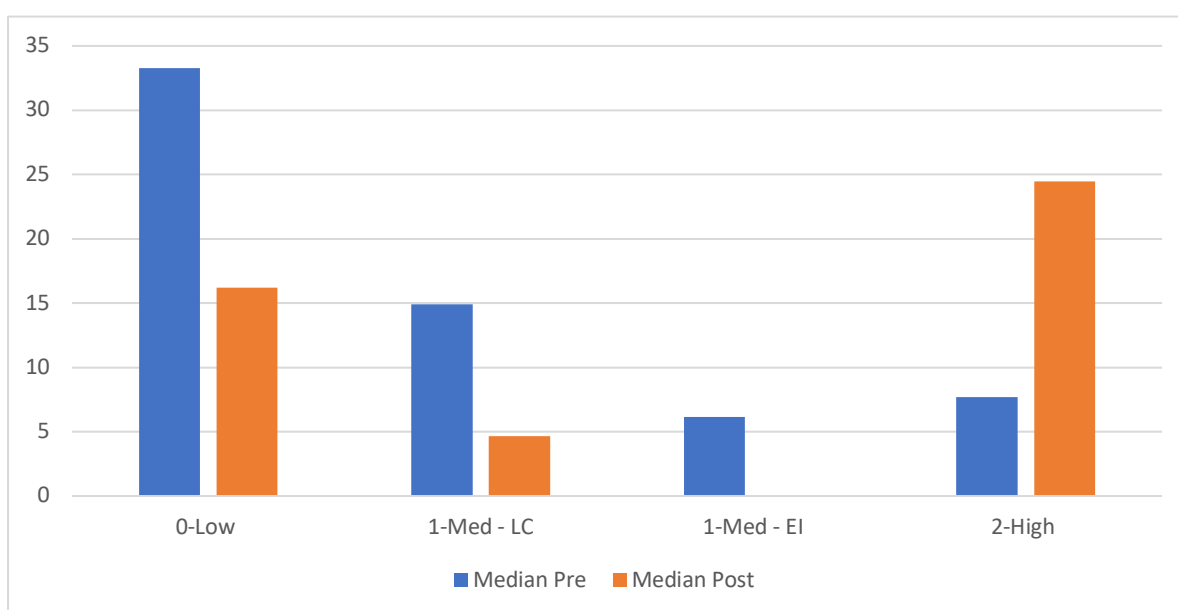
Only segments coded as *whole-class interactions* were rated considering long contributions (LC) and students engaged with each other's ideas (EI) (see ratings in

Table 8.6). The median duration of segments rated at each level is shown in Figure 8.8, which indicates that even before the TPD programme some classrooms had instances of *high participation*. Six lessons exhibited segments like this, with a median duration of 7.7 minutes and 1.3 segments per lesson (P11, P13 and P15 being exceptions). With regards to *medium participation*, it is apparent that *long contributions* were more common than *engagement with ideas* at the beginning, with median durations of 26.2 (4.2 segments) and 12.7 (2.3 segments) respectively. The most common rating was *low participation*, lasting a median of 33.3 minutes and present in 17 segments per lesson. This is noteworthy, considering that the threshold for *long contributions* was only two occurrences of 4-word-turns by a student.

**Table 8.6. Student participation ratings**

Rating	Name	Meaning
0	Low participation	No long contributions or engagement with other's ideas
1-LC	Medium participation	Long contributions only
1-EI	Medium participation	Engagement with ideas only
2	High participation	Long contributions and engagement with ideas

Important changes occurred in the post-lessons: *high participation* time grew in seven classrooms, amounting to a significant median increase of 11.8 minutes ( $Mdn\ duration\ post= 24.4$ ,  $\bar{x}= 2.38$ ,  $p= .017$ ) and a median difference of -11.4 minutes of *low participation* time ( $Mdn\ duration\ post= 16.2$ ,  $\bar{x}= -2.192$ ,  $p= .028$ ). No consistent pattern regarding segments rated *medium participation* was observed, but considering the initial differences between LC and EI, it can be assumed that teachers especially improved with regards to generating situations in which students could comment and build on others' ideas. The two exceptions to this trend were, first, P11, who did not make any progress, indeed increasing her *low participation* time. However, as explained in Section 8.3.1.1.1, serious behavioural issues were observed in her final lesson. Second, P16 already had around 50 minutes of lesson time between high and medium participation, which she maintained.



**Figure 8.8 Pre-post median lesson time per levels of participation (N=9)**



### 8.3.1.2 Turn-level analysis

A more fine-grained analysis was conducted examining turns of speech. All turns were marked with an agent and identified either as uncoded or assigned the applicable codes. The median number of turns in the pre-test was 685, ranging from 390 to 1,058; in the post-test it was 731, ranging from 306 to 928. Given the substantial dispersion in number of turns and in lesson duration, two types of corrected variables were created for teachers and students. Duration-corrected variables represent the number of coded turns per hour of lesson<sup>44</sup>. Agent-corrected variables represent the number of turns with each code out of a hundred turns by each agent<sup>45</sup>.

**Table 8.7 Duration-corrected median frequencies per code and agent (N= 9)**

Code		Teacher		Students	
		Median pre	Median post	Median pre	Median post
<b>U</b>	Uncoded	98.7	85.4	206.4	151.2
<b>OI</b>	Other Invitation	152.7	124.7	22.6	14.6
<b>EL-I</b>	Invite Elaboration	9.6	28.9	0	0.8
<b>EL</b>	Elaboration	13.8	29.6	23.6	49.5
<b>RE-I</b>	Invite Reasoning	11.3	9.6	0	0
<b>RE</b>	Reasoning	9.6	12.2	12.1	22.8
<b>Q</b>	Querying	21.8	28.4	8.4	14.4
<b>RB</b>	Refer Back	4.4	6.9	0.9	3.3
<b>RW</b>	Refer to the wider context	1.4	2.9	0	0

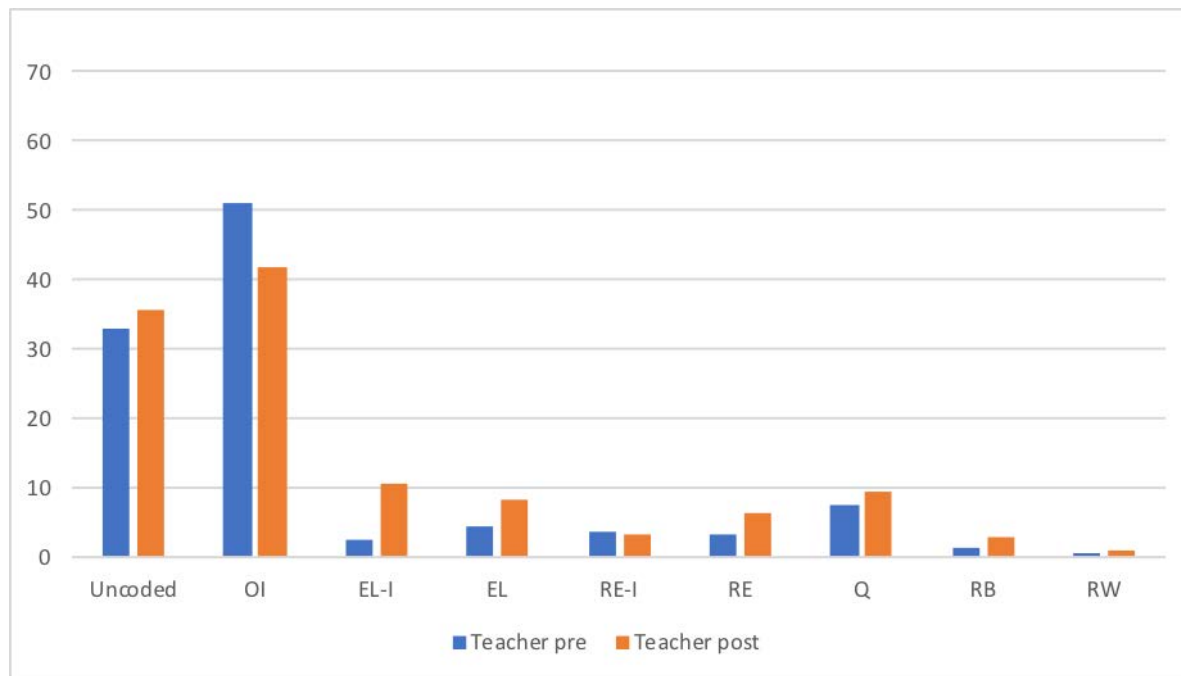
Table 8.7 shows that the non-dialogic *uncoded* turns were the most frequent, with students' turns left uncoded over three times per minute in the pre-test, and teachers' turns over once every minute. Overall, dialogue codes were rare in the pre-test, with *elaboration* and *querying* being the most frequent for teachers and students. Invitation codes were characteristic of teacher turns, especially *other invitations*, which happened over twice per minute. In the post-test, non-dialogic functions decreased but remained predominant, while dialogic codes increased, especially EL-I for teachers and EL for teachers and students.

The agent-corrected frequencies indicate the relative presence of dialogic functions in the pre- and post-tests. In the case of teachers, the non-dialogic functions dominated the turns of teachers in the pre-test (see Figure 8.9). The fact that around half of teacher turns were coded OI indicates that lessons tended to be interactive, with teachers making numerous invitations,

<sup>44</sup> Time-corrected frequencies were obtained by dividing the raw frequency of the turn by the lesson duration (that is, obtaining the rate per minute) and multiplying it by 60 to obtain the rate per hour.

<sup>45</sup> Actor-corrected frequencies were obtained by dividing each code's raw frequency for that actor by the total number of turns by that actor and multiplying it by 100. The ranges of raw number of turns are: Teacher, pre 188-512, post 176-443; Students, pre 194-546, post 130-485.

however, not necessarily encouraging productive exchanges<sup>46</sup>. With regards to dialogic codes, the aggregate median was 23 codes per 100 turns. The most frequent in the pre-test was Q, showing that teachers sometimes challenged or (partially) disagreed with students. Dialogic invitations to elaborate or reason were rare.



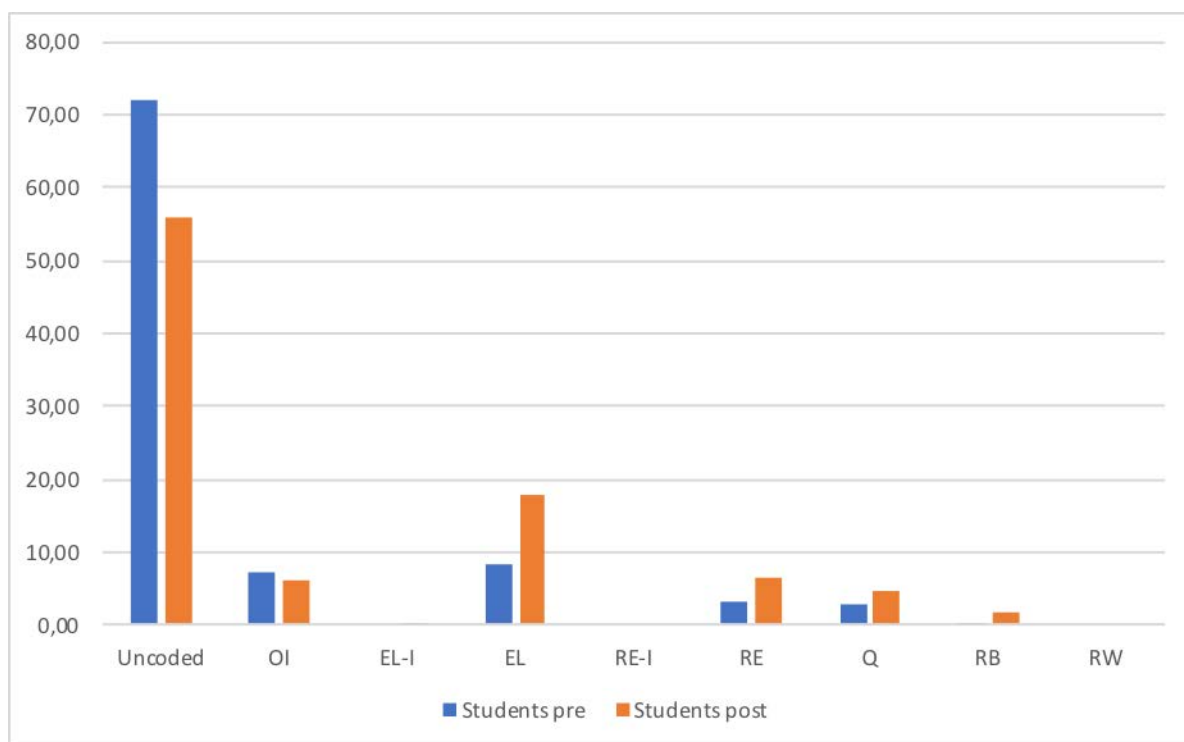
**Figure 8.9. Pre-post median number of teacher turns (agent-corrected, N=9)**

In the post-test, while the two most frequent functions were still non-dialogic, *other invitations* significantly decreased by 14 turns out of 100 ( $Mdn\ pre= 51.1, Mdn\ post= 41.8, \chi= -2.072, p= 0.038$ ). Dialogic functions taken in aggregate form showed a significant increase, with a median difference of 18.1 ( $\chi=2.666, p=.008$ ). Specifically, the codes with significant differences were *invitations to elaborate*, increasing by 7.8 ( $\chi=2.666, p=.008$ ) and *elaborations*, with a median increase of 4.4 ( $\chi=2.666, p=.008$ ). Differences in *Refer back* came close to significance ( $Mdn\ difference=0.5, \chi=1.955, p=.051$ ), and taken together, references beyond the dialogue (RB, RW) significantly increased ( $Mdn\ difference=1.25, \chi=2.073, p=.038$ ) but their occurrence was infrequent.

Students' agent-corrected frequencies are shown in Figure 8.10. The first observable aspect is that they rarely used invitations. In the pre-test, the vast majority of student talk was *uncoded*. Otherwise, students sometimes engaged in EL. Some favourable changes appeared in the post-test. *Uncoded* still predominated but showed a significant median difference of -13.4 turns ( $\chi= -2.666, p= .008$ ). As was the case with teachers, the aggregate median frequency of dialogue codes increased substantially, from 15.1 to 35 ( $Mdn\ difference=14, \chi=2.666, p=.008$ ). Again, these changes

<sup>46</sup> Note that the non-dialogic functions uncoded and other invitations cannot be added together, because codes are not mutually exclusive and OI could co-occur with dialogic functions in a turn.

were due to a boost in *elaboration*. In particular, EL-I only appeared in one classroom in the pre-test, increasing to six in the post-test, although its frequency remained low (*Mdn difference*= 0.3,  $\zeta$ = 2.201,  $p$ = .028), while EL increased twofold in the post-test lessons (*Mdn difference*= 8.5,  $\zeta$ = 2.666,  $p$ = .008). An apparent increase in *reasoning* came close to statistical significance (*Mdn difference*=2.5,  $\zeta$ = 1.836,  $p$ = .066), as was the case for *refer back* (*Mdn difference*= 1.3,  $\zeta$ = 1.836,  $p$ = .066).



**Figure 8.10. Pre-post median number of student turns (agent-corrected, N=9)**

### 8.3.1.3 *The relationship between turns and activities*

This far, analyses have focused on lesson, activity and turn levels independently, finding promising pre-post shifts. However, the interaction between levels could contextualise pre-post results by indicating whether certain dialogic aspects were more likely to be observed in certain activities. Correlation was considered an appropriate measure, as association rather than causality was of interest (Cohen et al., 2011). Duration-corrected variables adding teachers' and students' turns were used, with the lessons as the unit of analysis (regardless of the measuring instance), resulting in a sample of 18 lessons.<sup>47</sup> Scatter plots were created to examine the relationships between variables and select an appropriate test. Most relationships between variables appeared to be monotonic rather than linear (which is an assumption of Pearson's correlations), making

<sup>47</sup> Activity categories with a pre or post-test median of zero were excluded: OP2 – *Group work*, AX6 – *Inquiry*, AF5 – *Presenting*, AF6 – *Practical* and AF7 – *Reading*.

Spearman bivariate correlations more adequate, and leading to the exclusion of some relations (Laerd Statistics, n.d.-a, n.d.-b).

Some interesting association patterns emerged (see Table 8.8). With regards to OP, the examined dialogue codes had a negative relation with *individual work* (significant for EL-I, EL and RE-I) and a positive association with *whole-class teaching*, signalling that this was the main context of dialogue. The negative relation between dialogic turns and individual work could be hypothesised to result from less talk taking place or being audible. However, the former is not confirmed by this analysis, given that OP1 is not systematically associated with *uncoded*, OI or the total number of lesson turns ( $r_s = -.171, p = .498$ ). The latter was avoided by recording audio with a lapel microphone. Hence, these associations show that monitoring of individual work was usually non-dialogic.

**Table 8.8. Spearman correlations between activity and turn levels**

Category (N=18)		U	OI	EL-I	EL	RE-I	RE	Q	RB	RW
OP1 - Individual work	$r_s$	.309	-.059	-.506*	-.667**	-.650**	-.452	-	-	-
	<i>Sig</i>	.212	.816	.032	.002	.003	.06			
OP3 - Whole-class	$r_s$	.067	.449	.633**	.829**	.798**	.763**	-	-	-
	<i>Sig</i>	.791	.062	.005	0	0	0			
AX1 - Organise	$r_s$	.41	.331	.41	-	.379	.379	.445	-	-
	<i>Sig</i>	.091	.179	.091		.121	.121	.064		
AX2 - Introduce new contents	$r_s$	-.535*	-.152	-	.065	-	-	-.382	-	-
	<i>Sig</i>	.022	.547		.797			.118		
AX3 - Interpret/Comment/Evaluate	$r_s$	-.229	.052	.569*	.739**	.456	.497*	-	-	-
	<i>Sig</i>	.362	.837	.014	0	.057	.036			
AX4 - Recap/recount/recall	$r_s$	.015	.098	-	.131	.084	.325	-	.286	-
	<i>Sig</i>	.951	.699		.604	.742	.188		.25	
AX5 - Construct/formulate/generate	$r_s$	-	-	.639**	.707**	.428	.313	.229	.536*	-
	<i>Sig</i>			.004	.001	.076	.206	.361	.022	
AX7 - Skills practising	$r_s$	.37	.054	-	-.453	-.168	-.351	-	-	-
	<i>Sig</i>	.131	.832		.059	.504	.153			
AF1 - Direct instruction	$r_s$	-.591**	-.404	.257	.416	.127	.139	-	-	-
	<i>Sig</i>	.01	.097	.303	.086	.616	.581			
AF2 - Exchange	$r_s$	-.176	.195	.379	.439	.362	.191	.115	.368	.332
	<i>Sig</i>	.484	.438	.121	.069	.14	.448	.651	.132	.178
AF3 - Table work	$r_s$	.249	-.063	-.552*	-.589*	-.583*	-.298	-	-	-
	<i>Sig</i>	.32	.804	.018	.01	.011	.229			
AF4 - Shared writing	$r_s$	.384	.136	.293	.089	.448	.314	.208	-.187	-.366
	<i>Sig</i>	.115	.59	.239	.727	.062	.204	.407	.458	.135

Notes: \*  $p < .05$ , \*\*  $p < .01$ , - signals excluded coefficients due to scatter plot distributions.

Moving on to activity functions, AX1, AX4 and AX7 were not significantly related to any codes. This was not necessarily unexpected, given that they could be thought of as having less potential for dialogue, especially AX1-*organising*. The only indication of this is that AX7-*skills practice's* negative relation with *elaborate* came close to significance. AX2-*introducing new content*, was negatively related with *uncoded*. Given that most uncoded turns were uttered by students, this may indicate that these segments tended to be centred on teacher talk. Indeed, a significant negative correlation between AX2-*exchange* and AF1-*direct instruction* was found ( $r_s = -.510$ ,  $p = .031$ ), contributing to this explanation.

Two functions – AX3 and AX5 – were significantly related to dialogic codes. Both relate with *invite elaboration* and *elaborate*, indicating that when the purpose of the tasks was linked with *interpreting* or with *generating/constructing*, talk aimed to develop ideas further by clarifying, expanding and building on other's contributions. Additionally, AX3 related positively with *reasoning*, so that more explanations were offered when a task required students' commenting. AX5, in turn, was positively correlated with *refer back*.

Activity formats were, in turn, unrelated to the turn-level codes with two exceptions. AF1 – *Direct instruction* was negatively related to *Uncoded* turns, and AF3 – *Table work* was negatively related to dialogic invitations EL-I and RE-I, and with EL, which further supports that monitoring of private work did not involve high-level interactions.

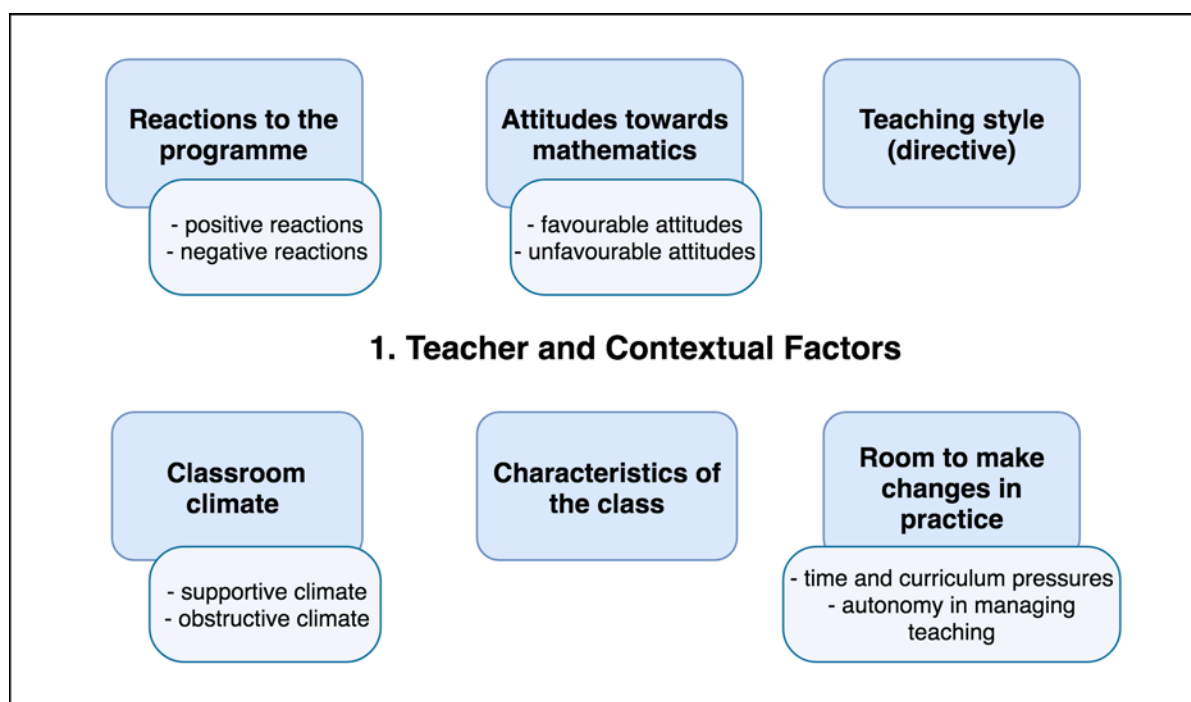
To summarise the results of the pre-post lesson analysis, important shifts were observed at different levels. With regards to activity function, the time spent on skills practising activities significantly decreased in the post-test, whereas time on tasks devoted to constructing or formulating significantly increased. Examining whole-class episodes, student participation ratings showed a significant increase of around 12 minutes in the time spent in segments with high Student Participation. The turn-by-turn analysis indicated that non-dialogic invitations (OI) and contributions (uncoded) were predominant in teachers' and students' talk in the pre-test lessons. In the post-test, while still representing the majority of turns, the frequency of teachers' other invitations and of students' non-dialogic contributions significantly decreased. In turn, teachers' and students' invitations to elaborate and elaborations increased significantly. Lastly, Spearman correlations showed that the activity functions *interpreting* and *constructing* were positively correlated with dialogic turns, indicating that they were a more fruitful context for dialogue. This was consistent with their increase in the post-test.

### 8.3.2 How effective was the programme in transforming participants' understanding and practice of dialogue?

In the final interviews, participants were invited to discuss their understanding of dialogue and report on their changes in practice. This evidence could validate and even expand observation results, while also serving to put them in context. 24 themes resulted from the analysis and are organised in five categories: *teacher and contextual factors*, *overall views of dialogue*, *understanding of dialogue in practice*, *reported changes in practice* and *observed effects*.

#### 8.3.2.1 Categories and themes

##### 8.3.2.1.1 Teacher and contextual factors



**Figure 8.11. Themes in category 1, Study 4**

Teachers discussed aspects related to themselves and their context that facilitated or obstructed the take up of the project (see Figure 8.11). The first three themes were centred on the teacher. In the first one, *reactions to the project*, seven participants reported a *positive reaction* and interest, especially regarding the project's novelty. Two teachers (P13, P18) expressed at least partially *negative reactions* that later turned positive, for instance:

(...) since we've been working for a very long time, we've seen it all, I mean we've done, there aren't any new things arriving [in the school], but it can be [new] in the way of doing things. I mean that's what's new, I feel that, we could reflect about how to teach students things we already knew, but to scrutinise it (P18)

*Attitudes towards mathematics* reflects teachers' strong views about the subject: one sub-theme captures participants' *favourable attitudes*, where some stated being fond of the subject and confident in their disciplinary knowledge, whereas many expressed *unfavourable attitudes* (P10-F, P12, P13, P15-F, P18, P19). They mainly reported feeling challenged or unprepared to teach it, some even disliking it. In addition, one teacher indicated that her students "have this thing that maths is like a monster (...) I'm up against this interpretation they have of mathematics and I think it's a big challenge" (P12).

A third theme was *teaching style*, discussed by some participants who considered it as a factor because their existing pattern of teaching was rather structured and directive, which in some cases reportedly led students to expect highly scripted practices (P11, P12, P14-F, P17, P18). Adopting more dialogic practices required challenging this script, as P14-F conveys:

[Interviewer: Did you face any obstacles?]

P14-F: Yes, of course, my urge to reply 'no, no it's not like that, because...' it's like saying 'one... two... three...' you expect the answer. Obviously, I had to go through a change, I had to shut up (*in a playful tone*), for it to come from them.

*Contextual factors* included *classroom climate*, referred to by teachers to explain why certain things they tried worked or not. Two sub-themes emerged. First, eight teachers mentioned aspects of *supportive climate for dialogue*, characterised by students' willingness to take part in lessons and collaborate with the teacher: "they have a, uhm, an ability to adapt to the way that I'm teaching and so they start to see that we are all participating, they start sharing their opinions" (P19). Second, all teachers mentioned aspects of *climate that obstructs dialogue* in their classrooms, especially regarding disruptive behaviour: "I have a class that's very difficult, very heterogeneous, right? (...) they struggle to pay attention, half of them I think are on medication." (P11). Additionally, some participants referred to students struggling to listen to each other and having a few pupils that tried to monopolise the floor.

Three main aspects surfaced regarding *characteristics of the class* as a factor. Class size and students' age were considered either as obstacles or facilitators. P13 had a combination of factors: "It's... very hard to be able to do it [in] an environment of 45 children, 6-year-old kids, that only want to play around" (P13). Finally, a few teachers indicated that this work was easier as a homeroom teacher because "here I have many things in my favour, I know most of [the students] since 2<sup>nd</sup> grade, so I throw them a glance and they know they have to behave, but in a different class, I don't know if it would be so easy to accomplish the same" (P15-F).

Finally, *room to make changes in practice* has two sub-themes. *Time and curriculum pressures* were discussed, with many participants indicating that the curriculum was too crowded, forcing them

to rush through it. Some stated that they did not have enough time to teach maths, either because of insufficient teaching hours or because they got cut short: “Maths is only six hours a week (...) we said with six hours it’s impossible to do maths properly, you end up lacking what we’re discussing [*I: right*] the reflection (...)” (P15-F). In the sub-theme *autonomy in managing teaching*, seven participants stressed that, regardless of their constraints, they had some room for manoeuvring. During implementation, this happened at the planning level, changing lesson plans (P10-F, P12), but also trialling the project strategies in other subjects to maximise practice (P15-F, P18) or even using another subject’s hours (such as arts education) to teach maths (P16). Some teachers went further to acknowledge: “The curriculum is extensive. But, you know, there was a point when I said: ‘what’s more valuable, going over the curriculum without [students] knowing it, or going through less and for them to... master it?’” (P14-F).

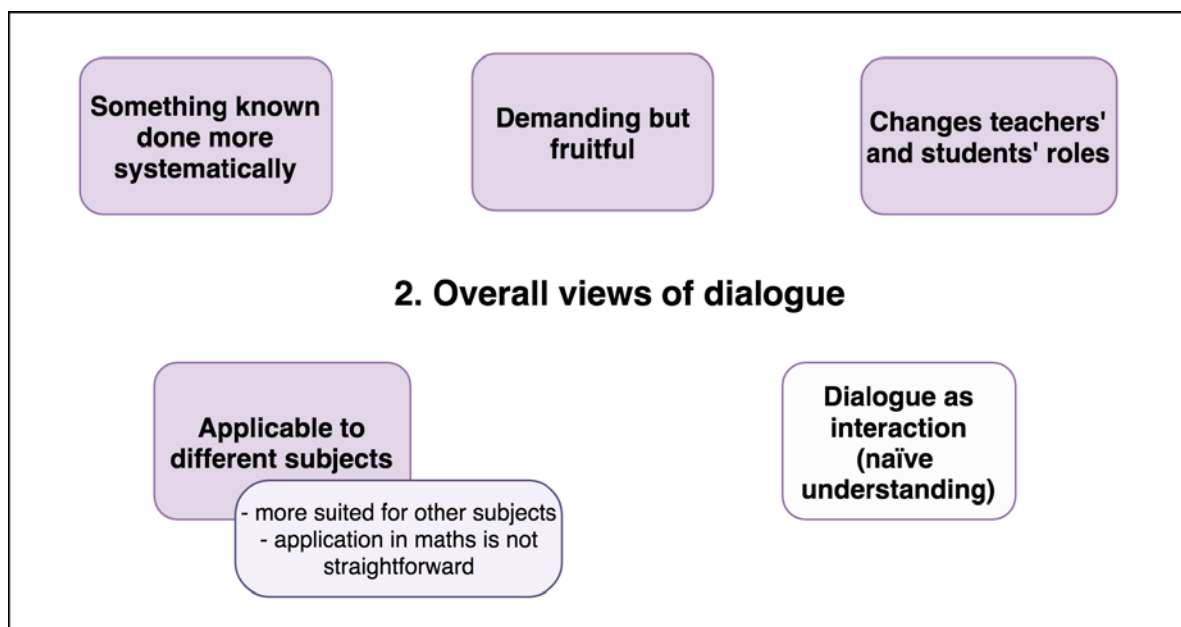
#### 8.3.2.1.2 Overall views of dialogue

This category refers to teachers’ general formulations about what dialogue was and how it related to teaching (see Figure 8.12). These were not mutually exclusive but reflected the different aspects of dialogic pedagogy considered by participants.

First, participants characterised dialogue as *something known done more systematically*. Five teachers indicated that this was something they knew or practised to some extent. While acknowledging this, five teachers stated that the programme brought more structure and systematicity to their knowledge of how to use talk in teaching: “I mean, it’s “new” in inverted commas, because as I told you, we have always tried to engage in dialogue in all subjects, but it is different when it is directed and includes phases” (P15-F). Two teachers said the programme made their use of talk more deliberate.

So being more purposeful, uhm... saying ‘ok, I want kids to (...) learn to respect turns, that who speaks, the others listen’, I know already with this [the Project] that I’ve got the lolly sticks, that I can work on this, and that, and that it, it, it has an effect, because they did wait. You see? So that’s being more purposeful, not doing things just because. But saying ‘why do I, why do I want to use this strategy, to achieve what?’ (P18)





**Figure 8.12. Themes in category 2, Study 4**

Another feature noted by teachers was that dialogue was *applicable to different subjects*. Notwithstanding, six of them said that they saw it as *more suitable for other subjects* such as language or science because of their particular knowledge type and/or learning strategies. Still, views about suitability were not consensual. For instance, while P12, P13 and P15-F emphasised its applicability in history, P14-F and P16 disagreed. Participants indicated that, although possible, dialogue's *application in mathematics was not straightforward*. Mainly, they indicated that to become more dialogic, they required overcoming more traditional ways of viewing and teaching the subject as algorithm-based “This project makes you (...) believe that... maths is not only numbers and results... nor... (..) the four basic operations, there is something beyond that” (P10-F). Others saw no room for problematising in mathematics, as P16 expresses:

One doesn't see maths as containing the possibility of engaging in dialogue (...) you usually deliver the contents, deliver the contents again, have them do a few exercises and then the test. That is, you don't really try to figure out what the student may be thinking regarding the exercises they worked on.

Nonetheless, many participants acknowledged that dialogue was applicable across the mathematics curriculum, with three teachers stressing the need for disciplinary knowledge to initiate and/or manage dialogue.

Teachers characterised dialogue as *demanding but fruitful*. Some only stressed the demanding aspects, whereas others indicated that it was possible to implement and that progress through dialogue produced learning results. Two teachers also pointed to benefits with regards to learning

depth. P12 said that dialogue needed to be purposeful in order to be effective. P17 referred to both sides of the matter:

The problem with dialogue, it's very good, but (...) look, in this school one has to make dialogue short. Because if we see that we have to go through certain contents, with dialogue it would take much longer because we would have to teach a lesson initiating a dialogue, but it would lack the skills practising element. And in maths (...) it's too much content... to work only through dialogue. Now, it is good, because that way we can see who are the ones that understand and the ones who don't, right?

Perhaps pointing to a more substantive view of dialogue, participants stated it involves *changes in teachers' and students' roles*. Almost all teachers mentioned that students needed time to take in this new form of teaching and what it demanded of them. Thus, it should be developed over time, ideally taking years. Others added that through their changes, students realised that they could learn in a different way. Synthesising these points, P13 said:

I mean, to plan your lesson based on... on dialogue, that students, and that students get used to this dialogue, because there it's v# it's very difficult, or, or, it's hard, it's an arduous task, I think for a whole semester being constant in this work with dialogue, dialogue, dialogue, dialogue, so that in the second semester they'll be used to 'these are the questions that they'll ask us'

Furthermore, five teachers discussed changes in their role: "one was the process mediator, more so than the guide" (P10-F), "I tried (...) not to be the protagonist, but for them to be" (P12), "I'm no longer a lecturer, but I co-construct with them" (P19).

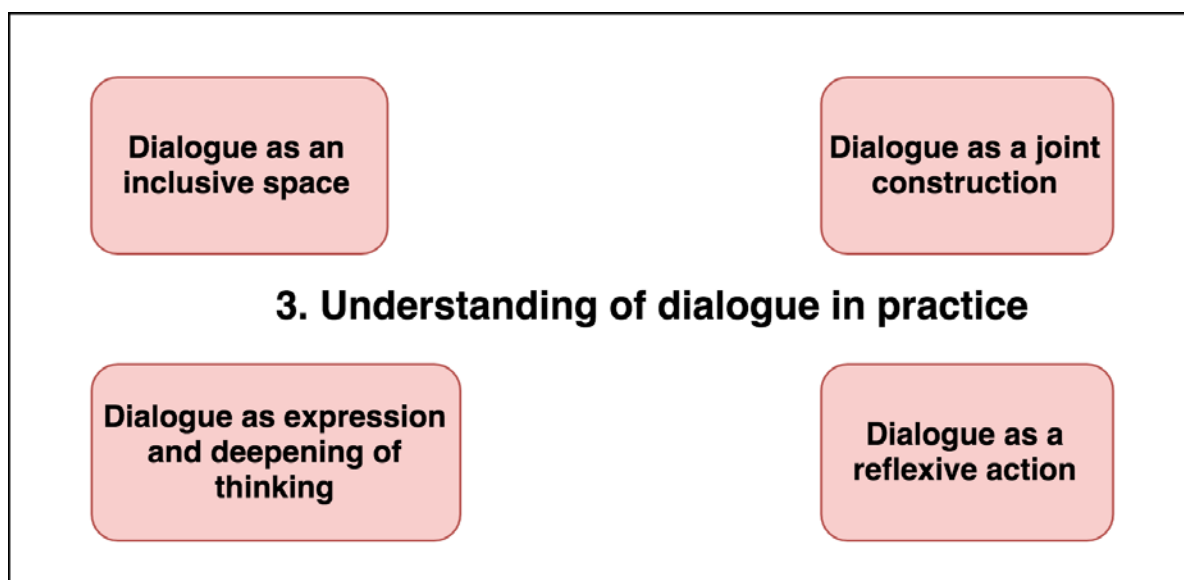
The final theme was *dialogue as interaction (naïve understanding)*. Some responses of four teachers (P11, P17, P18 and P19) were indicative of an understanding of dialogue that deviated from the intended views. These had to do, first, with them referring to dialogue as communication or exchanges in general rather than something more specific. In this example, P11 conflates dialogue with teachers' conceptual clarity:

[I: *how in tune do you think maths teaching is with dialogue?*] the thing is... let's see, to explain mathematics you need to be really precise, ok? You need to have a good command of certain contents... so dialogue and the words you use towards students are very important. I mean, I can't say 'a 3D geometric shape is the same as a 2D geometric shape' (...) and things will be clear for students as long as you're clear in what you're asking. If you're not clear about what you're asking they won't understand. That's why dialogue is paramount, a good dialogue with students.

When being asked about changes in their practice, two participants (P11 and P19) reported aspects that were not part of the project (aside from relevant ones), such as showing students videos. Interestingly, almost all of this theme’s references came from P11.

### 8.3.2.1.3 Understanding of dialogue in practice

Themes in this category show how teachers saw dialogic pedagogy in practice (see Figure 8.13). Four compatible views were expressed by teachers when discussing dialogue as applied in the classroom. These themes were closely linked with the next category that refers to changes in practice. The two are distinct because they highlight different aspects of teachers’ responses: the former focuses on how the description of practice represents their understanding of dialogue, and the latter on the concrete changes they made.



**Figure 8.13. Themes in category 3, Study 4**

First, *dialogue as an inclusive space* was mentioned by eight teachers, who emphasised giving all students space to talk and be involved: “(...) generating strategies so that *the ones that are always quiet can participate*, ok? that for me has been a change like... it was like saying ‘ok, this has to happen’” (P12)<sup>48</sup>. Many teachers stressed that this required listening as a counterpart: “When you have a dialogue with students you need respect, silence, that they listen to each other, what they’re saying” (P14-F).

Secondly, teachers saw *dialogue as joint construction* (mentioned by eight teachers). This focused on its collective character, that is, the way in which engaging in dialogue meant building on participants’ ideas and knowledge: “Being deliberate in, in, when defining a concept, for all

<sup>48</sup> Given that categories 3 and 4 are closely related, Italics have been used in the illustrative quotes to signal the element(s) that more closely relate to the theme and category.

students to take part, *the more students gave their opinion, uhm, the better we could generate a consensus*” (P19). Some highlighted the aspect of students reacting to each other’s ideas, whereas others talked about drawing on and enhancing students’ existing knowledge and cultural background.

I discovered that my students (...) have cultural knowledge, they’ve got a lot to say, right? Uhm... we talk in maths, but we end up talking about various things and maybe to others that seems like a waste of time, but I really feel like... my aspiration in a way is for them to raise their cultural level and I think that that is done in society, and that [the class] is a little society right there (P12)

A third element was *dialogue as expression and deepening of thinking*, referred to by six participants. The theme includes references to students expressing their ideas and their reasoning through different kinds of questions to allow “the possibility for them to speak and be able to *explain what their reasoning was* regarding certain things (...)” (P16). Other aspects were the importance of students presenting their work in public (P16), the use of mathematical vocabulary (P18) and, as a counterpart, students having difficulties in expressing ideas (P11).

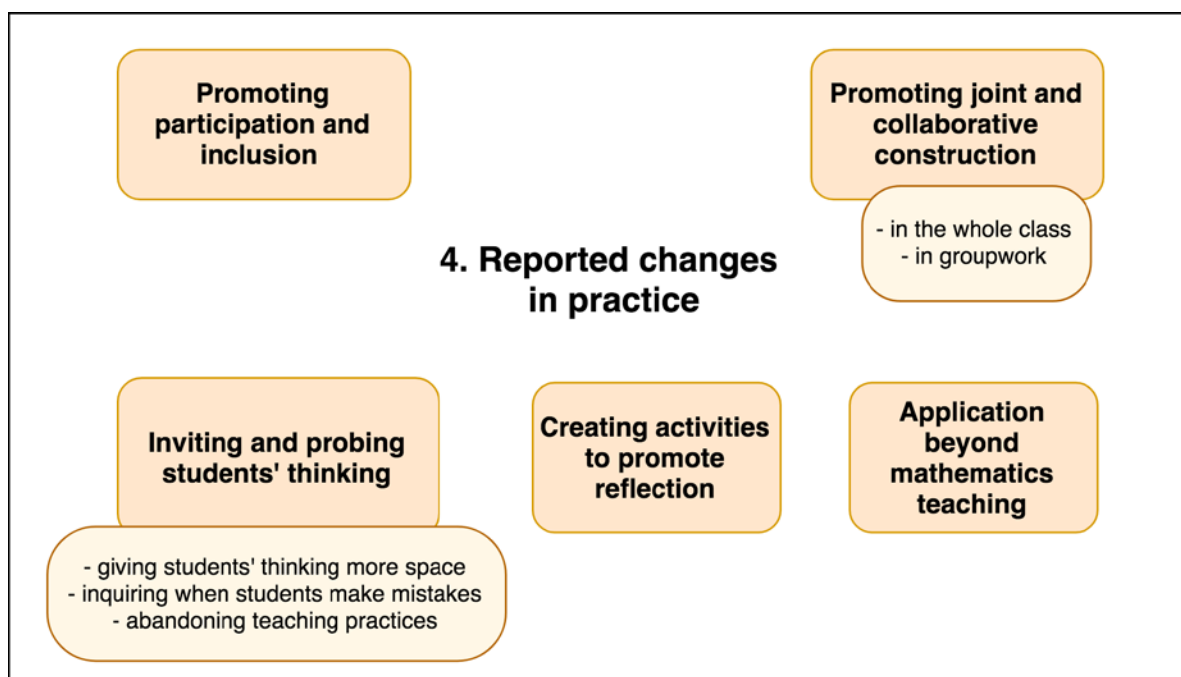
Finally, *dialogue as a reflexive action* was only mentioned by four participants. They referred to reflective exchanges in which students went beyond the first answer or idea, were able to argue or to change their minds and be critical. “That students acquire a routine and *ask themselves* ‘yeah... right, the answer is  $2+2=4$ , but why?’ *now they are capable of reaching that answer, and not only sticking with ‘yeah, that’s the right answer’*” (P15-F). P12 stated that this should involve students reflecting about dialogue itself to become more aware of how they learn.

#### 8.3.2.1.4 Reported changes in practice

As mentioned in Section 8.3.2.1.3, the themes in reported changes were closely linked with those appearing under *understanding of dialogue in practice*. Many of the specific changes were mentioned by only a few teachers, but I considered them important nonetheless because they showed how teachers appropriated different project elements (see Figure 8.14).

The first theme is *promoting participation and inclusion*, which was linked with *dialogue as an inclusive space*, and captured nine teachers’ reported changes in relation to promoting more and more diverse student involvement in the classroom. In part, this had to do with new strategies to manage the floor including allocating turns randomly. In doing this, teachers ensured that students who would not volunteer to participate still had a chance to be heard while also supporting students’ respect for turn-taking rules. The most common strategy was using lolly sticks with children’s names on them, especially in Boldo School: “*My colleagues and I agreed to use the lolly stick strategy* (...) So for students that was a fantastic strategy, we obtained very good results because we made students participate that had never taken part in previous years” (P15-F).

P16 refrained from doing this, thinking it was too stiff and there were other ways of inviting students. Also in Boldo School, teachers reported working with a ‘noisemeter’ proposed by the project as part of creating ground rules. This involved stating how many people should be speaking at the same time depending on the activity (e.g. whole-class discussion versus groupwork) supporting listening and an orderly working climate.



**Figure 8.14 Themes in category 4, Study 4**

Two teachers, P12 and P17, indicated that they invited more students to contribute when asking questions. In Araucaria School, the strategy ‘inclusive question’ was shared by P12, who had learnt in a previous Special Educational Needs-focused TPD, being taken up at least by P11 and P14-F. In it, if a student did not know an answer, the teacher asked a few classmates and then went back to the initial student to give them a chance to contribute. Finally, P18 said she: “went and *bought a microphone*, because I felt that students’ opinions weren’t... I wasn’t able to hear them, and that it was important to listen to students’ opinions, so now I’ve bought it for next year (...).”

*Promoting joint and collaborative construction* was observed in responses of all participants and was linked with the understanding of *dialogue as joint construction*. A first sub-theme focused on activities done with the *whole class*, such as dealing with students’ mistakes by drawing more people into the conversation and solving things collectively, instead of evaluating the answers.

*If a student didn't know [something]... trying for another classmate to come forward to explain, and another one, and another one, because, of course, it's not hard for me to say 'no, look, you have to do it like this, like this' but that way I'm being a guide, not a mediator.* (P10-F)

P12 and P15-F mentioned strategies to collectively and inductively arrive at a theme (lesson goal or topic).

A second subtheme related to *groupwork*. Teachers indicated they included or improved group or pair tasks, stressing that students ought to be grouped strategically to avoid misbehaviour (P14-F) or promote peer support: “I have (...) two kids that aren’t readers yet [in 3rd grade], so I sat them with students that were, they were very capable. So, they helped them, they helped them, and sometimes they learn best among peers” (P18).

*Inviting and probing students’ thinking* was the third theme, connected with the understanding of *dialogue as expression and deepening of thinking*. It was mentioned by nine teachers and organised in three sub-themes. Many of the reported changes related to *giving students more space to express their ideas*, sometimes by giving them thinking time: “That (...) gave me a lot of food for thought... I said ‘actually, I ask questions like ‘you’, ‘now you’” but I don’t, *I don’t allow them enough time to think of an answer...* so that was really helpful” (P17). Participants also reported giving dialogic activities more presence in their lessons by including them in their lesson plans and/or assigning more time for their completion. Five teachers described how they included instances for students to express their thinking in their evaluations (either orally or in written form). Interestingly, P14-F explained that, through dialogue, she came to realise that a student that normally did not respond to anything in written tests “(...) in dialogue he managed to stand his ground with arguments and correctly.” She thus went to the UTP and they agreed to evaluate him orally so that he would not fail the course.

Four teachers linked this with *new ways of dealing with students’ mistakes*, by either inquiring further or giving them a chance to realise they were mistaken instead of evaluating.

They tried themselves, *in trying to explain their exercise they realised their mistakes*, and that was really important for them, saying ‘I was wrong’, ‘no, it wasn’t like that’, ‘no, this one’s ok’, but it was because they saw for themselves that they had done something wrong. (P16)

Finally, P14-F reported *dropping certain practices* to privilege dialogue: reducing the use of manipulatives and time allocated to students’ written work. Additionally, she stopped doing an exit quiz, because through dialogue she could readily notice what had been accomplished and what needed further work.

Only two teachers mentioned *Creating activities to promote reflection* related to *dialogue as reflexive action*. They included this as part of their lesson goals: “on the class book (...) we always wrote the lesson objective, for instance, identifying the number line, decimal numbers. Instead, *when had I ever written a lesson objective that was ‘reflecting about the importance of addition in maths’? (...) never!*” (P15-F), or devised lesson plans including reflective activities (P12).

The final theme, *Application beyond mathematics teaching*, focused on a different aspect of change: nine teachers indicated that they applied some of their learning to other subjects, especially Spanish language and history, but also science and ‘guidance’<sup>49</sup>, often providing examples. P13 explained:

I like to inquire further sometimes because things come up that are so... entertaining to... (...) this is the first time that I have such great diversity in terms of... countries, I have a very diverse class, I have many Venezuelans, Ecuadorians, Peruvians, so I loved it when they put me on the spot... (...) on the exercise book when it said ‘circle the words that start with an A’ we had ‘aro’, ‘but auntie, this is a ‘zarcillo’, but auntie, this is a ‘carro’ (...) and I said ‘ok kids, this is an ‘auto’ here but there [in Venezuela] it’s called ‘carro’ (...)’ and that was so beautiful!<sup>50</sup>

#### 8.3.2.1.5 Observed effects of the changes

The final category encompasses the perceived effects of becoming more dialogic on students and teachers themselves (see Figure 8.15). P15-F, Boldo School’s facilitator who occasionally videoed her colleagues’ lessons, said she saw differences between the classes that were part of the project, and others that were not.

*The 5<sup>th</sup> graders are lacking with regards to the project and that was observable during the lessons, ok? Although I don’t teach maths to 5<sup>th</sup> grade, I teach them history uhm... I tried to sometimes mix some topics within history, which is more reflexive, and was ideal to implement with this project, and... I felt that they didn’t have the acquired tools, like the 6<sup>th</sup> grade did, like the 3<sup>rd</sup> grades did, like the 4<sup>th</sup> grades did (...)*

Nine teachers observed a *reciprocal and supportive environment* in their classrooms, which can be thought of as a nascent dialogic ethos relating to two of Alexander’s (2008) principles. First, seven participants indicated that *participation improved* in part because some students lost the fear of being wrong and raised their voices: “What I think is really positive is that, even if they’re risking being wrong, they’ll still raise their hands, no, they’re not inhibited by that. I think that this is a very positive change” (P16). P15-F went even further, explaining:

For instance in my class, Consuelo and Javiera were two girls who never raised their hand to participate in class (...) the second semester they had a shift that the whole class noticed: ‘Javiera has a voice, and she’s laughing and she raises her hand and when she comes up on

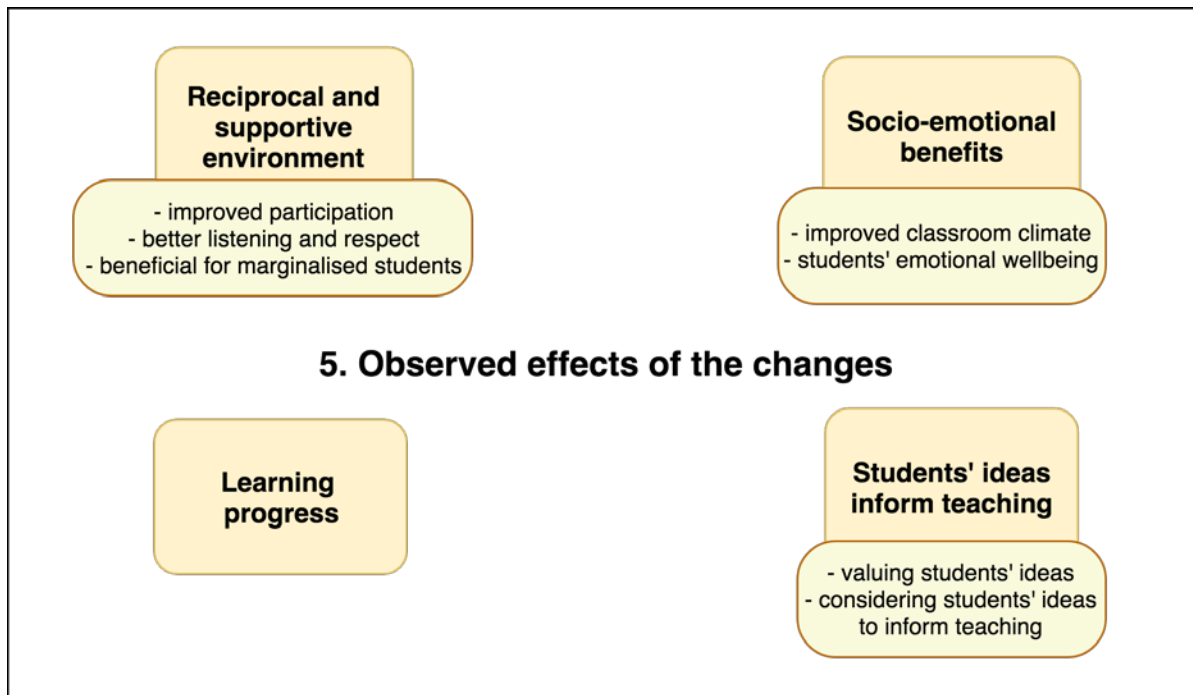
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<sup>49</sup> This subject is taught across all educational levels and focuses on students’ personal, affective and social development, usually taking one teaching hour per week.

<sup>50</sup> *Aro* and *zarcillo* are two words for earring and *auto* and *carro* are two words for car. They come from different regional variations of Spanish.

the lolly sticks, she speaks'. Instead, if we hadn't had the lolly sticks, we wouldn't have, we would've never heard that Javiera had a voice.

P12 and P14-F reported that still a few students struggled to get involved, underscoring their expectations for all to participate.



**Figure 8.15 Themes in category 5, Study 4**

This increased participation benefitted from students' *better listening and respect*. Indeed, P14-F and P17 said that some students went above and beyond, defending their classmates' right to speak when they were being interrupted: "Some would answer straight away (...) some of them are anxious, they said the answers, but the others also replied 'hey, stop shouting the answer, shut up, we all know it, but he's the one that has got to answer'" (P17)<sup>51</sup>. Finally, four teachers report that these changes were especially *beneficial for marginalised students* (P12, P14-F, P15-F, P16), those that would not normally be considered 'good at maths', and/or those with permanent SEN:

I have marvellous students, I have, uhm, accomplishments that I think are important to highlight. So, I try for this to be noticed day to day. If the student that has Asperger's speaks to me, I die, I get really emotional (...) This change of listening to what they have to explain, the way they structure their response to a maths problem or something, has been really moving. (P16)

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<sup>51</sup> This is something I witnessed in both classrooms during their final video recordings.



A second theme were *socio-emotional benefits* discussed by eight teachers. In social terms, five teachers reported an important *improvement in classroom climate*, which became more orderly and peaceful: “[I have seen changes] in students’ behaviour, of course. I started with a battlefield in my class and, based on conversation and on what the others felt about this aggressiveness, they did change” (P16). Some teachers underlined that by taking part in dialogue, *students’ emotional wellbeing* was impacted, specifically improving their self-esteem and: “I feel that students become more confident (...) they started to open up during the year” (P18). Students, particularly the timidest ones, realised that they could contribute to the lesson when they were given space to put their ideas forward: “I think that students were more, like their shyness receded a little bit, the fear of saying... I mean, to say the wrong question, the wrong answer and all that, like that diminished quite a bit” (P10-F). P19 linked aspects of participation and students’ wellbeing:

Those that didn’t take part, I think that they felt that they had a chance to, to give their opinions, even if it wasn’t the full concept (...) it helped them to participate and helped me to realise that they could also contribute, and that, that their shyness or low self-esteem could improve with (...) these small participation details.

Students’ *learning progress* was reported by only a few teachers. P12 and P14-F stated that their students understood content better through dialogic lessons, whereas others pointed out that students became more articulate and reflexive. P15-F revealed that her students were able to produce better written answers to argumentative mathematics tasks: “In the last test they had about angles, the kids wrote almost the complete six lines that they had available. So that’s clearly because the kids were able to reflect about what they were being asked.” However, some teachers said that progress was slow, only involving a few students (P10-F, P12 and P15-F) or could not be attributed to the project (P18).

A final theme was how *students’ ideas inform teaching*. Six teachers reported that after implementing some changes, their views shifted, feeding back to their teaching. A first sub-theme was how, through opening up space for students to talk and listening to them more carefully, teachers started *valuing students’ ideas* and thinking they indeed had a lot to contribute to their learning process (P12, P16, P18, P19). Second, four teachers reported *considering students’ ideas to inform teaching*, indicating that by inviting and being more attentive towards students’ thinking, they could observe their progress and notice problems with previous practices and/or identify the need for adjustments (P12, P14-F, P16, P17). This, in turn, led to further changes in practice, as P16 explains.

You know what? I feel that students had, uhm, they have that ability to express what they learn, and you [normally] don’t give it to them. Truth be told, one believes oneself

omnipotent in front of students, so when they do explain how they did it (...) one also learns from them (...) because they themselves tell you the mistakes you made as they explain what they understood.

### 8.3.2.2 *Links between themes*

The identified themes emerged from an analysis across all interviews. To go beyond their description and map relationships between them, two analytic strategies were employed. First, the thematic proximity between them was considered examining their contents. Second, their occurrence within and across interviews was tallied in coding matrices (see Appendix 20) to map participants' views more closely and understand whether certain themes tended to appear in conjunction. Through this exercise some connections could be advanced between the themes and categories (see Figure 8.16).

In exploring occurrence links, it is noteworthy that most themes in categories 1 and 2 were widespread, whereas categories 3, 4 and 5 exhibit more variation. This makes links between them hard to posit and questions how influential these factors were indeed. The most telling difference relates to *autonomy in managing teaching*, mentioned by seven teachers. Interestingly, those who did not mention it but referred to curricular and time pressures (P11 and P17) also reported fewer changes in their practices. This may indicate that a reduced perceived autonomy hinders teachers' change. Additionally, these two teachers were the only ones who spoke at length about the national quality of education measurement [SIMCE] and how they had to 'teach to the test'.

Focusing on thematic links, categories 3 and 4 (conceived in parallel) were strongly connected. These links can be seen as twofold: on the one hand, they indicated that the corresponding themes were intertwined, that is, when communicating changes, teachers often referred to how they saw dialogue. On the other, they showed that teachers brought their understanding of what dialogue meant close to their practice. Looking at occurrence links, for the most part, teachers who defined dialogue in certain ways did report engaging in related practices, which strengthens the validity of concrete changes. A similar connection was found between the themes *applicable to different subjects* and *application beyond mathematics*, with eight teachers discussing both. The case of *dialogue as reflexion* was different, with four teachers giving related definitions but only two engaging in actions. Three of the teachers who conveyed such understanding, and the two that reported changes, were those who teach in upper-primary, perhaps indicating that reflection was more accessible in these grades (P12, P14-F and P15-F).

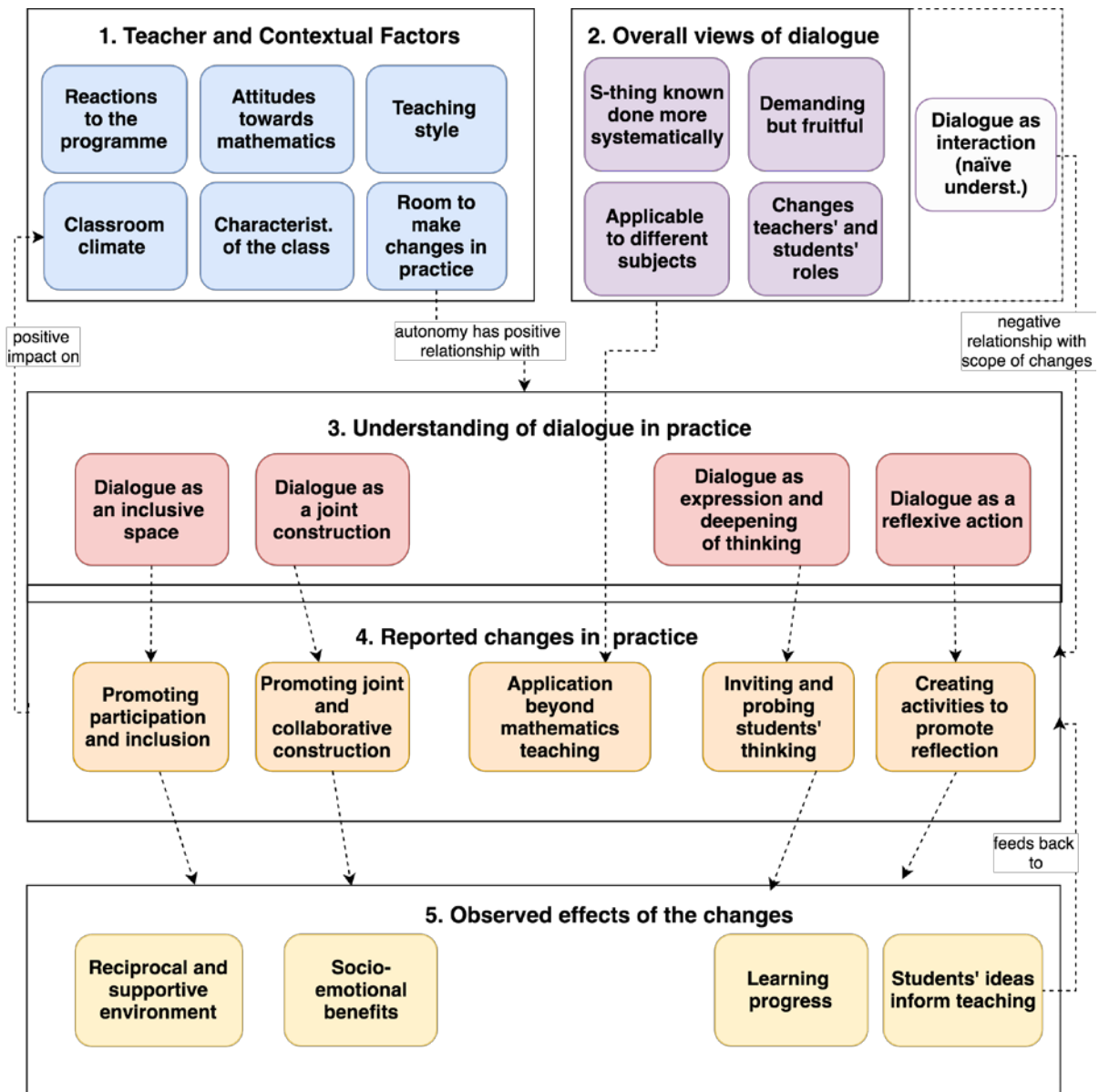


Figure 8.16. Links between categories and themes

The thematic links between *changes* and *effects* were less direct, but teachers themselves put forward some connections. Perhaps the most obvious associations were between a focus on *inclusion* and the reported *reciprocity and support*. However, teachers also linked this with *socio-emotional benefits*, including improving *classroom climate* and benefits for students in their *self-esteem*. Their rationale was that more equitable participation helped students realise they could make valuable contributions and they started feeling more competent, even realising that they had a voice (P15-F).

*Joint construction* was linked with *increased participation* by some teachers, especially with regards to dealing jointly with students' mistakes. Meanwhile, some teachers related *inviting and probing students' thinking* with *increased participation* because students realised that they had space to explain their ideas and also that mistakes were treated as part of learning. This helped them

become less fearful of mistakes and more willing to take part. Although a few teachers connected *inviting and probing* with *learning progress*, most participants did not mention seeing such progress among students, stating that the benefits concentrated in the *participation* and *socio-emotional* aspects. This is not to say that they were disappointed. On the contrary, most of them saw their efforts as very fruitful and had success stories to share.

An interesting thematic link was established by some teachers between *students' ideas informing teaching* and engaging in *changes in practice*. As they pictured it, by becoming more dialogic they started monitoring students' ideas and progress on the spot, which motivated them to manage mistakes differently (e.g. P16), made P12 realise a dialogic lesson had been effective for students' understanding, or even led P14-F to drop her routine exit quiz. This shows that, at least for some, dialogue invited more dialogue.

Finally, the theme *dialogue as interaction* captured a naïve understanding that was less refined than what the project had intended. While this theme applied to four teachers' accounts, references came mainly from P11. She conveyed an unclear understanding of dialogue and discussed a few relevant changes but mentioned other modifications to her practice that had no relationship with the project at all. Indeed, she was the teacher that reported fewest changes and one of fewest observed effects.

## 8.4 DISCUSSION

This chapter focused on changes in teachers' practices, the main targeted outcomes of the programme. Examining the dialogue TPD literature, Vrikki, Wheatley et al. (2019) distinguish between programmes with limited success, that achieve only part of their target results (e. g. Lefstein et al., 2015; Wells & Arauz, 2006), and those which are more successful in improving focal practices (e.g. Sedova et al., 2016; Wilkinson et al., 2017). Since not all targeted dialogic practices improved as a result of this programme, the project's success can be seen in one sense as limited. However, as has been established in the literature review (see Chapter 2), dialogue-focused programmes are typically long-term, demanding and costly. In this context, I would argue that this TPD's merits should be judged considering the fact that the built-in scalable and sustainable design features made the intervention far less intensive and its resources far more modest than what is usually found in the literature. In this light, the TPD results were truly promising, considering some more intensive programmes have failed to achieve as much (Hennessy & Davies, 2020).

#### 8.4.1 Methodological considerations and study limitations

As with the previous chapters, one of the limitations of this study was the relatively small number of participants due to sample attrition. This only made non-parametric statistics possible, impeding the broader generalisability of results. Indeed, conducting interviews with all participants instead of only a handful was decided after Canelo School with nine participants dropped out. Taking all participants' views into account contributed to understanding their changes beyond one final videoed lesson allowing for a richer interpretation of results, including cases of consistent but also contradictory results (Teddlie & Tashakkori, 2008), which are important in TPD research. This is where the use of mixed methods became a key choice to provide a deeper answer to the questions about the project's impact by providing complementary insights as well as corroboration (Tashakkori & Teddlie, 2008). Notwithstanding, mixed methods studies are subject to the methodological weaknesses of all their components, making it even more important to discuss the study strengths and limitations (Bryman et al., 2008).

The overall pros and cons of using interviews have been discussed in Chapters 0 and 5. It is worth noting that a further potential 'risk' when conducting interviews about participants' change and learning is that it is sometimes hard to tell apart teachers' sense of having learnt and specific examples that can illustrate the extent of change and teachers' understanding in practice. A potential remedy is pressing participants for concrete examples (Hennessy, Haßler, et al., 2016), which was built into the interview schedules employed. However, relying only on the interviews would have provided an incomplete picture, which is why the inclusion of pre-post videos was paramount.

With regards to the pre-post design employed in the quantitative strand, it aimed to establish a causal relationship between the intervention and the post-test results, but did so without including a comparison group (Cohen et al., 2011). There were validity threats in not including a comparison group or randomisation, because uncontrolled factors may have caused some of the variation. Wayne et al. (2008) address this issue, highlighting previous and current TPD that might somehow alter the effects of the target intervention. The reasons for not including a control condition were, on the one hand, the additional resources and time involved, especially considering that over 25 participants were initially recruited. On the other hand, I assumed that dialogic teaching was not subject to maturation effect, and teachers and students would not spontaneously become more dialogic, considering this has proven elusive even in intervention settings (Vrikki, Wheatley, et al., 2019).

Certain conditions in Chile also warranted this assumption. Dialogic pedagogy is rather inaccessible: to my knowledge at the time of implementation there were no programmes on the topic available publicly; participants reported not having previous training; and teachers'

independent access to the research literature (especially that in English) was unlikely. More so, evidence indicates that dominant teaching practices in mathematics are not highly dialogic, even for teachers assessed as outstanding in the NTES (Preiss et al., 2016, 2018).

Focusing on analysis, observational data has been considered appropriate to judge complex aspects of teaching such as the quality of discourse (Desimone, 2009). Coding has been a method of choice in analysing dialogue when datasets are large and quantification is the goal (Hennessy, 2020), which was the case in this study. However, there are limitations to this strategy. Considering that dialogue is a time-bound, meaning-making process (Mercer, 2008), quantifying instances of dialogic functions removed from their context can be seen as a crude simplification (Lefstein et al., 2015). Furthermore, focusing on quantifying what can be deemed surface-level functions of talk leads to overlooking the ideas being discussed and their mathematical quality, which are important features when assessing the value of talk (Hofmann & Ruthven, 2018; Webb et al., 2019).

In this study, the inclusion of multiple coding levels, coding instruments and sound reliability criteria were meant to mitigate these issues by producing reliable, layered and connected quantitative accounts. Namely, the changes in talk at the turn level were contextualised in activities, hinting how dialogic forms of talk relate to different task aims and formats. Additionally, the consideration of participation rating scales captured how changes in talk turns were part of interactions in which students engaged with each other's ideas. The interview analysis offered confirmations and possible interpretations for the observed quantitative changes which will be discussed in what follows. Conversely, having an observational account of teachers' changes gave validity to their reported changes, which could otherwise be seen as weaker evidence of progress (Wayne et al., 2008). While both forms of data and analysis are often employed in TPD research, their simultaneous use is less common and has proven highly informative. An important further step would be to conduct qualitative analyses on the contents of discourse and its mathematical quality.

Methodological and conceptual issues remain open, especially with regards to what or how much should be considered a success when attempting to promote dialogic teaching. If one stays in the realm of quantifying dialogue, there are pertinent questions of degree: how much dialogue (however this is operationalised) is enough for a lesson or teacher to be considered dialogic? And how much more dialogic would lessons have to be for a TPD to be considered successful? Statistically, these questions could be answered by going beyond statistical significance and considering effect sizes, as some proponents in the field are already doing (Hardman, 2019; Sedova et al., 2016). Still, operational or narrative definitions of what these effect sizes entail would be necessary to secure construct validity and make the expected results communicable to

practitioners. Furthermore, and considering that dialogic teaching has been described here as a pedagogy rather than a technique or best practice, employing dichotomous definitions (e.g. dialogic/non dialogic) is likely to fall short. Devising levels or degrees may be a more suitable avenue when a quantifiable operationalisation is sought, as some have done with regards to talk-based indicators and overall lesson descriptors (Reznitskaya et al., 2016; Vrikki, Wheatley, et al., 2019). Notwithstanding, others call for an understanding of dialogic pedagogy as a matter of ethos and repertoire instead of quantity alone (Kim & Wilkinson, 2019), which I also support. This study alongside previous chapters showed that considering multiple quantitative and qualitative aspects and domains of teacher change can be informative, but the question still stands: If this is how dialogic teaching is conceptualised, how should we then judge the success of a TPD programme?

#### 8.4.2 Merging of quantitative and qualitative findings

The combination of methods employed in this study allowed for the consideration of multiple aspects of teacher change located in three domains of professional growth (D. Clarke & Hollingsworth, 2002). In particular, this study explored changes in teachers' understanding (personal domain), their practices recorded through videos and reported by them (domain of practice) and observed benefits for students (domain of consequence). Mapping these domains and using multiple methods hints at the processes of professional growth that took place and offers results that converged in meaningful ways.

##### 8.4.2.1 *What improved in practice? Elaborative versus reasoned dialogue*

Among the main results emerging from the two analytic strands was that the most important changes happened in what can be termed 'elaborative' dialogue, that is, exchanges that involve sharing and building ideas collaboratively (Hennessy & Davies, 2020; Howe et al., 2019; Vrikki, Wheatley, et al., 2019). In this study, this result is validated through multi-method triangulation (Creswell & Miller, 2000). This was seen in the increase of *invitations to elaborate* and *elaboration* of teachers and students, as well as the increase in segments with high *student participation*. The latter indicates that this increase in elaborations did involve students engaging with others' contributions and not only their own lines of thought. Relatedly, in their interviews, teachers underscored aspects of *joint construction* and *inclusion* in their understanding and the changes in practice. Furthermore, the observed effects of these changes concentrated in reciprocity and support in their classes, and in socio-emotional benefits for students.

Other relevant aspects of dialogue that were part of the TPD involved reasoning and critique, related to acknowledging differences of opinion and offering explanations, and

metacognitive awareness of talk (Howe et al., 2019). These aspects were a substantial part of many TPD programmes for dialogue (Hennessy & Davies, 2020) and indeed some programmes consider student reasoning and argumentation as their main target (e.g. Sedova et al., 2016; Wilkinson et al., 2017). The results presented in this chapter indicated that there was no significant improvement in this regard after the TPD: the *reasoning* codes were the most relevant here and no significant changes were observed in the videos. Similarly, the view of *dialogue as reflexive* captured in the interviews was not widespread. However, three of the four participants that saw dialogue as reflexive (P12, P14-F, P15-F) indeed had the highest baseline levels of reasoning codes, showing a possible link between the two. Perhaps they linked some of their existing practices with the reflective aspect of dialogue.

Now, the project emphasised elaborative *and* reasoned aspects of dialogue through readings and practical suggestions on implementing dialogic goals of helping students express their ideas, listen to others, deepen their reasoning, and think with others including considering their reasoning (Chapin et al., 2009). So why was the former more salient for teachers than the latter? A few explanations can be put forward.

A possible factor is the way in which TPD contents were sequenced (see Section 4.3). This topic is seldom discussed or assessed in TPD for dialogue (Osborne et al., 2013). Sedová et al. (2016) offer an exception and their design introduced strategies to change questions first and only then promoted open discussions. In this study, ground rules (partly focused on promoting participation) came first, followed by inclusive strategies to manage the floor and elaboration-focused dialogue goals. Only in the final four sessions were teachers encouraged to trial the dialogue goals focused on reasoning, although they would have read about them by Session 6. Beyond the designed sequence, the topics that were actually discussed and prioritised during implementation were of vital importance, especially in this TPD where local facilitators instead of researchers led the process. In this case, because the TPD sessions were delayed during the year, in the end teachers may have had too little time to focus on the reasoning aspect of dialogue for it to improve substantially.

Considering participants' perceptions, the reported *obstructive classroom climate* was an important issue, which is often neglected in the dialogic teaching literature beyond the assumption that a positive environment should exist (Calcagni & Lago, 2018). However, when this is not the case, as was declared and observed in some participants' classrooms, perhaps the aspects of elaborative and inclusive participation can act as a way of improving student behaviour, which becomes a salient result for participants. Indeed, in our previous project working with professional learning communities in municipal schools, classroom climate was participants' preferred topic in discussions, even if this was not targeted in the programme. This



indicates that, when it is problematic, climate may be a priority for teachers even in the presence of researcher-facilitators with a different agenda (Calcagni et al., 2013; Grau et al., 2017). Now, the fact that most participants observed improvements in student behaviour as a result of their changes in practice is encouraging since it signals that focusing on promoting dialogue can help improve other aspects of classroom life. An exception was P11, whose class had very serious climate and behaviour issues throughout the year, and where very little change in dialogue was observed. This indicates that in the absence of minimal levels of respect and a working environment, changes in dialogue (and behaviour) are unlikely to be supported, at least through TPD like this. While this may be an unsurprising finding, studies on dialogue hardly ever discuss the possible influence of classroom climate on TPD results.

On the other hand, the (im)balance favouring elaborative over reasoned aspects of dialogue has been noted before in teachers' everyday practices (Sedova et al., 2014) and as a result of TPD, even if it is expert-led (Hennessy & Davies, 2020). The importance of elaborative dialogue to educational outcomes has been empirically established by Howe et al. (2019). They showed that the key dialogic aspects of teacher-led dialogue associated with students' learning outcomes were the co-occurrence of Student participation, Elaborations (EL-I and EL) and Challenging (Q). Their findings reinforce the importance of what teachers undertaking the TPD achieved.

#### 8.4.2.2 *The challenge of challenging students' responses*

Having established that elaboration and participation improved, it is worth examining what happened with *querying*, the other relevant aspect of dialogue in Howe and colleagues' (2019) results. In this study, Q had the highest pre-test median of all dialogue codes for teachers (*Mdn*=7.34 per 100 turns), and was not significantly different in the post-test (*Mdn*=9.31 per 100 turns), being surpassed by EL-I and almost matched by EL. As coded in this study, querying can signal a disagreement, challenge or rejection of an idea. Since Q was already relatively high at the beginning, and the other key aspects of dialogue improved, this potentially means that these aspects of dialogue were balanced better at the end of the year.

Whether Q itself was used for more dialogic purposes (e.g. not only to reject ideas) can in part be answered by examining the results from interviews. Some teachers mentioned interpreting mistakes differently, as evidence of students' thinking and even as a reflection of their own doing in teaching (especially P16). Also, many teachers talked about dealing with mistakes through either *joint construction* or *deepening ideas*, instead of rejecting students' answers or providing the correct answer themselves. Perhaps a finer distinction within the *querying* code, or further sociocultural discourse analysis (Mercer, 2004) of occurrences of Q in the pre- and post-lessons would help to corroborate this.

#### 8.4.2.3 *Impact on student learning and lack thereof*

A final relevant aspect of the interview findings was that teachers did not see progress in students' learning as a strong effect of the programme. It is interesting to consider why, since they mentioned and were observed making changes towards more dialogic ways of teaching. Student outcome measures would have been helpful to provide an external, more objective perspective. Indeed, they were contemplated and piloted as part of fieldwork, but technical and time constraints made them unfeasible (see details in Appendix 22). In their absence, a hypothesis can be put forward. As many participants underscored, learning to sustain dialogue takes time, and teachers had, in practice, only one semester to trial new strategies. It may well be that this was not long enough to contribute to student learning, while it did improve other aspects of teaching-and-learning. Longitudinal measures of teacher and student change, which are lacking in TPD research in general (M. M. Kennedy, 2016), would be necessary to test this hypothesis.

## 8.5 CONCLUSIONS

The combination of methods employed in this chapter paints a picture of successful TPD impact, if not in all dimensions of dialogue, in some of the key ones and to the satisfaction of participants. The aspects that did not improve (e.g. Reasoning and Querying, reports of dialogue as reflection) are worth considering. It would be important to examine through further research whether teachers would manage to incorporate such aspects of dialogic teaching in their practice as a result of peer-facilitated TPD if the conditions discussed above (content sequencing, practice time and classroom climate) were different. This would allow for the consideration of whether this TPD model could indeed promote other functions of dialogue involving more reasoning and challenging, or whether having progressed in elaborative aspects of dialogue through this approach, teachers would need other kinds of learning conditions or models to move forward. In this sense, examining how the TPD model promoted the observed changes is key.

Importantly, following a Phase 2 design, the observed progress was accomplished in two different schools, with different facilitators and only remote, occasional external support (Borko, 2004). The approach combined two of the TPD pedagogies outlined by M. M. Kennedy (2016), providing teachers with strategies to incorporate dialogue in their teaching, and supporting their insights about practice based on video-based reflections. This combination shows promise in overcoming the great challenges of scalability faced in the field (Osborne, 2015). Indeed, the fact that teachers applied their learning in different subjects is a sign of the intervention's *spread* within each classroom even in this first encounter participants had with the topic. Spread is a key element in Coburn's (2003) concept of scalability.

Furthermore, teachers' interviews provided a sense of their understanding of dialogue and its connection with changes in practice, pointing to a level of *depth* in their learning (Coburn, 2003). This was also a positive indication of professional growth that connects different domains of change through enaction and reflection (D. Clarke & Hollingsworth, 2002). The latter was indeed reported by some participants whose interviews showed one possible growth path. After learning about this in the TPD (external domain), they allowed more space for students' ideas through new practices (domain of practice), which in turn resulted in them noticing and valuing such ideas (domain of consequence), feeding back to their understanding of dialogue as a collaborative construction and expression of thinking (personal domain) and to their use of dialogic practices (domain of practice). Since the results presented here and in previous results chapters focused mostly on the group of participants, an important further step in exploring these growth trajectories would be to examine individual learning pathways.

Finally, stronger impact claims could have been made with follow-up data, showing whether teachers continued to engage in dialogic teaching in the next academic year and beyond. Unfortunately, these could not be included within the scope of fieldwork and the time frame of the PhD. This is a weakness that many TPD studies that promote dialogue share, and which future programmes focused on scale should address (Hennessy & Davies, 2020).

# 9 CONCLUSIONS

## 9.1 RESEARCH OVERVIEW

This dissertation drew from the fields of dialogic teaching and TPD. Through a review of the literature, the importance of classroom dialogue was established, and a working definition of dialogic teaching was proposed. It is seen as a general pedagogical approach that strives to build a classroom culture of collective knowledge building and supportive and reciprocal relationships. It involves teachers' strategic attention towards, use and modelling of a repertoire of forms of classroom talk where multiple students can express, explore and contrast their ideas in an inclusive and critical form of discussion aimed at learning and developing of thinking.

Through the literature review, it was established that, while there are available TPD programmes that promote dialogic teaching, the majority have limited scope and scalability given their small-scale and costly designs that rely on external implementers, usually researchers. Thus, a knowledge gap was identified with regards to how dialogic teaching can be promoted through programmes that have built-in scalable features while retaining viability. In terms of programme design, identified under-researched areas that apply more broadly to TPD research involved selecting and trialling features that could potentially be scaled up, and reporting on conditions and details of their implementation, as well as assessing programme effectiveness. Along these lines, more than fifteen years ago Hilda Borko (2004) called for multi-site implementation with different facilitators that examines the interplay between programmes, facilitators and participants and the consequences for fidelity and adaptability, but insufficient progress has been made.

This research set out to address these knowledge gaps by proposing a TPD design to promote dialogic teaching in primary mathematics adopting some core scalable features. These linked to how roles in the TPD were formulated: implementation was conducted by peer facilitators and was school-run with the support of school leaders, and researchers provided reduced external support, instead aiding implementation through an induction, detailed materials and responsive (mostly remote) help. The programme included an induction for peer-facilitators that I delivered, and ten TPD sessions that they implemented for their colleagues. The core programme activities included collective learning about key concepts of dialogic teaching through

discussion about readings and videos, trialling through lesson planning and teaching integrating dialogic practices, and reflection about the new practices using self-captured participants' videos.

Two main research questions were put forward. RQ1 was: *To what extent is the implementation of the proposed school-run and peer-facilitated teacher professional development programme viable?* The RQ included two subsidiary questions about implementation and peer facilitation. RQ2 was: *How effective is the proposed design in promoting dialogic pedagogy in mathematics?* It examined effectiveness, with three subsidiary questions covering impact on teacher noticing, classroom practices and understanding. Four schools were recruited to apply the programme over a school year in Chile, showing only partial feasibility, with two schools implementing a substantial part of the programme and two dropping out at different points. Multiple data sources were analysed to answer the questions in four findings chapters. This chapter revisits the main contributions of the research, theorising its key findings and drawing implications for TPD design and research.

## 9.2 METHODOLOGICAL CONSIDERATIONS

An important feature of this research was its multi-site character, with different schools and facilitators implementing the same programme. This step in TPD design and research has been considered a necessity on the road to scaling up (Borko, 2004). The consideration of implementation sites has often been neglected in TPD research in general (Hubers, 2020) and in relation to dialogic teaching, with teachers and/or their classes as focal points. Given that much of the reviewed TPD research draws on sociocultural theory, which conceptualises learning as situated and participatory, it should not omit teachers' work context. Thus, this project highlights how different focal units (e.g. schools, teachers, classes) can be considered in studying TPD. Considering multiple schools and stakeholders made visible the interactions between programme design, facilitators and school, and their changing centrality over time. Considering dropouts as well as more successful cases also painted to a richer picture.

Another central feature was the employment of multiple (mixed) methods of data collection and analysis, combining strategies with varying degrees of openness and multiple forms of data representation (Symonds & Gorard, 2010). These decisions sought to acknowledge the complexity of the phenomena under study, an important challenge in the field of TPD (Opfer & Pedder, 2011). Their use thus offers illustrations of the complementarity and corroboration potential of mixed methods research (Teddlie & Tashakkori, 2008).

Now, the merits of multiple methods should be considered in light of quality criteria. Inference quality has been considered a more comprehensive alternative to validity in mixed methods, including two components: *design quality* and *interpretive rigour* (Tashakkori & Teddlie,

2008). The *design quality* aspects were discussed in the respective findings chapters, including securing the quality of data and the correspondence between questions, methods and analytic techniques (Bryman et al., 2008). *Interpretive rigour* relates to the inferences about the meaning of results from different strands and the relationships between them (meta-inferences), whereby the substantive ‘mixing’ of mixed methods can be achieved (Tashakkori & Teddlie, 2008). This was addressed by maximising complementarity of data, methods and analysis. Strategies for complementarity included employing inductive and deductive logics within and across studies, considering emerging themes as well as building on relevant literature; alternating and corroborating between narrative accounts and quantifications; employing multiple units of analysis and analytic tools to answer the question about teachers’ changes without oversimplifying; and comparing results across sites. In sum, this research employed forms of ‘mixing’ that cumulatively built on previous research while also proposing innovative forms of responding to the challenges posed by a complex and multi-layered phenomenon. The study assessing noticing was the most innovative, considering its application to dialogue. It remained linked to noticing research by drawing on established data collection techniques (Jacobs, 2017), while benefitting from a sequence of exploration and quantification that permitted inductive mapping and evaluating change (Guetterman et al., 2017; Teddlie & Tashakkori, 2008).

Finally, considering limitations of the research, those that were specific to each study and the strategies employed to overcome them were discussed in the respective chapters. The main shortcomings came from the small number of sites and participants. The way in which this restricted the scope of the answers to the research questions include the exploration of viability in further contexts and the exclusion of parametric statistics and more powerful methods to assess impact. Had more resources or time been available, the inclusion follow-up data of continuing TPD practices and aspects of impact in the year after implementation would have allowed for sustainability to be assessed, and the inclusion of a comparison group would have strengthened impact claims. Another limitation, common to research studying only one programme, is that the effectiveness of core features and scalable features could not be judged separately, making it difficult to assess design traits individually (Hill et al., 2013; Hubers, 2020).

## 9.3 MAIN FINDINGS

### 9.3.1 Different levels of viability in implementation

To assess the level of success, viability was proposed as the focal concept, referring to the degree of feasibility to implement the proposed programme, its roles and components, preserving

the intended goals while considering local contexts, particularly variations in light of emerging favourable elements and constraints. The concern with feasibility came from the novelty of the approach, whereby established TPD practices usually implemented by external experts would be applied in a school-run, peer-facilitated setting. Thus, it was important to assess rather than assume the possibility of role enactment and programme application. Similarly, Hill et al. (2013) propose exploring whether designs are realistic in their initial development stages. The inclusion of roles and local conditions, in turn, went beyond the interest in programme delivery that characterises studies focusing on implementation, and its usual criteria that include fidelity and adaptation as well as quality delivery, among other dimensions (Berkel et al., 2011).

Considering viability as an alternative, the key research findings can be synthesised considering three levels of implementation. Successful implementation involves application as intended as well as adaptations that aid feasibility without hindering design intentions. Partial success means that the components' were viable only under certain conditions and/or that some important intended aspect(s) was not observed, but without compromising programme integrity. In turn, unsuccessful aspects include those where application proved unfeasible or too removed from the original intentions. The programme roles and core components will be examined considering these levels, theoretical interpretations and implications for TPD design and research.

#### *9.3.1.1 TPD roles*

With regards to the roles in the programme, their success can be seen as partial since they were only possible in two of four schools. Starting with school leaders, their intended role was that of initiators and backing figures, securing crucial preparation and implementation time. The degree to which they assumed these functions depended on the perceived alignment between this programme and their own TPD goals. Furthermore, where it was implemented, leaders went beyond their intended function, reporting also monitoring the implementation to some extent, and securing continuation when facilitators considered dropping out.

The importance of leadership teams has been documented more broadly in programme implementation (Durlak & DuPre, 2008; Fullan, 2016). However, it has largely been omitted in the dialogue-focused TPD literature. Instead, to date, aspects that partly depend on them such as school priorities and enforcement of teaching practices are usually listed as obstacles for dialogic teaching (Osborne, 2015). Alas, if this pedagogy is to be promoted at scale, and in the absence of scoping reforms with this aim, we need to contemplate how school leaders' support can be enlisted. In this case existing interests were pivotal, and the question remains of whether and how these conditions could have been nurtured in Schools C and D. Opportunities to explore and negotiate match between programme and interests should be included in the initiation. If a match

is not accomplished, the implementation should come into question. Furthermore, school leaders would possibly benefit from learning about the programme contents so that local coherence can be boosted, and teachers' efforts perceived as worthwhile. Results from our international trials of T-SEDA point in this direction, whereby knowledgeable local leaders readily enlisted engagement (Hennessy, Kershner, Calcagni & Ahmed, forthcoming).

Regarding the research team's role, it was envisioned that after conducting the induction, negotiating implementation time and supplying TPD resources, we would focus on data collection and be available to address occasional questions. This was only partially successful, since the role entailed some monitoring, responsive support and pressure to continue in the programme. In Araucaria and Boldo Schools, this was seen as necessary and adequate, whereas in Canelo School, they saw it as insufficient, requesting our direct involvement as facilitators.

The identified aspects of support and pressure to secure the implementation, going beyond the initial design, deserve consideration. It could be thought that the need for support came, in part, from insufficient clarity in the materials, which could be addressed through piloting and refinement. However, support also related to an aspect affecting implementation identified by Durlak and DuPre (2008): empathising with implementers. In this case, this meant trying to make them feel accompanied in what was deemed a demanding new role. In Araucaria the school leaders spontaneously served this function, whereas in Boldo it came mostly from the research team, and in Canelo the offered researcher support proved insufficient. Pressure to prioritise the programme was also important, especially since facilitators had many competing demands. This also relates to monitoring, identified as consequential for implementation (Durlak & DuPre, 2008). These functions were spontaneously shared between leadership and research teams, but they should be considered in future programmes, and some instances of implementation discussion between leaders and implementers should be negotiated from the onset, providing suitable guidelines. Regardless, it is likely that the designers' presence is still necessary at least for some time. Pointing in this direction, Haßler et al. (2018) indicated that, after providing support in the initial year of a sustainable TPD programme, external input eventually became redundant.

The key actors in the programme were peer facilitators, crucially related to scalability given that working with external experts at scale was considered unfeasible. As argued in Chapter 2, the selection, preparation and expertise of TPD implementers are under-researched (M. M. Kennedy, 2016). Matching the intended design, participants in this research saw the role as involving sustaining the project, preparing for and leading sessions. The varying degrees of viability in its exercise appeared to depend on facilitators' commitment to the programme, the ownership of the role, and their perception of workload and its manageability. Shortcomings in the latter two aspects appeared to be crucial in Canelo School's failed implementation. In addition, the



perceived support of leaders and researchers also impacted their engagement. These findings can also be linked with previous implementation research that identifies: “perceptions related to the need for, and potential benefits of the innovation, self-efficacy, and skill proficiency” as implementer-related factors (Durlak & DuPre, 2008, p. 336). These were echoed in facilitators’ comments about the benefits of the programme, and their skill proficiency was observed – at least to some degree – in their delivery of the sessions. Links can be hypothesised between their ownership (or lack thereof) and self-efficacy, although more evidence would be necessary. These issues with viability signal key aspects of design that need to be considered, including refining the criteria for facilitator selection, how the induction could conceptualise the role in a manageable way, and securing ongoing preparation time to reduce the workload (see Section 9.4.2 for further discussion).

Focusing on Araucaria and Boldo Schools that did continue with the programme, facilitators’ actions are worth considering. They largely succeeded in their tasks, establishing stable learning groups with periodical meetings. Furthermore, they managed to build a positive and confidential learning atmosphere for their peers, engaging their motivation to take part in the project. In the sessions, they managed and guided the proposed activities following the guidelines, involved their peers and participated by sharing their views. In addition, and signalling a high level of ownership, they made some fruitful adaptations and adjustments to the proposed activities to maximise their applicability, especially regarding changing their format (from individual to group-based) and sometimes shortening them. In other words, they made the planned sessions come to life and took part in them as learners as well.

A partially successful aspect of their role, however, was observed in relation to the way they mediated conversations: they actively invited, accepted and built on contributions, but more rarely challenged or pressed their peers (especially in Araucaria School). Meanwhile, these aspects were suggested in the induction and facilitators’ guidelines since they have been considered key to productive discussions in TPD (van Es et al., 2014), but these scaffolds were likely insufficient, since pressing remained rare. These difficulties are commonly found in peer-led TPD (Borko et al., 2014; Elliott et al., 2009) and will be discussed in more depth in Section 9.4.2.

An important message emerging from Araucaria and Boldo Schools is that, once the role is assumed, its intended functions appeared to be largely viable and appreciated in schools. Thus, the proposed path to scalability relying on peer facilitation shows promise as long as sufficient support and some pressure are in place.

### *9.3.1.2 Core programme components*

Most of the programme core components were successfully implemented in Schools A and B. They include, in the induction, the coverage of the outlined contents, learning opportunities as participants in core TPD activities and role playing and the negotiation of key aspects of the programme. Throughout the school year, learners got to experience the main components of the design in 10-13 meetings: they learnt collectively about observation and dialogic teaching in the introductory sessions, and implemented reflective cycles comprising planning, videoing and reflecting on their practices by observing each other's videos. Some successful adaptations were observed, especially taking more time to implement sessions 4 (focused on ground rules) and 5 (focused on strategies for dialogue), since one session did not suffice. Furthermore, participants valued the programme contents, its community-based format and the use of videos.

Other aspects of the design were only partially successful. Firstly, time proved consequential, both for facilitators' preparation which was inconsistent, and for implementing sessions, which was sufficient in Araucaria and Boldo, but still affected by constant rescheduling. In the induction phase, the coverage of contents took longer than planned, limiting time for role-playing. Interestingly, this imbalance was echoed in the main TPD where the additional time taken in the introductory sessions reduced the time for reflective cycles, thus curtailing opportunities for trialling classroom dialogue. This relates to participants' criticism of the sessions sometimes being too reading-intensive and theoretical. Focusing on the delivery of programme contents, they were mostly discussed as intended, however some errors or misunderstandings were observed in facilitators' treatment of the video observation stances (See Chapter 6). Another partially successful aspect was the handling of printed project materials, whereby some losses, confusions and repetitions arose and required our intervention.

Finally, some elements in the design were unsuccessful, notably those involving activities outside the sessions. First, participants did not produce self-captured classroom videos, nor did they select footage to share in the meetings following the provided guidelines. To secure the availability of videos, the research team and P15-F conducted the recordings, and participants tended to show the initial segment of their lessons. Second, the use of worksheets to guide reflection between sessions was not apparent and this is likely to have reduced participants' time and opportunities to reflect on their learning.

What transpires from these findings is that, provided generally adequate implementation conditions, the TPD model was feasible to implement and appreciated by participants, who valued its contents and engaged in the proposed learning activities. The less successful components point to improvements or revisions needed to increase viability, which can be taken as more general design recommendations as well. Some of the identified issues could be tackled

with renewed attention to the design of materials and their piloting, aiming to reduce their intricacy and smoothen applicability (Fullan, 2016). This should include friendlier and more condensed presentation of the theory-based aspects in the induction and implementation. In the latter, they should contemplate facilitators' adaptations regarding group work and activity duration. The simplification and consolidation of materials in a booklet would prevent losses and confusion. Streamlining of facilitators' guidelines and making more of the programme and activities rationale explicit in the materials for all participants could help to partly compensate for facilitators' lack of preparation time. Furthermore, these improvements and the re-introduction of core concept definitions along the way could also compensate for occasional mistakes in facilitators' treatment of the contents (like what was observed in this case), so long as these are not recurrent or threaten the integrity of the core concepts.

The theory-practice imbalance suggests that opportunities for theory-informed practice should be carefully considered. In the induction, facilitators watched classroom videos to learn about noticing and dialogic teaching, but analysing examples of facilitation could be beneficial as well (Elliott et al., 2009). In the main programme, the reflective cycles were delayed until after Session 5 to give the group time to consolidate before showing their own videos. However, earlier instances of practice without videoing could be valuable, including self-inquiry exercises linked to the initial sessions (see Hennessy et al., 2016). On this topic, participants' videos were meant to prompt reflection, and they were highly appreciated. Thus, although self-captured video was unfeasible here, its use should not be discarded so easily. The negotiation phase could include assessing and nurturing (instead of assuming) local capacities with regards to technology use, especially in the absence of technical assistance. Teaching assistants and other support school personnel could be helpful allies.

### 9.3.2 Effectiveness of the programme

Following the working concept of dialogic teaching (see Section 9.1), the programme sought for teachers: to enrich their noticing of classroom dialogue; to learn about the concept; to construct classroom ground rules to support a dialogic classroom culture (Mercer & Littleton, 2007); and to engage in whole-class dialogue, increasing student involvement in providing extended contributions, deepening their ideas and listening and thinking with others (Alexander, 2018; Chapin et al., 2009). Chapters 7 and 8 assessed these goals in Araucaria and Boldo schools, with different degrees of success.

The most successful aspects include teachers' noticing, whereby participants' attention focused more on dialogue, especially regarding participants and aspects specific to mathematics. In turn, participants' understanding of dialogic teaching was in line with the programme and was

seen as involving the creation of an inclusive space for students, a joint construction, the expression and deepening of participants' thinking, and to a lesser degree, involving reflection. More inclusive and symmetrical participation was apparent in the significant increase of lesson time with high student participation, and in teachers' reports of promoting such participation, as well as their observations of a more supportive and reciprocal environment in their classrooms. Indications of sustainability, depth and breadth of these changes (Coburn, 2003) were found in participants' willingness and ability to continue with dialogic practices across subjects.

In terms of teachers' orchestration of classroom discussions and students' involvement through sharing and engaging with others' ideas, evidence shows mixed results. Significant progress was made in invitations to elaborate and elaborations of ideas by teachers and students, as well as in high participation, and more time was spent on tasks devoted to constructing and formulating solutions as opposed to practising skills. However, there were no significant changes in querying of ideas, invitations to reason or in turns coded 'reasoning'. Nor were aspects such as argumentation or positioning prominent in participants' understanding of dialogue. This indicates that the aspects of challenging as a way of deepening ideas did not improve substantially.

Possible explanations for this change pattern were discussed in Chapter 8, and they match results of previous programmes that show that opening up the space for dialogue through, for instance, open invitations appears more achievable than other aspects such as coordination of positions or critique (Hennessy & Davies, 2020; Vrikki, Wheatley et al., 2019). However, both aspects are central to current understandings of dialogic teaching and it is not necessarily desirable that teachers finish TPD programmes with a view of dialogue that is confined to building on without critique. That is, accountability to knowledge and reasoning are also necessary to develop understanding (Michaels et al., 2008). It is highly likely that dialogic teaching in general, and these aspects of dialogue in particular, need more time to develop, especially if considered a pedagogy with its complexities (Osborne, 2015). This would create the need for a longer programme, incorporating more reflective cycles. The question of whether a peer-facilitated approach would suffice in promoting these aspects of dialogue remains unanswered.

In any case, we should pay attention to phasing, that is, the order in which contents and their application were presented (Sedova et al., 2016). From this study it could be suggested that, especially where classroom climate is problematic, the elaborative and inclusive aspects of dialogue may be suitable to start with, and they should thus precede the focus on more critical exchanges. This topic should be the focus of further study and debate. More generally, the idea of 'chunking' aspects of dialogue to make it more manageable in TPD has indeed been put forward based on theoretical considerations and empirical research (Howe et al., 2019; Osborne, 2015).

This is not to say that dialogic teaching should be reduced to a series of strategies, but rather that different elements could be learnt progressively to manage the complexity of the endeavour.

Finally, an emerging topic that was not contemplated in the TPD design was that of (problematic) classroom climate, which was salient across datasets. Climate problems are widespread in Chile, where teachers report frequently managing student behaviour (OECD, 2019b, 2019a) and where effective management has been found to impact achievement beyond the quality of interactions and lesson structure (Gazmuri et al., 2015). This research contributes by highlighting how important classroom climate can be for dialogic teaching, especially when it is found lacking. Most teachers reported that their involvement in classroom dialogue improved classroom environment, especially the aspects related to ground rules and making room for students' ideas through better questioning and more inclusive participation. These are promising results, showing that dialogic teaching can help address climate issues (Hennessy et al., 2016 also found positive effects of interactive teaching in Zambia). While the connection between the two aspects seems logical, it has not been systematically studied before, perhaps because they are less problematic in developed countries (OECD, 2019b). At least in contexts where it is an issue, future TPD could include the topic explicitly, addressing its relationship with dialogue and possibly including observation or assessment tools to support participants' reflection and action.

### 9.3.3 Emerging messages for TPD policy

Some messages related to school-run TPD can be drawn from the examination of the programme's viability considering its potential impact. These will be linked to the Chilean context, where the programme was implemented. Currently, the teaching career is undergoing a major reform involving school-based TPD, with institutions having the chance to develop and/or implement programmes tailored to their needs (Treviño, 2018), which makes this research timely. Beyond this project, in the coming years Chile will become a laboratory for school-run TPD, making it a fertile soil for future studies.

With regards to participants, including a relatively small number of teachers in each group proved fruitful and manageable for facilitators, but opportunities for scaling up within schools could include several parallel groups, or starting with a smaller group and later expanding to the whole staff (Hennessy et al., 2016). Roles would deserve consideration as well. Given the centrality of local leaders' TPD priorities, monitoring and support for viability, their involvement should be carefully considered, including opportunities for learning and guidance on how to support implementation. The policy should contemplate the pivotal role of facilitators, including appropriate induction and built-in support that they would require to develop in their new functions, and adequate planning and implementation time should be secured. The role of the

research team, including TPD design, induction, and support, would have to be reimagined. Universities and TPD agencies could act as designers in partnership with the Ministry and schools<sup>52</sup>. Their task would be to create contents and guidelines that would be adequately informed by evidence and the local curriculum while remaining applicable and adaptable to different contexts. Researching viability as proposed here would be crucial in understanding the process of scaling and could feed back to programme design. Meanwhile, in the implementation, induction and support could be provided by designers, by local ministerial staff and, in time, by experienced local facilitators.

## 9.4 DISCUSSION OF KEY RESEARCH TOPICS

### 9.4.1 Viability in the context of scale

This research aimed to address the need for scalable solutions that can help promote dialogic teaching more widely. It was proposed that this should be included in TPD design from the onset, building scalable features into the programmes while keeping cumulateness and effectiveness in sight. The latter two aspects were researched considering aspects of impact that were relevant to the study's definition of dialogic teaching, namely understanding of dialogue and changes in professional practice. The consideration of scalable features, in turn, involved examining traditional roles and decision-making power in researcher-led TPD, proposing increased school ownership and reduced external support. In this context, deciding on appropriate concepts for studying implementation was crucial.

In previous studies, an important distinction is established between fidelity and adaptation, and tensions between the two elements in implementation were discussed in Chapter 2. While it is acknowledged that fidelity is important to achieve programme outcomes, adaptations that take into account local realities or facilitators' impressions can be conducive if they are aligned with programme goals (Ogden & Fixen, 2014). To this, Borko (2004) adds that sufficient alignment is important, especially regarding core components. However, determining what counts as sufficient is not unproblematic, and what is core to an intervention depends on its goals and characteristics. In turn, Hubers (2020) raises concerns that resonate with this research. She finds flaws in both fidelity and adaptation in the study of sustainable educational change. In lack of

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<sup>52</sup> Along these lines, in 2019 I held a meeting with professionals working in the development of the relevant policies in the Ministry of Education to share some of the learnt lessons of this project. They had not encountered similar research in Chile, and they were particularly interested in the roles of facilitators and leaders, their experiences and the difficulties we encountered. Such roles will be crucial in the reform, and their concerns included how to select, prepare and support practitioners who would assume these new responsibilities so that implementation was sustainable in time. While no further collaboration was pursued, the alignment between their concerns and the present research questions shows that such partnerships could be fruitful.

adequate knowledge about why programmes work, focusing on fidelity overemphasises adherence to a pre-defined model, failing to determine ‘allowable deviation’ (p. 5), whereas stressing adaptation loses sight of the changes, making it hard to assess TPD. More generally, both aspects remain focused on the programme at hand, and Hubers (2020) suggests shifting the interest of sustainability studies to schools, considering change and learning.

Beyond the concepts’ internal limitations, their appeal is greater where tight replication is desirable, for instance in the context of an RCT. While RCTs have an important place in advancing our knowledge of TPD for dialogic teaching and its effects (see Alexander, 2018), this research suggests that there are other, complementary forms of TPD research that show promise. In such situations, local ownership is necessary and valuable (Segal et al., 2018). To go beyond the fidelity/adaptation tension, this research proposed a tentative concept of viability. It is understood as the degree to which it is feasible to implement a design in different settings, including considerations of integrity and adaptations as well as enactment of activities and roles and their interaction with emerging constraints. The concept helped to build, and was further informed by, an overall viability model for the programme applied to three sites, showing that dialogic teaching can be promoted through the proposed approach, provided certain local factors are present.

The concept might be informative in future studies of (scalable) TPD implementation in a few ways. Firstly, the focus on feasibility can help to understand the affordances of the selected built-in scalable features. In this context, conditions and constraints for feasibility and local interpretations and adaptations that maximise it are of the highest importance and are likely to be obscured by studying fidelity alone. The resulting concern would not be whether something was correctly applied, but how it could be used (and usable) in different contexts. This is even more important when school-run initiatives employ more flexible tools, providing a set of alternatives for schools and participants to choose from (T-SEDA being an example, see Hennessy et al. forthcoming). In these cases, viability can be fruitful in capturing variations and illuminating our understanding of teachers’ professional growth pathways.

Secondly, especially in the development and initial trials of TPD programmes like the one at hand, dealing with viability can help explore the applicability of theoretically core components beyond the dichotomous question of fidelity, feeding back to programme design (Hill et al., 2013). Following Hubers (2020), this fruitfully shifts the focus from the programme to the school. Thirdly, the critical examination of roles as part of the study of implementation is fundamental for scalability, since implementation capacity is what needs to be scaled up (Ogden & Fixen 2014), and transforming roles is a crucial part of change in an activity system (Feldman & Weiss, 2010). Considering the different roles in successive phases and from the standpoint of

local constraints and possibilities, showed that the roles initially envisioned were richer and more complex in reality, that they changed over time, and that different pathways or constellations of factors could still result in viable implementation.

Taking viability into account in the study of scalable TPD will require that, alongside questions of effectiveness that consider participants' learning (in this case, of dialogic teaching), the conditions and adjustments that lead to feasibility of the new roles and TPD practices are researched. The links between the emerging forms of implementation and effectiveness should also be examined, considering the ability of TPD to reach its goals. In this sense, viability could be conceived as a precondition of the aspects of scale proposed by Coburn (2003), that is, sustainability, breath, depth and ownership. Some indications of scale were indeed observed where the programme was viable, however, a longer span of TPD and research would be necessary to explore the potential and implications of these connections more fully. Future research could also explore the applicability and potential of the selected scalable features in other contexts, especially in more favourable conditions than Chilean schools in terms of teachers' time and experiences with collaborative TPD, among other elements. Other scalable features (such as more flexible designs) could be identified and trialled retaining the focus on viability.

#### 9.4.2 Peer facilitation

The study of viability of this school-run approach showed that facilitators were the key actors in the implementation process. It was suggested that their actions differed to some extent from those of external expert facilitators. The way in which these differences are interpreted depends on the idea of facilitation at hand, and in Chapter 6, two possible avenues were identified: taking external expert facilitation as the benchmark, or (re)conceptualising peer facilitation as rather different from it. The former idea has been predominant in the literature and influenced in part the design of this study. Its logical implication is developing novice/peer facilitators' knowledge and skills to equate those of experts, which has been addressed by programmes that directly engage experts with prospective facilitators, usually over several years. It has been done with relative success considering facilitators' actions in mathematics-focused TPD with small (Borko et al., 2014) and medium-sized samples (Elliott et al., 2009), however noting outstanding difficulties in mediating content-focused discussions. Some recent large-scale initiatives worked with districts and over twenty facilitators, achieving changes in participating teachers' knowledge and self-efficacy (see Carney et al., 2019, in mathematics), and their beliefs (see Reiser et al., 2017, in science), albeit facilitation was not analysed.

Still, evidence of how to develop the knowledge of TPD implementers and what their actions ought to be remains admittedly limited (Carney et al., 2019; Elliott et al., 2009).



Furthermore, these designs impose restrictions on scalability related to costs and reliance on external resources, although to a lesser degree than 'boutique designs' considering that new facilitators can importantly multiply a programme's impact. In any case, their costs and intensiveness make them appropriate for large-scale educational initiatives (Carney et al., 2019).

In this programme, the approach was much more modest, with a brief induction, independent implementation with built-in guidance and some ongoing support to maximise scalability in the absence of more substantial resources. The goal was to trial a suitable alternative for scaling up TPD where resources and expertise like the ones described above were absent. Considering that professional growth can be achieved through multiple pathways (D. Clarke & Hollingsworth, 2002), it is possible that there is more than one constellation of stimuli, including facilitation actions and learning activities, that can support it in school-based settings. Along these lines, this research found that the roles and implementation of core components were viable under certain conditions, achieving important effects where it was feasible. Thus, the idea that peer facilitation could be conceptualised as having unique features that make it worthwhile deserves consideration. Emerging results from this research relate to overall engagement with the role (ownership) and enactment of the role in learning settings (mediation and co-learning).

Ownership of the role was identified as one of the aspects that determined viability, meaning that teachers saw themselves as suitable for and capable of sustaining the TPD. Thus, it appears that some degree of differentiation from peers is necessary to adopt the role. What supports and characterises this sense of ownership? In this case, it was at least in part linked with the selection of facilitators due to their existing positions as informal leaders among colleagues. A related aspect was their commitment to completing the programme and 'doing things well', showing that a sense of professional responsibility could be important too. Thus, ownership could be anchored in existing leadership competencies and a related professional identity (see also Carney et al., 2019).

In addition, ownership can be grounded in opportunities for practice that provide additional reassurance and build self-efficacy, in this case involving the induction and initial contact with the programme ideas and materials, and some preparation time for each session. However, Haßler et al. (2018) argue that peer facilitators should have opportunities to trial new approaches in their teaching first, and only then guide others. While the timeline of this programme did not afford such occasions, their benefits could be studied further, establishing their potential in conjunction with the other elements. It is possible that this could have helped facilitators in Canelo School to become more comfortable in the role. Another productive design feature in establishing facilitators' position is the decision power to make at least some decisions about the programme (Berkel et al., 2011). This was done in the initial negotiation of programme

materials and contents, and in the adaptation of TPD tasks. In the sessions, their function in managing and guiding tasks further aided this distinction. Thus, a combination of guidance that supports role enactment and room for deciding upon adaptations appear to further local appropriation (Haßler et al., 2018; Segal et al., 2018).

A finding that could be seen as contradictory was the admittedly necessary presence of support and/or pressure exerted by leadership teams and researchers. This hints that the programme and the role were still seen as external (the researcher's initiative and/or the leadership's agenda) to some degree. The implication is that alongside ownership, some external influence could still be needed to sustain implementation, at least initially (Haßler et al., 2018). In this sense, ownership in peer facilitation could be understood as evolving throughout implementation and shaped by teachers' characteristics, opportunities for enactment and external influences. The implications of this understanding of the role should be researched further to confirm the importance of the identified preconditions and processes and uncover other factors.

Within TPD sessions, facilitators' function was dual, in that they were both leaders and learners. To understand the functions and potential of the role, it is important to revisit the definition of teacher learning used in this research. Teacher professional learning was conceived as growth that connects multiple domains including the personal domain (knowledge, beliefs), practices (noticing, teaching) and salient outcomes, through processes of reflection, enaction and dissonance (D. Clarke & Hollingsworth, 2002; Opfer & Pedder, 2011). These processes were meant to be supported through the introduction of new strategies and reflection on theory and practice (M. M. Kennedy, 2016).

How can peer facilitators support these processes for their peers and themselves as learners? An important aspect is the establishment of a safe learning environment, actively creating a collegial atmosphere involving empathy and humour. In this case, it emerged that closeness between peers was appreciated and perhaps enabled a less formal context for exchanges, compared to an externally-run TPD. In turn, this space allows for others, and facilitators themselves, to open up about their teaching experiences and share their classrooms (in this case through video), providing occasions for reflection and examination of practice. The tasks and materials can serve the function of introducing new contents, as well as providing templates and guidance to structure professional experimentation and enaction of new practices, presented and commented by facilitators. In completing the proposed tasks, peer facilitators can shape the conversation by sustaining the group's focus, inviting, pressing and summarising. These actions might resemble those of expert facilitators. An important difference is that when they are learning about the topic as well, by sharing their own experiences and building on their colleagues' contributions a sense of symmetry is created, that has been found harder to emulate

in expert-led settings (Lefstein & Snell, 2011b). Furthermore, a peer-facilitator's knowledge of the local context allows them to make connections to the materials and explore limitations of the approach, perhaps increasing authenticity and relevance in the process of enaction. Therefore, closeness between participants and shared knowledge of their teaching realities appear as distinctive and possibly advantageous characteristics of peer facilitation.

It is worth noting that, alongside ownership, mediation and co-learning, a pre-condition for the success of peer facilitation could relate to the school's positive working climate. There were indications of this in Araucaria and Boldo Schools: teachers who were appointed facilitators were highly regarded by their peers, who appeared willing to follow them in their new role. In Canelo School, in turn, conflicts among staff emerged during the year, possibly hindering the chances of success of the programme (in the absence of other supporting factors).

Of course, having a local non-expert guide the conversation is not without perils, and two important aspects should be noted. First, the risk of the programme goals being implemented superficially or even misunderstood to the degree that they no longer represent the designers' intentions could be increased. The problem of participants' superficial or formulaic adoption is not exclusive to peer-facilitated programmes and it has been noted before with regards to dialogic teaching (Hofmann & Ruthven, 2018). It appears that, in expert-led TPD, this aspect can be linked to content-focused conversations and it hinges on facilitators' knowledge of the approach, and on their ability to steer conversations towards specific programme goals (Asterhan & Babichenko, 2019; Carney et al., 2019; Elliott et al., 2009). This is reportedly challenging for peer-facilitators that have extensive preparation as well (Borko et al., 2014; Elliott et al., 2009). Second, it is possible that it is harder for peers to challenge existing practices among colleagues, given their shared horizon of what is possible and desirable, which is precisely what should come into question (Rainio & Hofmann, 2015). Yet, sustaining the tensions between established norms and practices and the new approach is key for learning (Hennessy et al., 2016), especially when a whole pedagogical approach is being promoted.

These appear to be the most challenging aspects of defining peer facilitation as distinctive and viable for meaningful TPD, given that non-expert facilitators that do not undergo extensive training are unlikely to have such deep knowledge, nor have enough distance from their own context from the onset. In this sense, supporting facilitators' 'critical alignment' with local practices would be decisive (Jaworski, 2006) so that they can sustain an openness towards the new approach that helps them, and others, learn. This would require a combination of built-in facilitator guidance and opportunities for reflection about their role, alongside tasks and prompts that offer chances to experience dissonance coming from examples of practice, exploration in their own settings and questioning of the new practices and their significance in their context

(Haßler et al., 2018). Although not part of this programme, self-auditing tools for participants to examine the application of changes could be important scaffolds as well, making applicable expert knowledge more available for all involved (e.g. Hennessy et al., 2019).

This work suggested that peer facilitation could be conceptualised as different from expert facilitation, which would be especially relevant for the goal of reaching scalable TPD solutions. This idea needs to be substantiated with further evidence describing their role, considering the features outlined here as well as different or complementary ones. These elements should be empirically connected to facilitators' and their peers' learning as a result of TPD in more specific ways than this study allowed. Furthermore, the consequences of the dual leader-learner role for facilitators' change pathways should be explored. Enriching our understanding of what makes the role distinctive should have implications for programme design considering the type of initial and ongoing support that would be required in different contexts. Another important area would be developing criteria to assess the quality of peer facilitation to aid practitioners and researchers to generate better opportunities for peer-facilitators' and teachers' learning.

## 9.5 CONCLUDING REMARKS

When I embarked in this project, I wished to explore to what degree teachers could lead their own learning groups as a way of making TPD more sustainable and scalable in schools. This interest came in part from the fact that resources for professional development in Chile are relatively scarce and affordable solutions to the problem of continuous development appeared necessary. Moreover, this was an innovative way to promote dialogic teaching through TPD, and one that has been considered a current necessity by proponents in the field (Hennessy & Davies, 2020; Khong et al., 2017; Osborne, 2015). In that way, this research contributes to the still scarce literature about TPD implementation in multiple schools and the role that different contexts and facilitators play in it (Borko, 2004).

Having conducted the research, it appears that the path taken has promise in fostering dialogue through this reduced support approach. Nonetheless, the approach's interest does not only come from cutting costs and making dialogic teaching more readily available. Choosing a teacher-led and school-run design also speaks to a view of the teaching profession, which transpired from participants and came up throughout the project: Teachers can and should be protagonists in their learning, enriching their practice through local collaboration and dialogue.

## REFERENCES

- Agencia de Calidad de la Educación. (2017). *Informe Resultados Educativos Educación Básica Docentes y Directivos 2016*.
- Alexander, R. (2004). Still no pedagogy? Principle, pragmatism and compliance in primary education. *Cambridge Journal of Education*, 34(1), 7–33.  
<https://doi.org/10.1080/0305764042000183106>
- Alexander, R. (2008). *Towards Dialogic Teaching: Rethinking Classroom Talk* (4th Edition). Dialogos.
- Alexander, R. (2009). Towards a comparative pedagogy. In *International handbook of comparative education* (pp. 923–939). Springer. [http://link.springer.com/chapter/10.1007/978-1-4020-6403-6\\_59](http://link.springer.com/chapter/10.1007/978-1-4020-6403-6_59)
- Alexander, R. (2010). Speaking but not listening? Accountable talk in an unaccountable context. *Literacy*, 44(3), 103–111. <https://doi.org/10.1111/j.1741-4369.2010.00562.x>
- Alexander, R. (2015). Dialogic Pedagogy at Scale: Oblique Perspectives. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 429–440). American Educational Research Association.
- Alexander, R. (2018). Developing dialogic teaching: Genesis, process, trial. *Research Papers in Education*, 33(5), 561–598. <https://doi.org/10.1080/02671522.2018.1481140>
- Alexander, R. (2020). *A dialogic teaching companion*. New York, NY: Routledge.
- Alexander, R., Hardman, F., & Hardman, J. (2017). *Changing Talk, Changing Thinking: Interim report from the in-house evaluation of the CPRT/UoY Dialogic Teaching Project*. <https://www.robinalexander.org.uk/wp-content/uploads/2017/07/Alexander-et-al-EEF-in-house-interim-report-final-170714.pdf>

- Alles, M., Seidel, T., & Gröschner, A. (2019). Establishing a positive learning atmosphere and conversation culture in the context of a video-based teacher learning community. *Professional Development in Education*, 45(2), 250–263. <https://doi.org/10.1080/19415257.2018.1430049>
- Alrø, H., & Skovsmose, O. (2002). *Dialogue and Learning in Mathematics Education: Intention, Reflection, Critique*. Springer.
- Amodia-Bidakowska, A. (n.d.). *Lesson Activity Coding Scheme*.
- Applebee, A. N., Langer, J. A., Nystrand, M., & Gamoran, A. (2003). Discussion-Based Approaches to Developing Understanding: Classroom Instruction and Student Performance in Middle and High School English. *American Educational Research Journal*, 40(3), 685–730. <https://doi.org/10.3102/00028312040003685>
- Araya, R., & Dartnell, P. (2009). *Saber pedagógico y conocimiento de la disciplina matemática en docentes de educación general básica y media*. (Selección de Investigaciones Primer Concurso FONIDE). Ministerio de Educación.
- Asterhan, C. S. C., & Babichenko, M. (2019, February). Productive dialogue in the staffroom: Moving from the study of student argumentation to peer-led, teacher dialogue in Professional Learning Communities. Better learning through argumentation symposium, Brno, Czech Republic.
- Asterhan, C. S. C., & Schwarz, B. B. (2016). Argumentation for Learning: Well-Trodden Paths and Unexplored Territories. *Educational Psychologist*, 51(2), 164–187. <https://doi.org/10.1080/00461520.2016.1155458>
- Baines, E., Blatchford, P., & Chowne, A. (2007). Improving the effectiveness of collaborative group work in primary schools: Effects on science attainment. *British Educational Research Journal*, 33(5), 663–680. <https://doi.org/10.1080/01411920701582231>
- Bakhtin, M. M. (1981). *The Dialogic Imagination: Four Essays*. University of Texas Press.

- Bakhtin, M. M. (1984). *Problems of Dostoevsky's Poetics* (C. Emerson, Trans.). University of Minnesota Press.
- Bakhtin, M. M. (2004). Dialogic origin and dialogic pedagogy of grammar: Stylistics in teaching Russian language in secondary school. *Journal of Russian & East European Psychology*, 42(6), 12–49. <https://doi.org/10.1080/10610405.2004.11059233>
- Bakker, A., Smit, J., & Wegerif, R. (2015). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM*, 47(7), 1047–1065. <https://doi.org/10.1007/s11858-015-0738-8>
- Ball, D. (1991). What's All this Talk About "Discourse"? *The Arithmetic Teacher*, 39(3), 44–48.
- Ball, D., & Schroeder, T. L. (1992). Improving Teaching, Not Standardizing It. *The Mathematics Teacher*, 85(1), 67–72.
- Bellei, C., Contreras, D., & Valenzuela, J. P. (Eds.). (2008). *La agenda pendiente en educación: Profesores, administradores y recursos: propuesta para la nueva arquitectura de la educación chilena*. Universidad de Chile; Fondo de las Naciones Unidas para la Infancia UNICEF.
- Bellei, C., Muñoz, G., Rubio, X., Alcaíno, M., Donoso, M. P., Martínez, J., de la Fuente, L., del Pozo, F., & Díaz, R. (2018). *La Nueva Educación Pública. Contexto, contenidos y perspectivas de la desmunicipalización*. Lom.
- Bellei, C., Raczynski, D., & Osses, A. (2010). ¿Qué hemos aprendido sobre programas de Asistencia Técnica Educativa? Análisis colectivo de los estudios de caso. In C. Bellei (Ed.), *Asistencia técnica educativa ¿aporte al mejoramiento escolar?* (pp. 31–76). Ocho Libros.
- BERA. (2011). *Ethical Guidelines for Educational Research*. <https://www.bera.ac.uk/wp-content/uploads/2014/02/BERA-Ethical-Guidelines-2011.pdf>
- Berkel, C., Mauricio, A. M., Schoenfelder, E., & Sandler, I. N. (2011). Putting the Pieces Together: An Integrated Model of Program Implementation. *Prevention Science*, 12(1), 23–33. <https://doi.org/10.1007/s11121-010-0186-1>

- Black, L., & Radovic, D. (2018). Gendered Positions and Participation in Whole Class Discussions in the Mathematics Classroom. In U. Gellert, C. Knipping, & H. Strachler-Pohl (Eds.), *Inside the Mathematics Class* (pp. 269–289). Springer. [https://doi.org/10.1007/978-3-319-79045-9\\_13](https://doi.org/10.1007/978-3-319-79045-9_13)
- Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher*, 33(8), 3–15. <https://doi.org/10.3102/0013189X033008003>
- Borko, H., Jacobs, J., Eiteljorg, E., & Pittman, M. E. (2008). Video as a tool for fostering productive discussions in mathematics professional development. *Teaching and Teacher Education*, 24(2), 417–436. <https://doi.org/10.1016/j.tate.2006.11.012>
- Borko, H., Koellner, K., & Jacobs, J. (2014). Examining novice teacher leaders' facilitation of mathematics professional development. *The Journal of Mathematical Behavior*, 33(March), 149–167. <https://doi.org/10.1016/j.jmathb.2013.11.003>
- Borko, H., Koellner, K., Jacobs, J., & Seago, N. (2011). Using video representations of teaching in practice-based professional development programs. *ZDM*, 43(1), 175–187. <https://doi.org/10.1007/s11858-010-0302-5>
- Boyd, M., & Markarian, W. C. (2011). Dialogic teaching: Talk in service of a dialogic stance. *Language and Education*, 25(6), 515–534. <https://doi.org/10.1080/09500782.2011.597861>
- Boyd, M., Mykula, V., & Choi, Y. (2019). Responsive and responsible teacher telling: An across time examination of classroom talk during whole group writing workshop minilessons. *Research Papers in Education*, 1–29. <https://doi.org/10.1080/02671522.2019.1601761>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brissenden, T. (1988). *Talking About Mathematics*. Simon & Schuster Education.
- Brownlee, J. L., Ferguson, L. E., & Ryan, M. (2017). Changing Teachers' Epistemic Cognition: A New Conceptual Framework for Epistemic Reflexivity. *Educational Psychologist*, 52(4), 242–252. <https://doi.org/10.1080/00461520.2017.1333430>



- Bryman, A. (2007). Barriers to Integrating Quantitative and Qualitative Research. *Journal of Mixed Methods Research*, 1(1), 8–22. <https://doi.org/10.1177/2345678906290531>
- Bryman, A., Becker, S., & Sempik, J. (2008). Quality Criteria for Quantitative, Qualitative and Mixed Methods Research: A View from Social Policy. *International Journal of Social Research Methodology*, 11(4), 261–276. <https://doi.org/10.1080/13645570701401644>
- Butler, D. L., Lauscher, H. N., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and self-regulation in teachers' professional development. *Teaching and Teacher Education*, 20(5), 435–455. <https://doi.org/10.1016/j.tate.2004.04.003>
- Calcagni, E., Grau, V., Hayes, B., Gómez, D., Ortiz, D., & Preiss, D. D. (2013). *Talking about thinking: Developing teacher reflection in a community of learners using classroom videos*. 15th Biennial Conference of the European Association for Learning and Instruction, Munich, Germany.
- Calcagni, E., & Lago, L. (2018). The Three Domains for Dialogue: A framework for analysing dialogic approaches to teaching and learning. *Learning, Culture and Social Interaction*, 18(September), 1–12. <https://doi.org/10.1016/j.lcsi.2018.03.001>
- Calderhead, J. (1981). Stimulated recall: A method for research on teaching. *British Journal of Educational Psychology*, 51(2), 211–217. <https://doi.org/10.1111/j.2044-8279.1981.tb02474.x>
- Cardemil, C. (2002). Prácticas de enseñanza y aprendizaje en las aulas de enseñanza básica: Una cuenta pendiente de la reforma educativa en Chile. *Revista Digital UMBRAL 2000*, 9(Mayo), 1–26.
- Carney, M. B., Brendefur, J. L., Hughes, G., Thiede, K., Crawford, A. R., Jesse, D., & Smith, B. W. (2019). Scaling professional development for mathematics teacher educators. *Teaching and Teacher Education*, 80, 205–217. <https://doi.org/10.1016/j.tate.2019.01.015>
- Cazden, C. B. (2001). *Classroom Discourse: The Language of Teaching and Learning* (2nd Revised edition edition). Heinemann Educational Books, U.S.

- Centro de Estudios MINEDUC. (2012a). *Medidas de segregación escolar: Discusión para el caso chileno*. (Serie Evidencias).  
[http://centroestudios.mineduc.cl/tp\\_enlaces/portales/tp5996f8b7cm96/uploadImg/File/A1N12\\_Segregacion.pdf](http://centroestudios.mineduc.cl/tp_enlaces/portales/tp5996f8b7cm96/uploadImg/File/A1N12_Segregacion.pdf)
- Centro de Estudios MINEDUC. (2012b). *Realidad educativa en Chile: ¿Qué aprendemos de la Encuesta CASEN 2011?* (Serie Evidencias).  
[http://centroestudios.mineduc.cl/tp\\_enlaces/portales/tp5996f8b7cm96/uploadImg/File/A10N1\\_Casen.pdf](http://centroestudios.mineduc.cl/tp_enlaces/portales/tp5996f8b7cm96/uploadImg/File/A10N1_Casen.pdf)
- Centro de Estudios MINEDUC. (2015). *Variación de matrícula y tasas de permanencia por sector*. Ministerio de Educación.  
[http://centroestudios.mineduc.cl/tp\\_enlaces/portales/tp5996f8b7cm96/uploadImg/File/Evidencias/Evidencias%20final\\_julio\\_2015.pdf](http://centroestudios.mineduc.cl/tp_enlaces/portales/tp5996f8b7cm96/uploadImg/File/Evidencias/Evidencias%20final_julio_2015.pdf)
- Chapin, S. H., O'Connor, C., & Anderson, N. C. (2009). *Classroom Discussions: Using Math Talk to Help Students Learn* (2nd Edition). Math Solutions.
- Chazan, D., & Ball, D. (1999). Beyond Being Told Not to Tell. *For the Learning of Mathematics*, 19(2), 2–10.
- Cisternas, T. (2011). La investigación sobre formación docente en Chile: Territorios explorados e inexplorados. *Calidad En La Educación*, December(35), 131–164.  
<https://doi.org/10.4067/S0718-45652011000200005>
- Clarke, D. (2006). Using international research to contest prevalent oppositional dichotomies. *ZDM*, 38(5), 376–387. <https://doi.org/10.1007/BF02652799>
- Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education*, 18(8), 947–967. [http://dx.doi.org/10.1016/S0742-051X\(02\)00053-7](http://dx.doi.org/10.1016/S0742-051X(02)00053-7)

- Clarke, S. N. (2015). The Right to Speak. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 167–180). American Educational Research Association.
- Cobb, P., Stephan, M., McClain, K., & Gravemeijer, K. (2001). Participating in Classroom Mathematical Practices. *The Journal of the Learning Sciences*, *10*(1/2), 113–163. [https://doi.org/10.1207/S15327809JLS10-1-2\\_6](https://doi.org/10.1207/S15327809JLS10-1-2_6)
- Cobb, P., Yackel, E., & Wood, T. (1992). Interaction and learning in mathematics classroom situations. *Educational Studies in Mathematics*, *23*(1), 99–122. <https://doi.org/10.1007/BF00302315>
- Coburn, C. E. (2003). Rethinking Scale: Moving Beyond Numbers to Deep and Lasting Change. *Educational Researcher*, *32*(6), 3–12. <https://doi.org/10.3102/0013189X032006003>
- Cochran-Smith, M., & Lytle, S. (1999). Relationships of Knowledge and Practice: Teacher Learning in Communities. *Review of Research in Education*, *24*(1), 249–305. <https://doi.org/10.3102/0091732X024001249>
- Cochran-Smith, M., & Lytle, S. (2009). *Inquiry as Stance: Practitioner Research for the Next Generation*. Teachers College Press.
- Cofré, H., Camacho, J., Galaz, A., Jiménez, J., Santibáñez, D., & Vergara, C. (2010). La educación científica en Chile: Debilidades de la enseñanza y futuros desafíos de la educación de profesores de ciencia. *Estudios Pedagógicos (Valdivia)*, *36*(2), 279–293. <https://doi.org/10.4067/S0718-07052010000200016>
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th Edition). Routledge.
- Coles, A. (2012). Using video for professional development: The role of the discussion facilitator. *Journal of Mathematics Teacher Education*, *16*(3), 165–184. <https://doi.org/10.1007/s10857-012-9225-0>

- Cox, C., Meckes, L., & Bascopé, M. (2011). La institucionalidad formadora de profesores en Chile en la década del 2000: Velocidad del mercado y parsimonia de las políticas. *Pensamiento Educativo*, 46(1), 205–245.
- CPEIP. (2008). *Marco para la buena enseñanza* (7 Edition). Ministerio de Educación [MINEDUC].
- Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. *Theory Into Practice*, 39(3), 124–130. [https://doi.org/10.1207/s15430421tip3903\\_2](https://doi.org/10.1207/s15430421tip3903_2)
- Dawes, L., Wegerif, R., & Mercer, N. (2000). Thinking Together: A Programme of Activities for Developing Speaking, Listening and Thinking Skills for Children Aged 8-11 (2nd Revised Edition). Imaginative Minds.
- Desimone, L. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher*, 38(3), 181–199. <https://doi.org/10.3102/0013189X08331140>
- Díez-Palomar, J., & Olivé, J. C. (2015). Using dialogic talk to teach mathematics: The case of interactive groups. *ZDM*, 47(7), 1299–1312. <https://doi.org/10.1007/s11858-015-0728-x>
- Dobie, T. E., & Anderson, E. R. (2015). Interaction in teacher communities: Three forms teachers use to express contrasting ideas in video clubs. *Teaching and Teacher Education*, 47(April), 230–240. <https://doi.org/10.1016/j.tate.2015.01.003>
- Domínguez, M., Bascopé, M., Meckes, L., & San Martín, E. (2012). ¿Producen mejores resultados las carreras de pedagogía básica con más años de acreditación? *Estudios Públicos*, 128(Primavera), 1–59.
- Donoso, S. (2008). Políticas de perfeccionamiento de los docentes en Chile 1990 – 2005: Silencios y proyecciones. In C. Bellei, D. Contreras, & J. P. Valenzuela (Eds.), *La agenda pendiente en educación: Profesores, administradores y recursos: Propuesta para la nueva arquitectura de la educación chilena* (pp. 79–104). Universidad de Chile; Fondo de las Naciones Unidas para la Infancia UNICEF.

- Durlak, J. A., & DuPre, E. P. (2008). Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. *American Journal of Community Psychology, 41*(3–4), 327. <https://doi.org/10.1007/s10464-008-9165-0>
- Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelley-Petersen, M. (2009). Conceptualizing the Work of Leading Mathematical Tasks in Professional Development. *Journal of Teacher Education, 60*(4), 364–379. <https://doi.org/10.1177/0022487109341150>
- Espinoza, A. M. (2014). Patrones instruccionales y pedagogías intuitivas de profesores de lenguaje y comunicación de escuelas municipales chilenas. [Masters Dissertation]. Pontificia Universidad Católica de Chile.
- Espinoza, A. M., & Taut, S. (2016). El Rol del Género en las Interacciones Pedagógicas de Aulas de Matemática Chilenas. *Psykhé, 25*(2), 1–18. <https://doi.org/10.7764/psykhe.25.2.858>
- Espinoza, O. (2014). *Cambios recientes al curriculum escolar: Problemáticas e interrogantes* (No. 18; Notas Para Educación). Centro de Estudios de Políticas y Prácticas en Educación.
- Evans, L. (2002). What is Teacher Development? *Oxford Review of Education, 28*(1), 123–137. <https://doi.org/10.1080/03054980120113670>
- Fang, Z. (1996). A review of research on teacher beliefs and practices. *Educational Research, 38*(1), 47–65. <https://doi.org/10.1080/0013188960380104>
- Feldman, A., & Weiss, T. (2010). Understanding change in teachers' ways of being through collaborative action research: A cultural–historical activity theory analysis. *Educational Action Research, 18*(1), 29–55. <https://doi.org/10.1080/09650790903484517>
- Felton, M., Garcia-Mila, M., & Gilabert, S. (2009). Deliberation versus Dispute: The Impact of Argumentative Discourse Goals on Learning and Reasoning in the Science Classroom. *Informal Logic, 29*(4), 417. <https://doi.org/10.22329/il.v29i4.2907>

- Fernández, M., Wegerif, R., Mercer, N., & Rojas-Drummond, S. (2002). Re-conceptualizing “Scaffolding” and the Zone of Proximal Development in the Context of Symmetrical Collaborative Learning. *The Journal of Classroom Interaction*, 36(2), 54–72.
- Fernández-Cárdenas, J. (2015). Dialogism: Sequentiality, positioning, plurality and historicity in the analysis of educational practice. *Sinéctica*, 43(Julio-Diciembre). [http://www.sinectica.iteso.mx/?seccion=articulo&lang=en&id=664\\_dialogism\\_sequentiality\\_positioning\\_plurality\\_and\\_historicity\\_in\\_the\\_analysis\\_of\\_educational\\_pract](http://www.sinectica.iteso.mx/?seccion=articulo&lang=en&id=664_dialogism_sequentiality_positioning_plurality_and_historicity_in_the_analysis_of_educational_pract)
- Finefter-Rosenbluh, I. (2016). Behind the scenes of reflective practice in professional development: A glance into the ethical predicaments of secondary school teachers. *Teaching and Teacher Education*, 60(November), 1–11. <https://doi.org/10.1016/j.tate.2016.07.028>
- Fisher, R., & Larkin, S. (2008). Pedagogy or Ideological Struggle?08/09/2020 09:23:00 An Examination of Pupils’ and Teachers’ Expectations for Talk in the Classroom. *Language and Education*, 22(1), 1–16. <https://doi.org/10.2167/le706.0>
- Fishman, B. J., Marx, R. W., Best, S., & Tal, R. T. (2003). Linking teacher and student learning to improve professional development in systemic reform. *Teaching and Teacher Education*, 19(6), 643–658. [https://doi.org/10.1016/S0742-051X\(03\)00059-3](https://doi.org/10.1016/S0742-051X(03)00059-3)
- Fishman, B. J., Penuel, W., Allen, A.-R., Cheng, B. H., & Sabelli, N. (2013). Design-Based Implementation Research: An Emerging Model for Transforming the Relationship of Research and Practice. *Yearbook of the National Society for the Study of Education*, 112(2), 136–156.
- Flick, U. (2014). *An Introduction to Qualitative Research* (5th Edition). Sage.
- Fullan, M. (2016). *The New Meaning of Educational Change* (5th Edition). Teachers College Press.
- García-Carrión, R., Martínez de la Hidalga, Z., & Villardón, L. (2016). Tertulias literarias dialógicas: Herramienta para una educación de éxito. *Padres y Maestros. Publicación de La*

*Facultad de Ciencias Humanas y Sociales*, 367, 42–47.  
<https://doi.org/10.14422/pym.i367.y2016.008>

- Gazmuri, C., Manzi, J., & Paredes, R. R. (2015). Disciplina, clima y desempeño escolar en Chile. *Revista CEPAL*, 115(Abril), 115–128.
- Gee, J. P., & Green, J. L. (1998). Discourse Analysis, Learning, and Social Practice: A Methodological Study. *Review of Research in Education*, 23, 119.  
<https://doi.org/10.2307/1167289>
- Givvin, K. B., Hiebert, J., Jacobs, J., Hollingsworth, H., & Gallimore, R. (2005). Are there national patterns of teaching? Evidence from the TIMSS 1999 Video Study. *Comparative Education Review*, 49(3), 311–343. <https://doi.org/10.1086/430260>
- González-Weil, C., Cortéz, M., Bravo, P., Ibaceta, Y., Cuevas, K., Quiñones, P., Maturana, J., & Abarca, A. (2012). La indagación científica como enfoque pedagógico: Estudio sobre las prácticas innovadoras de docentes de ciencia en EM (Región de Valparaíso). *Estudios Pedagógicos (Valdivia)*, 38(2), 85–102. <https://doi.org/10.4067/S0718-07052012000200006>
- Grau, V., Calcagni, E., & Preiss, D. D. (2015, August). *Teacher professional development using classroom videos: Effects on dialogic practices*. 16th Biennial Conference of the European Association for Learning and Instruction, Lymassol, Cyprus.
- Grau, V., Calcagni, E., Preiss, D. D., & Ortiz, D. (2017). Teachers' professional development through university–school partnerships: Theoretical standpoints and evidence from two pilot studies in Chile. *Cambridge Journal of Education*, 47(1), 19–36.  
<https://doi.org/10.1080/0305764X.2015.1102867>
- Grau, V., Muller, M., Calcagni, E., & Hayes, B. (2012). *Suspensión de la disposición crítica*.
- Greeno, J. (2015). Classroom Talk Sequences and Learning. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 255–262). American Educational Research Association.

- Gröschner, A., Seidel, T., Kiemer, K., & Pehmer, A.-K. (2014). Through the lens of teacher professional development components: The 'Dialogic Video Cycle' as an innovative program to foster classroom dialogue. *Professional Development in Education*, 41(4), 729–756. <https://doi.org/10.1080/19415257.2014.939692>
- Gubrium, J. F., & Holstein, J. A. (2002). *Handbook of interview research*. Sage.
- Guetterman, T. C., Babchuk, W. A., Howell Smith, M. C., & Stevens, J. (2017). Contemporary Approaches to Mixed Methods–Grounded Theory Research: A Field-Based Analysis. *Journal of Mixed Methods Research*, 13(2), 179–195. <https://doi.org/10.1177/1558689817710877>
- Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching*, 8(3), 381–391. <https://doi.org/10.1080/135406002100000512>
- Hammer, D., & van Zee, E. (2006). Seeing the science in children's thinking: Case studies of student inquiry in physical science. A staff developer's guide. Heinemann.
- Hanushek, E. A., Peterson, P. E., & Woessmann, L. (2012). Achievement Growth: International and US State Trends in Student Performance. PEPG Report No.: 12-03. *Program on Education Policy and Governance, Harvard University*. <http://eric.ed.gov/?id=ED534652>
- Hardman, J. (2019). Developing and supporting implementation of a dialogic pedagogy in primary schools in England. *Teaching and Teacher Education*, 86, 1–14. <https://doi.org/10.1016/j.tate.2019.102908>
- Hargreaves, D. (1996). Teaching as a research based profession: Possibilities and prospects [Annual Lecture 1996].
- Haßler, B., Hennessy, S., & Hofmann, R. (2018). Sustaining and Scaling Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development. *Journal of Learning for Development - JLAD*, 5(1), 58–78. <https://jl4d.org/index.php/ejl4d/article/view/264>



- Hayes, A. F., & Krippendorff, K. (2007). Answering the Call for a Standard Reliability Measure for Coding Data. *Communication Methods and Measures*, 1(1), 77–89. <https://doi.org/10.1080/19312450709336664>
- Hegedus, S. J., Dalton, S., Roschelle, J., Penuel, W., Dickey-Kurdziolek, M., & Tatar, D. (2014). Investigating Why Teachers Reported Continued Use and Sharing of an Educational Innovation After the Research Has Ended. *Mathematical Thinking and Learning*, 16(4), 312–333. <https://doi.org/10.1080/10986065.2014.953017>
- Hein, A., & Taut, S. (2010). El uso de información evaluativa externa con fines formativos: El caso de establecimientos educacionales chilenos participantes de SEPA [The use of external evaluative information with formative means: The case of Chilean educative establishments participants of the SEPA]. *Revista Iberoamericana de Evaluación Educativa*, 2010, 3(2), 160–181.
- Hennessy, S. (2020). Chapter 6. Analytical coding schemes for classroom dialogue. In R. Kershner, Sara Hennessy, Wegerif, Rupert, & Ahmed, Ayesha (Eds.), *Research Methods for Educational Dialogue* (pp. 95–134). London: Bloomsbury Academic.
- Hennessy, S. (2014). Bridging between research and practice: Supporting professional development through collaborative studies of classroom teaching with technology. Sense Publishers.
- Hennessy, S., & Davies, M. (2020). Teacher professional development to support classroom dialogue: Challenges and promises. In N. Mercer, R. Wegerif, & L. Major (Eds.), *The Routledge International Handbook of Research on Dialogic Education* (pp. 238–253). Routledge.
- Hennessy, S., & Deane, R. (2009). The impact of collaborative video analysis by practitioners and researchers upon pedagogical thinking and practice: A follow-up study. *Teachers and Teaching*, 15(5), 617–638. <https://doi.org/10.1080/13540600903139621>
- Hennessy, S., Dragovic, T., & Warwick, P. (2018). A research-informed, school-based professional development workshop programme to promote dialogic teaching with

interactive technologies. *Professional Development in Education*, 44(2), 145–168.  
<https://doi.org/10.1080/19415257.2016.1258653>

Hennessy, S., Haßler, B., Blair, J., Duggal, N., Leong, W. S., Makonga, A., & Tembo, A. (2014). *OER4Schools: A professional learning programme for interactive teaching and learning with and without ICT. Facilitator version*. University of Cambridge; Commonwelath Education Trust.  
[http://oer.educ.cam.ac.uk/w/images/b/be/OER4Schools\\_Facilitator\\_book.pdf](http://oer.educ.cam.ac.uk/w/images/b/be/OER4Schools_Facilitator_book.pdf)

Hennessy, S., Haßler, B., & Hofmann, R. (2015). Challenges and opportunities for teacher professional development in interactive use of technology in African schools. *Technology, Pedagogy and Education*, 24(5), 1–28. <https://doi.org/10.1080/1475939X.2015.1092466>

Hennessy, S., Haßler, B., & Hofmann, R. (2016). Pedagogic change by Zambian primary school teachers participating in the OER4Schools professional development programme for one year. *Research Papers in Education*, 31(4), 1–29.  
<https://doi.org/10.1080/02671522.2015.1073343>

Hennessy, S., Kershner, R., Calcagni, E., & Ahmed, F. (2019). *Teacher Scheme for the Analysis of Educational Dialogue, version 7c*.  
<https://www.educ.cam.ac.uk/research/projects/tseda/index.html>

Hennessy, S., Kershner, R., Calcagni, E., & Ahmed, F. (forthcoming). Supporting practitioner-led inquiry into classroom dialogue with a research-informed professional learning resource: a design-based approach.

Hennessy, S., Rojas-Drummond, S., Higham, R., Márquez, A. M., Maine, F., Ríos, R. M., García-Carrión, R., Torreblanca, O., & Barrera, M. J. (2016). Developing a coding scheme for analysing classroom dialogue across educational contexts. *Learning, Culture and Social Interaction*, 9(June), 16–44. <https://doi.org/10.1016/j.lcsi.2015.12.001>

Hennessy, S., Warwick, P., Brown, L., Rawlins, D., & Neale, C. (2014). *Developing Interactive Teaching and Learning Using the IWB*. Open University Press.

- Hennessy, S., Warwick, P., & Mercer, N. (2011). A dialogic inquiry approach to working with teachers in developing classroom dialogue. *Teachers College Record*, *113*(9), 1906–1959.
- Hill, H. C., Beisiegel, M., & Jacob, R. (2013). Professional Development Research: Consensus, Crossroads, and Challenges. *Educational Researcher*, *42*(9), 476–487.  
<https://doi.org/10.3102/0013189X13512674>
- Hofer, B. K., & Pintrich, P. R. (2002). *Personal Epistemology*. Routledge.
- Hofmann, R., & Ruthven, K. (2018). Operational, interpersonal, discussional and ideational dimensions of classroom norms for dialogic practice in school mathematics. *British Educational Research Journal*, *44*(3), 496–514. <https://doi.org/10.1002/berj.3444>
- Horn, I. S., & Little, J. (2010). Attending to Problems of Practice: Routines and Resources for Professional Learning in Teachers' Workplace Interactions. *American Educational Research Journal*, *47*(1), 181–217. <https://doi.org/10.3102/0002831209345158>
- Howe, C. (2010). *Peer Groups and Children's Development*. Wiley.
- Howe, C. (2014). Optimizing small group discourse in classrooms: Effective practices and theoretical constraints. *International Journal of Educational Research*, *63*, 107–115.  
<https://doi.org/10.1016/j.ijer.2013.03.011>
- Howe, C., & Abedin, M. (2013). Classroom dialogue: A systematic review across four decades of research. *Cambridge Journal of Education*, *43*(3), 325–356.  
<https://doi.org/10.1080/0305764X.2013.786024>
- Howe, C., Hennessy, S., Mercer, N., Vrikki, M., & Wheatley, L. (2019). Teacher–Student Dialogue During Classroom Teaching: Does It Really Impact on Student Outcomes? *Journal of the Learning Sciences*, *28*(4–5), 1–51.  
<https://doi.org/10.1080/10508406.2019.1573730>
- Howe, C., McWilliam, D., & Cross, G. (2005). Chance favours only the prepared mind: Incubation and the delayed effects of peer collaboration. *British Journal of Psychology*, *96*(1), 67–93. <https://doi.org/10.1348/000712604X15527>

- Howe, C., & Mercer, N. (2007). Children's social development, peer interaction and classroom learning. In *The primary review (research survey 2/1b)*. Cambridge University.
- Howe, C., & Mercer, N. (2017). Commentary on the papers. *Language and Education*, 31(1), 83–92. <https://doi.org/10.1080/09500782.2016.1230126>
- Hubers, M. D. (2020). Paving the way for sustainable educational change: Reconceptualizing what it means to make educational changes that last. *Teaching and Teacher Education*, 93. <https://doi.org/10.1016/j.tate.2020.103083>
- Hunting, R. P. (1997). Clinical interview methods in mathematics education research and practice. *The Journal of Mathematical Behavior*, 16(2), 145–165. [https://doi.org/10.1016/S0732-3123\(97\)90023-7](https://doi.org/10.1016/S0732-3123(97)90023-7)
- 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). Basil Blackwell.
- Ing, M., Webb, N. M., Franke, M. L., Turrou, A. C., Wong, J., Shin, N., & Fernandez, C. H. (2015). Student participation in elementary mathematics classrooms: The missing link between teacher practices and student achievement? *Educational Studies in Mathematics*, 90(3), 341–356. <https://doi.org/10.1007/s10649-015-9625-z>
- Iturra, C. (2013). Los diálogos construidos y los contenidos elaborados en clases dedicadas a la comprensión de textos, en aulas chilenas. *Psicología Educativa*, 19(2). <http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authType=crawler&jrnl=1135755X&AN=93919926&h=4D7XPTCQfb9s9z3xo4ptBQg18xRl6z%2FYmOwgP%2Fi1UHGHeYivT6MK4ZshwVv6Awyk1bV1PNOssDxezxwGSYg%3D%3D&crl=c>
- Jacobs, V. R. (2017). Complexities in Measuring Teacher Noticing: Commentary. In E. O. Schack, M. H. Fisher, & J. A. Wilhelm (Eds.), *Teacher Noticing: Bridging and Broadening*

- Perspectives, Contexts, and Frameworks* (pp. 273–279). Springer.  
[https://doi.org/10.1007/978-3-319-46753-5\\_16](https://doi.org/10.1007/978-3-319-46753-5_16)
- Jacobs, V. R., Lamb, L., & Philipp, R. A. (2010). Professional Noticing of Children’s Mathematical Thinking. *Journal for Research in Mathematics Education*, 41(2), 169–202.
- Jaworski, B. (2006). Theory and Practice in Mathematics Teaching Development: Critical Inquiry as a Mode of Learning in Teaching. *Journal of Mathematics Teacher Education*, 9(2), 187–211.  
<https://doi.org/10.1007/s10857-005-1223-z>
- Jefferson, T. (1984). Transcription Notation. In J. Atkinson & J. Heritage (Eds.), *Structures of Social Interaction*. Cambridge University Press.
- Juzwik, M. M., Nystrand, M., Kelly, S., & Sherry, M. B. (2008). Oral Narrative Genres as Dialogic Resources for Classroom Literature Study: A Contextualized Case Study of Conversational Narrative Discussion. *American Educational Research Journal*, 45(4), 1111–1154. <https://doi.org/10.3102/0002831208321444>
- Kaner, S. (1996). *Facilitator’s Guide to Participatory Decision-Making*. New Society Publishers.
- Kazak, S., Wegerif, R., & Fujita, T. (2015). Combining scaffolding for content and scaffolding for dialogue to support conceptual breakthroughs in understanding probability. *ZDM*, 47(7), 1269–1283. <https://doi.org/10.1007/s11858-015-0720-5>
- Kazepides, T. (2012). Education as Dialogue. *Educational Philosophy and Theory*, 44(9), 913–925.  
<https://doi.org/10.1111/j.1469-5812.2011.00762.x>
- Kelly, P. (2006). What is teacher learning? A socio-cultural perspective. *Oxford Review of Education*, 32(4), 505–519. <https://doi.org/10.1080/03054980600884227>
- Kennedy, A. (2005). Models of Continuing Professional Development: A framework for analysis. *Journal of In-Service Education*, 31(2), 235–250.  
<https://doi.org/10.1080/13674580500200277>
- Kennedy, M. M. (2016). How Does Professional Development Improve Teaching? *Review of Educational Research*, 86(4), 945–980. <https://doi.org/10.3102/0034654315626800>

- Khong, T. D. H., Saito, E., & Gillies, R. M. (2017). Key issues in productive classroom talk and interventions. *Educational Review*, 1–16. <https://doi.org/10.1080/00131911.2017.1410105>
- Kiemer, K., Gröschner, A., Pehmer, A.-K., & Seidel, T. (2015). Effects of a classroom discourse intervention on teachers' practice and students' motivation to learn mathematics and science. *Learning and Instruction*, 35(February), 94–103. <https://doi.org/10.1016/j.learninstruc.2014.10.003>
- Kim, M.-Y., & Wilkinson, I. A. G. (2019). What is dialogic teaching? Constructing, deconstructing, and reconstructing a pedagogy of classroom talk. *Learning, Culture and Social Interaction*, 21(June), 70–86. <https://doi.org/10.1016/j.lcsi.2019.02.003>
- Koole, T. (2003). The Interactive Construction of Heterogeneity in the Classroom. *Linguistics and Education*, 14(1), 3–26. [https://doi.org/10.1016/S0898-5898\(03\)00010-X](https://doi.org/10.1016/S0898-5898(03)00010-X)
- Krippendorff, K. (2011). Agreement and Information in the Reliability of Coding. *Communication Methods and Measures*, 5(2), 93–112. <https://doi.org/10.1080/19312458.2011.568376>
- Kuhn, D. (1999). A Developmental Model of Critical Thinking. *Educational Researcher*, 28(2), 16–46. <https://doi.org/10.3102/0013189X028002016>
- Kuzborska, I. (2011). Links between teachers' beliefs and practices and research on reading. *Reading in a Foreign Language*, 23(1), 102–128.
- Kyndt, E., Gijbels, D., Grosemans, I., & Donche, V. (2016). Teachers' Everyday Professional Development: Mapping Informal Learning Activities, Antecedents, and Learning Outcomes. *Review of Educational Research*, 86(4), 1111–1150. <https://doi.org/10.3102/0034654315627864>
- Laerd Statistics. (n.d.-a). *Pearson's product-moment correlation in SPSS Statistics*. Statistical Tutorials and Software Guides. Retrieved November 23, 2018, from <https://statistics.laerd.com/>
- Laerd Statistics. (n.d.-b). *Spearman's correlation using SPSS Statistics*. Statistical Tutorials and Software Guides. Retrieved November 23, 2018, from <https://statistics.laerd.com/>

- Langer-Osuna, J. M., & Avalos, M. A. (2015). "I'm trying to figure this out. Why don't you come up here?": Heterogeneous talk and dialogic space in a mathematics discussion. *ZDM*, 47(7), 1313–1322. <https://doi.org/10.1007/s11858-015-0735-y>
- Larrain, A., Freire, P., Grau, V., López, P., Salvat, I., Silva, M., & Gastellu, V. (2018). The Effect of Peer-Group Argumentative Dialogue on Delayed Gains in Scientific Content Knowledge: The Effect of Peer-Group Argumentative. *New Directions for Child and Adolescent Development*, 2018(162), 67–87. <https://doi.org/10.1002/cad.20263>
- Larrain, A., Freire, P., & Howe, C. (2014). Science Teaching and Argumentation: One-sided versus dialectical argumentation in Chilean middle-school science lessons. *International Journal of Science Education*, 36(6), 1017–1036. <https://doi.org/10.1080/09500693.2013.832005>
- Larrain, A., & Haye, A. (2012). The discursive nature of inner speech. *Theory & Psychology*, 22(1), 3–22. <https://doi.org/10.1177/0959354311423864>
- Larrain, A., Howe, C., & Cerda, J. (2014). Argumentation in Whole-Class Teaching and Science Learning. *Psykhe*, 23(2). <http://www.psykhe.cl/index.php/psykhe/article/view/712>
- Larrain, A., Howe, C., & Freire, P. (2018). "More is not necessarily better": Curriculum materials support the impact of classroom argumentative dialogue in science teaching on content knowledge. *Research in Science & Technological Education*, 36(3), 282–301. <https://doi.org/10.1080/02635143.2017.1408581>
- Larrain, A., Moreno, C., Grau, V., Freire, P., Salvat, I., López, P., & Silva, M. (2017). Curriculum materials support teachers in the promotion of argumentation in science teaching: A case study. *Teaching and Teacher Education*, 67(October), 522–537. <https://doi.org/10.1016/j.tate.2017.07.018>
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press.

- Lefstein, A. (2010). More Helpful as Problem than Solution: Some Implications of Situating Dialogue in Classrooms. In K. Littleton & C. Howe (Eds.), *Educational Dialogues: Understanding and Promoting Productive interaction* (pp. 170–191). Routledge.
- Lefstein, A., Israeli, M., Pollak, I., & Bozo-Schwartz, M. (2013). Investigating dilemmas in teaching: Towards a new form of pedagogical scholarship. *Studia Paedagogica*, 18(4), 9–36. <https://doi.org/10.5817/SP2013-4-2>
- Lefstein, A., & Snell, J. (2011a). Classroom discourse: The promise and complexity of dialogic practice. In S. Ellis & E. McCartney (Eds.), *Applied linguistics and primary school teaching* (pp. 165–185). Cambridge University Press. <http://johnsonj.blog.monroe.edu/files/2014/11/promise-and-complexity-of-dialogic-practice.pdf>
- Lefstein, A., & Snell, J. (2011b). Professional vision and the politics of teacher learning. *Teaching and Teacher Education*, 27(3), 505–514. <https://doi.org/10.1016/j.tate.2010.10.004>
- Lefstein, A., & Snell, J. (2014). Better Than Best Practice: Developing Teaching and Learning Through Dialogue. Routledge.
- 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*, 41(5), 866–885. <https://doi.org/10.1002/berj.3164>
- Levenson, E., Tirosh, D., & Tsamir, P. (2009). Students' perceived sociomathematical norms: The missing paradigm. *The Journal of Mathematical Behavior*, 28(2–3), 171–187. <https://doi.org/10.1016/j.jmathb.2009.09.001>
- Levine, T. H., & Marcus, A. S. (2010). How the structure and focus of teachers' collaborative activities facilitate and constrain teacher learning. *Teaching and Teacher Education*, 26(3), 389–398. <https://doi.org/10.1016/j.tate.2009.03.001>



- Little, J. (2002). Locating learning in teachers' communities of practice: Opening up problems of analysis in records of everyday work. *Teaching and Teacher Education*, 18(8), 917–946. [https://doi.org/10.1016/S0742-051X\(02\)00052-5](https://doi.org/10.1016/S0742-051X(02)00052-5)
- Littleton, K., & Howe, C. (Eds.). (2010). Educational dialogues: Understanding and promoting productive interaction. Routledge.
- Major, L., & Watson, S. (2018). Using video to support in-service teacher professional development: The state of the field, limitations and possibilities. *Technology, Pedagogy and Education*, 27(1), 49–68. <https://doi.org/10.1080/1475939X.2017.1361469>
- Manzi, J., González, R., & Sun, Y. (Eds.). (2011). *La evaluación docente en Chile*. MIDE UC.
- Manzi, J., Strasser, K., San Martín, E., & Contreras. (2008). *Quality of Education in Chile*. Inter-American Development Bank. <http://www.iadb.org/res/laresnetwork/files/pr300finaldraft.pdf>
- Martinez, F., Taut, S., & Schaaf, K. (2016). Classroom observation for evaluating and improving teaching: An international perspective. *Studies in Educational Evaluation*, 49(June), 15–29. <https://doi.org/10.1016/j.stueduc.2016.03.002>
- Martínez, S., López, A., Martínez, M. V., Varas, L., Peñafiel, B., & Turino, E. (2016). *Matemática en Aula: Docentes en acción*. SM.
- Mason, J. (2002). *Researching Your Own Practice: The Discipline of Noticing*. Routledge.
- Matusov, E. (2004). Guest Editor's Introduction: Bakhtin's Dialogic Pedagogy. *Journal of Russian & East European Psychology*, 42(6), 3–11. <https://doi.org/10.1080/10610405.2004.11059237>
- Matusov, E. (2007). Applying Bakhtin scholarship on discourse in education: A critical review essay. *Educational Theory*, 57(2), 215–237. <https://doi.org/10.1111/j.1741-5446.2007.00253.x>
- Matusov, E. (2009). *Journey into Dialogic Pedagogy*. Nova Science Publishers Inc.

- Matusov, E. (2011). Irreconcilable differences in Vygotsky's and Bakhtin's approaches to the social and the individual: An educational perspective. *Culture & Psychology, 17*(1), 99–119. <https://doi.org/10.1177/1354067X10388840>
- Matusov, E., & Wegerif, R. (2014). Dialogue on 'Dialogic Education': Has Rupert gone over to 'the Dark Side'? *Dialogic Pedagogy: An International Online Journal, 2*. <https://doi.org/10.5195/dpj.2014.78>
- McIntyre, D. (2005). Bridging the gap between research and practice. *Cambridge Journal of Education, 35*(3), 357–382. <https://doi.org/10.1080/03057640500319065>
- Mehan, H. (1979). *Learning Lessons: Social Organization in the Classroom*. Harvard University Press.
- Menter, I., & McLaughlin, C. (2015). What do we know about teachers' professional learning? In C. McLaughlin, P. Cordingley, R. McLellan, & V. Baumfield (Eds.), *Making a difference, Turning Teacher Learning Inside Out* (pp. 31–51). Cambridge University Press.
- Mercer, N. (1995). The Guided Construction of Knowledge: Talk Amongst Teachers and Learners. *Multilingual Matters*.
- Mercer, N. (2000). *Words and minds: How we use language to think together*. Routledge.
- Mercer, N. (2004). Sociocultural discourse analysis. *Journal of Applied Linguistics, 1*(2), 137–168. <https://doi.org/10.1558/japl.2004.1.2.137>
- Mercer, N. (2008). The Seeds of Time: Why Classroom Dialogue Needs a Temporal Analysis. *Journal of the Learning Sciences, 17*(1), 33–59. <https://doi.org/10.1080/10508400701793182>
- Mercer, N. (2010). The analysis of classroom talk: Methods and methodologies. *British Journal of Educational Psychology, 80*(1), 1–14. <https://doi.org/10.1348/000709909X479853>
- Mercer, N., & Dawes, L. (2014). The study of talk between teachers and students, from the 1970s until the 2010s. *Oxford Review of Education, 40*(4), 430–445. <https://doi.org/10.1080/03054985.2014.934087>

- Mercer, N., Dawes, L., & Kleine Staarman, J. K. (2009). Dialogic teaching in the primary science classroom. *Language and Education*, 23(4), 353–369. <https://doi.org/10.1080/09500780902954273>
- 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), 359–377. <https://doi.org/10.1080/01411920410001689689>
- Mercer, N., Hennessy, S., & Warwick, P. (2019). Dialogue, thinking together and digital technology in the classroom: Some educational implications of a continuing line of inquiry. *International Journal of Educational Research*, 97, 187–199. <https://doi.org/10.1016/j.ijer.2017.08.007>
- 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(1), 12–21. <https://doi.org/10.1016/j.lcsi.2012.03.001>
- Mercer, N., & Littleton, K. (2007). Dialogue and the development of children’s thinking: A sociocultural approach. Routledge.
- Mercer, N., & Sams, C. (2006). Teaching Children How to Use Language to Solve Maths Problems. *Language and Education*, 20(6), 507–528. <https://doi.org/10.2167/le678.0>
- Mercer, N., Wegerif, R., & Dawes, L. (1999). Children’s Talk and the Development of Reasoning in the Classroom. *British Educational Research Journal*, 25(1), 95–111. <https://doi.org/10.1080/0141192990250107>
- Mertens, D. M. (2009). *Research and Evaluation in Education and Psychology: Integrating Diversity With Quantitative, Qualitative, and Mixed Methods* (3rd Edition). Sage.
- Michaels, S., & O’Connor, C. (2015). Conceptualizing Talk Moves as Tools: Professional Development Approaches for Academically Productive Discussions. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 347–362). American Educational Research Association.

- Michaels, S., O'Connor, C., & Resnick, L. B. (2008). Deliberative Discourse Idealized and Realized: Accountable Talk in the Classroom and in Civic Life. *Studies in Philosophy and Education*, 27(4), 283–297. <https://doi.org/10.1007/s11217-007-9071-1>
- Michaels, S., O'Connor, C., Williams, M., & Resnick, L. B. (n.d.). *Accountable Talk Sourcebook: For classroom conversation that works*. Institute for Learning, University of Pittsburgh. [http://ifl.pitt.edu/index.php/educator\\_resources/accountable\\_talk](http://ifl.pitt.edu/index.php/educator_resources/accountable_talk)
- Ministerio de Educación. (n.d.). *Proyecto de Ley. Nueva carrera docente: Sistema de promoción y desarrollo profesional docente*. Ministerio de Educación [MINEDUC]. [http://www.oei.es/formaciondocente/legislacion/CHILE/OTROS/PROYECTO\\_LEY\\_PROFESORADO.pdf](http://www.oei.es/formaciondocente/legislacion/CHILE/OTROS/PROYECTO_LEY_PROFESORADO.pdf)
- Ministerio de Educación. (2012). *Bases curriculares Matemática*. Ministerio de Educación [MINEDUC]. <http://www.curriculumlineamineduc.cl/605/w3-propertyvalue-53688.html>
- Mizala, A., & Torche, F. (2012). Bringing the schools back in: The stratification of educational achievement in the Chilean voucher system. *International Journal of Educational Development*, 32(1), 132–144. <https://doi.org/10.1016/j.ijedudev.2010.09.004>
- Montecinos, C. (2003). Desarrollo profesional docente y aprendizaje colectivo. *Psicoperspectivas*, 2, 105–128.
- Morris, P. (Ed.). (1995). *The Bakhtin Reader: Selected Writings of Bakhtin, Medvedev, Voloshinov*. Bloomsbury Academic.
- Mortimer, E., & Scott, P. (2003). *Meaning Making in Secondary Science Classrooms*. McGraw-Hill Education.
- Muller, M., Calcagni, E., Grau, V., Preiss, D. D., & Volante, P. (2013). Desarrollo de habilidades de observación en estudiantes de pedagogía: Resultados de una intervención piloto basada en el uso de la Videoteca de Buenas Prácticas Docentes. *Estudios Pedagógicos (Valdivia)*, XXXIX(1 (Special Issue)), 85–101.

- Myhill, D. (2006). Talk, talk, talk: Teaching and learning in whole class discourse. *Research Papers in Education*, 21(1), 19–41. <https://doi.org/10.1080/02671520500445425>
- National Council of Teachers of Mathematics. (1991). *Professional Standards on Teaching Mathematics*. The Council.
- Newton, P., Driver, R., & Osborne, J. (1999). The place of argumentation in the pedagogy of school science. *International Journal of Science Education*, 21(5), 553–576. <https://doi.org/10.1080/095006999290570>
- Nickerson, S. D., Lamb, L., & LaRochelle, R. (2017). Challenges in Measuring Secondary Mathematics Teachers’ Professional Noticing of Students’ Mathematical Thinking. In E. O. Schack, M. H. Fisher, & J. A. Wilhelm (Eds.), *Teacher Noticing: Bridging and Broadening Perspectives, Contexts, and Frameworks* (pp. 381–398). Springer International Publishing. [https://doi.org/10.1007/978-3-319-46753-5\\_22](https://doi.org/10.1007/978-3-319-46753-5_22)
- Nystrand, M. (1997). *Opening Dialogue: Understanding the Dynamics of Language and Learning in the English Classroom*. Teachers’ College Press.
- O’Connor, C., & Michaels, S. (2019). Supporting teachers in taking up productive talk moves: The long road to professional learning at scale. *International Journal of Educational Research*, 97, 166–175. <https://doi.org/10.1016/j.ijer.2017.11.003>
- O’Connor, C., Michaels, S., & Chapin, S. H. (2015). “Scaling Down” to Explore the Role of Talk in Learning: From District Intervention to Controlled Classroom Study. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 111–126). American Educational Research Association.
- OECD. (n.d.). *GDP and spending—Gross domestic product (GDP)—OECD Data*. OECD. Retrieved June 24, 2019, from <http://data.oecd.org/gdp/gross-domestic-product-gdp.htm>
- OECD. (2014a). *TALIS 2013 Results: An International Perspective on Teaching and Learning*. OECD. <https://doi.org/10.1787/9789264196261-en>

- OECD. (2014b). *A Teachers' Guide to TALIS 2013*. OECD Publishing. [http://www.oecd-ilibrary.org/education/a-teachers-guide-to-talis-2013\\_9789264216075-en](http://www.oecd-ilibrary.org/education/a-teachers-guide-to-talis-2013_9789264216075-en)
- OECD. (2015). Embedding professional development in schools for teacher success (No. 10; Teaching in Focus). OECD Publishing.
- OECD. (2017). *Education in Chile*. OECD Publishing. <https://doi.org/10.1787/9789264284425-en>
- OECD. (2019a). *Chile. Country Note. Results from TALIS 2018*. OECD Publishing. [http://www.oecd.org/education/talis/TALIS2018\\_CN\\_CHL.pdf](http://www.oecd.org/education/talis/TALIS2018_CN_CHL.pdf)
- OECD. (2019b). TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners. OECD Publishing. <https://doi.org/10.1787/1d0bc92a-en>
- Ogden, T., & Fixsen, D. L. (2014). Implementation Science. *Zeitschrift Für Psychologie*, 222(1), 4–11. <https://doi.org/10.1027/2151-2604/a000160>
- Olofson, M. W., & Garnett, B. R. (2018). Measuring the impact of professional development for student-centred pedagogies: A mixed-methods study. *Professional Development in Education*, 44(3), 342–355. <https://doi.org/10.1080/19415257.2017.1347805>
- Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research*, 81(3), 376–407. <https://doi.org/10.3102/0034654311413609>
- OREALC/UNESCO. (2013a). Antecedentes y Criterios para la Elaboración de Políticas Docentes en América Latina y el Caribe. UNESCO. <http://unesdoc.unesco.org/images/0022/002232/223249S.pdf>
- OREALC/UNESCO. (2013b). *Situación Educativa de América Latina y el Caribe: Hacia la educación de calidad para todos al 2015*. UNESCO. <http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Santiago/images/SITIED-espanol.pdf>
- Osborne, J. (2010). Arguing to Learn in Science: The Role of Collaborative, Critical Discourse. *Science*, 328(5977), 463–466. <https://doi.org/10.1126/science.1183944>

- Osborne, J. (2015). The Challenges of Scale. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 403–414). American Educational Research Association.
- Osborne, J., Simon, S., Christodoulou, A., Howell-Richardson, C., & Richardson, K. (2013). Learning to argue: A study of four schools and their attempt to develop the use of argumentation as a common instructional practice and its impact on students. *Journal of Research in Science Teaching*, 50(3), 315–347. <https://doi.org/10.1002/tea.21073>
- Otten, S., Engledowl, C., & Spain, V. (2015). Univocal and dialogic discourse in secondary mathematics classrooms: The case of attending to precision. *ZDM*, 47(7), 1285–1298. <https://doi.org/10.1007/s11858-015-0725-0>
- Pauli, C., & Reusser, K. (2015). Discursive Cultures of Learning in (Everyday) Mathematics Teaching: A Video-Based Study on Mathematics Teaching in German and Swiss Classrooms. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 181–193). American Educational Research Association.
- Pehmer, A.-K., Gröschner, A., & Seidel, T. (2015a). How teacher professional development regarding classroom dialogue affects students' higher-order learning. *Teaching and Teacher Education*, 47(April), 108–119. <https://doi.org/10.1016/j.tate.2014.12.007>
- Pehmer, A.-K., Gröschner, A., & Seidel, T. (2015b). Fostering and scaffolding student engagement in productive classroom discourse: Teachers' practice changes and reflections in light of teacher professional development. *Learning, Culture and Social Interaction*, 7(December), 12–27. <https://doi.org/10.1016/j.lcsi.2015.05.001>
- Perrenoud, P. (2004). Desarrollar la práctica reflexiva en el oficio de enseñar: Profesionalización y razón pedagógica. Grao.
- Pinkney, J. (2007). Subtle tortures of the neo-liberal age: Teachers, students, and the political economy of schooling in Chile. *Journal for Critical Education Policy Studies*, 5(2), 42–64.

- Preiss, D. D. (2009). The Chilean instructional pattern for the teaching of language: A video-survey study based on a national program for the assessment of teaching. *Learning and Individual Differences, 19*(1), 1–11. <https://doi.org/10.1016/j.lindif.2008.08.004>
- Preiss, D. D. (2010). Folk pedagogy and cultural markers in teaching: Three illustrations from Chile. In D. D. Preiss & R. Sternberg (Eds.), *Innovations in educational psychology: Perspectives on Learning, Teaching, and Human Development* (pp. 325–356). Springer.
- Preiss, D. D., Calcagni, E., Espinoza, A. M., Gómez, D., Grau, V., Guzmán, V., Muller, M., Ramírez, F., & Volante, P. (2014). Buenas prácticas pedagógicas observadas en el aula del segundo ciclo básico en Chile. *Psyche, 23*(2), 1–12. <https://doi.org/10.7764/psyche.23.2.716>
- Preiss, D. D., Calcagni, E., Espinoza, A. M., & Grau, V. (2016). ¿Cómo se enseña el lenguaje y las matemáticas en las salas de primer y segundo ciclo básico en Chile? Principales hallazgos de una serie de estudios observacionales en clases de lenguaje y matemáticas [How are Spanish language and mathematics taught in primary and middle schools in Chile? Main findings from a series of observational studies in Spanish language and mathematics lessons]. In J. Manzi & M. R. García (Eds.), *Abriendo las puertas del aula: Transformación de las prácticas docentes [Opening the classroom doors: Transforming teaching practices]* (pp. 153–184). Ediciones UC.
- Preiss, D. D., Calcagni, E., & Grau, V. (2015). Classroom Research and Child and Adolescent Development in South America. *New Directions for Child and Adolescent Development, 2015*(147), 85–92. <https://doi.org/10.1002/cad.20093>
- Preiss, D. D., Grau, V., Calcagni, E., Guzmán, V., & Ramírez, F. (2015). Observando e identificando prácticas que promueven la metacognición y la autorregulación en el aula matemática de segundo ciclo básico [Observing and identifying practices promoting metacognition and self-regulation in the mathematics classroom in middle school] [Grant report]. FONIDE.



- Preiss, D. D., Grau, V., Nuñez, M., Alegría, I., Espinoza, A. M., & Ponce, L. (2013). *Instructional Patterns Remain the Same across a Segregated Educational System: The Case of Chile*. Annual conference of the International Congress for School Effectiveness and Improvement, Santiago de Chile.
- Preiss, D. D., Grau, V., Torres Iribarra, D., & Calcagni, E. (2018). Metacognition, Self-Regulation, and Autonomy Support in the Chilean Mathematics Classroom: An Observational Study: Metacognition, Self-Regulation, and Autonomy Support in the Chilean. *New Directions for Child and Adolescent Development*, 162(Winter), 115–136. <https://doi.org/10.1002/cad.20260>
- Preiss, D. D., Larrain, A., & Valenzuela, S. (2011). Discurso y pensamiento en el aula matemática chilena. *Psyke*, 20(2), 131–146. <http://dx.doi.org/10.4067/S0718-22282011000200011>
- Preiss, D. D., San Martín, E., Alegría, I., Espinoza, A. M., Nuñez, M., & Ponce, L. (2011). Estructura y discurso en el aula matemática de primer ciclo: Enseñar matemáticas fomentando la apropiación privada de terminos y procedimientos. (Evidencias Para Políticas Públicas En Educación. Selección de Investigaciones Cuarto Concurso FONIDE, pp. 127–165). Centro de Estudios Mineduc.
- Raczynski, D., & Salinas, D. (2008). Fortalecer la educación municipal. Evidencia empírica, reflexiones y líneas de propuesta. In C. Bellei, D. Contreras, & J. P. Valenzuela (Eds.), *La agenda pendiente en educación: Profesores, administradores y recursos: Propuesta para la nueva arquitectura de la educación chilena* (pp. 105–133). Universidad de Chile; Fondo de las Naciones Unidas para la Infancia UNICEF.
- Radovic, D., & Preiss, D. D. (2010). Patrones de discurso observados en el aula de matemática de segundo ciclo básico en Chile. *Psyke*, 19(2), 65–79. <http://dx.doi.org/10.4067/S0718-22282010000200007>

- Rainio, A. P., & Hofmann, R. (2015). Transformations in teachers' discourse about their students during a school-led pedagogic intervention. *The European Journal of Social and Behavioural Sciences*, 13(2), 1815–1829. <https://doi.org/10.15405/ejsbs.163>
- Reiser, B. J., Michaels, S., Moon, J., Bell, T., Dyer, E., Edwards, K. D., ... Park, A. (2017). Scaling Up Three-Dimensional Science Learning Through Teacher-Led Study Groups Across a State. *Journal of Teacher Education*. 68(3), 280-298.  
<https://doi.org/10.1177/0022487117699598>
- Resnick, L. B., Asterhan, C. S. C., & Clarke, S. (2015). Introduction. Talk, Learning and Teaching. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 1–12). American Educational Research Association.
- Resnick, L. B., Asterhan, C. S. C., Clarke, S. N., & Schantz, F. (2018). Next Generation Research in Dialogic Learning. In *The Wiley Handbook of Teaching and Learning* (pp. 323–338). Wiley.  
<https://doi.org/10.1002/9781118955901.ch13>
- Resnick, L. B., Michaels, S., & O'Connor, C. (2010). How (well structured) talk frames the mind. In R. Sternberg & D. D. Preiss (Eds.), *Innovations in Educational Psychology: Perspectives on Learning, Teaching, and Human Development* (pp. 163–194). Springer.
- Reznitskaya, A. (2012). Dialogic Teaching: Rethinking Language Use During Literature Discussions. *The Reading Teacher*, 65(7), 446–456. <https://doi.org/10.1002/TRTR.01066>
- Reznitskaya, A., & Gregory, M. (2013). Student Thought and Classroom Language: Examining the Mechanisms of Change in Dialogic Teaching. *Educational Psychologist*, 48(2), 114–133.  
<https://doi.org/10.1080/00461520.2013.775898>
- Reznitskaya, A., & Wilkinson, I. A. G. (2017). Truth matters: Teaching young students to search for the most reasonable answer. *Phi Delta Kappan*, 99(4), 33–38.  
<https://doi.org/10.1177/0031721717745550>
- Reznitskaya, A., Wilkinson, I. A. G., Oyler, J., Bourdage, K., & Sykes, A. (2016). *Using the Argumentation Rating Tool to Support Teacher Facilitation of Inquiry Dialogue in Elementary*

*Language Arts Classrooms*. Annual Meeting of the American Educational Research Association, Washington, DC.

- Robutti, O., Cusi, A., Clark-Wilson, A., Jaworski, B., Chapman, O., Esteley, C., Goos, M., Isoda, M., & Joubert, M. (2016). ICME international survey on teachers working and learning through collaboration: June 2016. *ZDM*, 48(5), 651–690. <https://doi.org/10.1007/s11858-016-0797-5>
- Rojas-Drummond, S., Maine, F., Alarcón, M., Trigo, A. L., Barrera, M. J., Mazón, N., Vélez, M., & Hofmann, R. (2017). Dialogic literacy: Talking, reading and writing among primary school children. *Learning, Culture and Social Interaction*, 12, 45–62. <https://doi.org/10.1016/j.lcsi.2016.09.005>
- Rojas-Drummond, S., Mazón, N., Fernández, M., & Wegerif, R. (2006). Explicit reasoning, creativity and co-construction in primary school children's collaborative activities. *Thinking Skills and Creativity*, 1(2), 84–94. <https://doi.org/10.1016/j.tsc.2006.06.001>
- Rojas-Drummond, S., Mazón, N., Littleton, K., & Vélez, M. (2014). Developing reading comprehension through collaborative learning. *Journal of Research in Reading*, 37(2), 138–158. <https://doi.org/10.1111/j.1467-9817.2011.01526.x>
- Rojas-Drummond, S., & Mercer, N. (2003). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research*, 39(1–2), 99–111. [https://doi.org/10.1016/S0883-0355\(03\)00075-2](https://doi.org/10.1016/S0883-0355(03)00075-2)
- 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. <https://doi.org/10.1016/j.lcsi.2012.12.003>
- Ruthven, K., Howe, C., Mercer, N., Taber, K., Luthman, S., Hofmann, R., & Riga, F. (2011). Effecting Principled Improvement in STEM Education: Research-based pedagogical development for student engagement and learning in early secondary-school physical

science and mathematics. *Proceedings of the 7th British Society for Research into Learning Mathematics*, 30 (1).

Ruthven, K., Mercer, N., Taber, K. S., Guardia, P., Hofmann, R., Ilie, S., Luthman, S., & Riga, F. (2017). A research-informed dialogic-teaching approach to early secondary school mathematics and science: The pedagogical design and field trial of the *epiSTEMe* intervention. *Research Papers in Education*, 32(1), 18–40. <https://doi.org/10.1080/02671522.2015.1129642>

Santagata, R., & Angelici, G. (2010). Studying the Impact of the Lesson Analysis Framework on Preservice Teachers' Abilities to Reflect on Videos of Classroom Teaching. *Journal of Teacher Education*, 61(4), 339–349. <https://doi.org/10.1177/0022487110369555>

Schön, D. A. (1987). *Educating the reflective practitioner*. Jossey-Bass.

Schonfeld, A. H. (2011). Conclusion. In M. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics Teacher Noticing: Seeing Through Teachers' Eyes* (pp. 223–238). Routledge.

Scott, P. H., Mortimer, E., & Aguiar, O. G. (2006). The tension between authoritative and dialogic discourse: A fundamental characteristic of meaning making interactions in high school science lessons. *Science Education*, 90(4), 605–631. <https://doi.org/10.1002/sce.20131>

Sedova, K., Salamounova, Z., & Svaricek, R. (2014). Troubles with dialogic teaching. *Learning, Culture and Social Interaction*, 3(4), 274–285. <https://doi.org/10.1016/j.lcsi.2014.04.001>

Sedova, K., Sedlacek, M., & Svaricek, R. (2016). Teacher professional development as a means of transforming student classroom talk. *Teaching and Teacher Education*, 57(July), 14–25. <https://doi.org/10.1016/j.tate.2016.03.005>

Segal, A., Lefstein, A., & Vedder-Weiss, D. (2018). Appropriating protocols for the regulation of teacher professional conversations. *Teaching and Teacher Education*, 70(February), 215–226. <https://doi.org/10.1016/j.tate.2017.11.018>

- Segal, A., Snell, J., & Lefstein, A. (2017). Dialogic teaching to the high-stakes standardised test? *Research Papers in Education*, 32(5), 596–610. <https://doi.org/10.1080/02671522.2016.1225803>
- Segovia, C., & Gamboa, R. (2012). Chile: El año en que salimos a la calle [Chile: The year we took the streets]. *Revista de Ciencia Política*, 32(1), 65–85. <https://doi.org/10.4067/S0718-090X2012000100004>
- Seidel, T., & Stürmer, K. (2014). Modelling and Measuring the Structure of Professional Vision in Preservice Teachers. *American Educational Research Journal*, 51(4), 739–771. <https://doi.org/10.3102/0002831214531321>
- Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., & Schwindt, K. (2011). Teacher learning from analysis of videotaped classroom situations: Does it make a difference whether teachers observe their own teaching or that of others? *Teaching and Teacher Education*, 27(2), 259–267. <https://doi.org/10.1016/j.tate.2010.08.009>
- Sfard, A. (2008). *Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing*. Cambridge University Press.
- Sfard, A. (2015). Why All This Talk About Talking Classrooms? Theorizing the Relation Between Talking and Learning. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 245–254). American Educational Research Association.
- Sherin, M. (2001). Developing a professional vision of classroom events. In T. Wood, B. S. Nelson, & J. Warfield (Eds.), *Beyond classical pedagogy: Teaching elementary school mathematics* (pp. 75–93). Erlbaum.
- Sherin, M. (2007). The development of teacher's professional vision in video clubs. In R. Goldman, R. Pea, B. Barron, & S. J. Derry (Eds.), *Video Research in the learning sciences* (pp. 383–396). Lawrence Erlbaum Associates.

- Sherin, M., & Han, S. Y. (2004). Teacher learning in the context of a video club. *Teaching and Teacher Education*, 20(2), 163–183. <https://doi.org/10.1016/j.tate.2003.08.001>
- Sherin, M., Jacobs, V. R., & Philipp, R. A. (Eds.). (2011a). *Mathematics teacher noticing: Seeing through teachers' eyes*. Routledge.
- Sherin, M., Jacobs, V. R., & Philipp, R. A. (2011b). Situating the study of teacher noticing. In M. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 3–13). Routledge.
- Sherin, M., & van Es, E. (2009). Effects of Video Club Participation on Teachers' Professional Vision. *Journal of Teacher Education*, 60(1), 20–37. <https://doi.org/10.1177/0022487108328155>
- Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15(2), 4–14. <https://doi.org/10.3102/0013189X015002004>
- Sims, S., & Fletcher-Wood, H. (2018). Characteristics of effective teacher professional development: What we know, what we don't, how we can find out. *Improving Teaching*. <https://improvingteaching.co.uk/characteristics-cpd/>
- Sinclair, J. M., & Coulthard, M. (1975). *Towards an Analysis of Discourse: English Used by Teachers and Pupils*. Oxford University Press.
- Sohmer, R., Michaels, S., O'Connor, C., & Resnick, L. B. (2009). Guided construction of knowledge in the classroom: The troika of talk, tasks and tools. In B. Schwarz, T. Dreyfus, & R. Hershkowitz (Eds.), *Transformation of knowledge through classroom interaction* (pp. 105–129). Routledge.
- Song, Y., Chen, X., Hao, T., Liu, Z., & Lan, Z. (2019). Exploring two decades of research on classroom dialogue by using bibliometric analysis. *Computers & Education*, 137(August), 12–31. <https://doi.org/10.1016/j.compedu.2019.04.002>
- Sotomayor, C., Parodi, G., Coloma, C., Ibáñez, R., & Cavada, P. (2011). La formación inicial de docentes de Educación General Básica en Chile. ¿Qué se espera que aprendan los futuros

- profesores en el área de Lenguaje y Comunicación? *Pensamiento Educativo*, 48(1), 28–42.  
<https://doi.org/10.7764/PEL.48.1.2011.3>
- Sotomayor, C., & Walker, H. (2009). Formación continua de profesores ¿Cómo desarrollar competencias para el trabajo escolar? Editorial Universitaria.
- Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2015). Orchestrating Productive Mathematical Discussions: Helping Teachers Learn to Better Incorporate Student Thinking. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 375–388). American Educational Research Association.
- Stemler, S. E. (2004). A Comparison of Consensus, Consistency, and Measurement Approaches to Estimating Interrater Reliability. *Practical Assessment, Research & Evaluation*, 9(4), 1–11.
- Stockero, S. L., & Rupnow, R. L. (2017). Measuring Noticing Within Complex Mathematics Classroom Interactions. In E. O. Schack, M. H. Fisher, & J. A. Wilhelm (Eds.), *Teacher Noticing: Bridging and Broadening Perspectives, Contexts, and Frameworks* (pp. 281–301). Springer. [https://doi.org/10.1007/978-3-319-46753-5\\_17](https://doi.org/10.1007/978-3-319-46753-5_17)
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional Learning Communities: A Review of the Literature. *Journal of Educational Change*, 7(4), 221–258.  
<https://doi.org/10.1007/s10833-006-0001-8>
- Strauss, A. C., & Corbin, J. (1990). Basics of Qualitative Research: Grounded Theory Procedures and Techniques (2nd Edition). Sage.
- Sullivan, P., & Clarke, D. (1992). Problem solving with conventional mathematics content: Responses of pupils to open mathematical tasks. *Mathematics Education Research Journal*, 4(1), 42–60. <https://doi.org/10.1007/BF03217231>
- Sun, Y., Correa, M., Zapata, Á., & Carrasco, D. (2011). Resultados: Qué dice la Evaluación Docente acerca de la enseñanza en Chile. In J. Manzi, R. González, & Y. Sun (Eds.), *La evaluación docente en Chile* (pp. 91–136). MIDE UC.

- Symonds, J. E., & Gorard, S. (2010). Death of mixed methods? Or the rebirth of research as a craft. *Evaluation & Research in Education*, 23(2), 121–136.  
<https://doi.org/10.1080/09500790.2010.483514>
- Tashakkori, A., & Teddlie, C. (1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Sage.
- Tashakkori, A., & Teddlie, C. (2008). Quality of Inferences in Mixed Methods Research: Calling for an Integrative Framework. In M. M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 103–120). Sage.
- Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to Qualitative Research Methods: A Guidebook and Resource*. Wiley.
- Teddlie, C., & Tashakkori, A. (2008). *Foundations of Mixed Methods Research: Integrating Quantitative And Qualitative Approaches In The Social And Behavioral Sciences*. Sage.
- Teuscher, D., Leatham, K. R., & Peterson, B. E. (2017). From a Framework to a Lens: Learning to Notice Student Mathematical Thinking. In E. O. Schack, M. H. Fisher, & J. A. Wilhelm (Eds.), *Teacher Noticing: Bridging and Broadening Perspectives, Contexts, and Frameworks* (pp. 31–48). Springer. [https://doi.org/10.1007/978-3-319-46753-5\\_3](https://doi.org/10.1007/978-3-319-46753-5_3)
- Treviño, E. (2018). Diagnóstico del sistema escolar: Las reformas educativas de 2014-2017. In I. Sánchez (Ed.), *Ideas en Educación II: Definiciones en tiempos de cambio* (pp. 133–165). Ediciones UC.
- Valverde, G. (2011). La buena enseñanza y la agenda abierta de la evaluación docente ante un recurso escaso. In J. Manzi, R. González, & Y. Sun (Eds.), *La Evaluación Docente en Chile* (pp. 231–238). MIDE UC.
- van Es, E. (2010). A Framework for Facilitating Productive Discussions in Video Clubs. *Educational Technology*, 50(January-February), 8–12.



- van Es, E., & Sherin, M. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, 24(2), 244–276. <https://doi.org/10.1016/j.tate.2006.11.005>
- van Es, E., & Sherin, M. (2009). The influence of video clubs on teachers' thinking and practice. *Journal of Mathematics Teacher Education*, 13(2), 155–176. <https://doi.org/10.1007/s10857-009-9130-3>
- van Es, E., Tunney, J., Goldsmith, L. T., & Seago, N. (2014). A Framework for the Facilitation of Teachers' Analysis of Video. *Journal of Teacher Education*, 65(4), 340–356. <https://doi.org/10.1177/0022487114534266>
- Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education*, 61(January), 47–59. <https://doi.org/10.1016/j.tate.2016.10.001>
- Varas, L., Felmer, P., Gálvez, G., Lewin, R., Martínez, C., Navarro, S., Ortiz, A., & Schwarze, G. (2008). Oportunidades de preparación para enseñar matemáticas de futuros profesores de educación general básica en Chile. *Calidad en la Educación*, 29, 64–88. <https://doi.org/10.31619/caledu.n29.188>
- Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education*, 24(1), 80–91. <https://doi.org/10.1016/j.tate.2007.01.004>
- Vieluf, S., Kaplan, D., Klieme, E., & Bayer, S. (2012). *Teaching Practices and Pedagogical Innovations: Evidence from TALIS*. OECD Publishing. <https://doi.org/10.1787/9789264123540-en>
- Vrikki, M., Kershner, R., Calcagni, E., Hennessy, S., Lee, L., Hernández, F., Estrada, N., & Ahmed, F. (2019). The teacher scheme for educational dialogue analysis (T-SEDA): Developing a research-based observation tool for supporting teacher inquiry into pupils' participation in classroom dialogue. *International Journal of Research & Method in Education*, 42(2), 185–203. <https://doi.org/10.1080/1743727X.2018.1467890>

- Vrikki, M., Wheatley, L., Howe, C., Hennessy, S., & Mercer, N. (2019). Dialogic practices in primary school classrooms. *Language and Education*, 33(1), 85–100. <https://doi.org/10.1080/09500782.2018.1509988>
- Vygotsky, L. S. (1978). *Mind In Society*. Harvard University Press.
- Vygotsky, L. S. (1986). *Thought and language*. MIT Press.
- Vygotsky, L. S. (1987a). *The Collected Works of L. S. Vygotsky: Volume 1: Problems of General Psychology*. Kluwer Academics/Plenum Publishers.
- Vygotsky, L. S. (1987b). *The Collected Works of L. S. Vygotsky: Volume 4: The History of the Development of Higher Mental Functions*. Kluwer Academics/Plenum Publishers.
- Vygotsky, L. S. (1987c). *The Collected Works of L. S. Vygotsky: Volume 6: Scientific Legacy (Vol. 6)*. Kluwer Academics/Plenum Publishers.
- Walshaw, M., & Anthony, G. (2008). The Teacher's Role in Classroom Discourse: A Review of Recent Research Into Mathematics Classrooms. *Review of Educational Research*, 78(3), 516–551. <https://doi.org/10.3102/0034654308320292>
- Wayne, A. J., Yoon, K. S., Zhu, P., Cronen, S., & Garet, M. S. (2008). Experimenting With Teacher Professional Development: Motives and Methods. *Educational Researcher*, 37(8), 469–479. <https://doi.org/10.3102/0013189X08327154>
- Webb, N. M., Franke, M. L., Ing, M., Turrou, A. C., Johnson, N. C., & Zimmerman, J. (2019). Teacher practices that promote productive dialogue and learning in mathematics classrooms. *International Journal of Educational Research*, 97, 176–186. <https://doi.org/10.1016/j.ijer.2017.07.009>
- Webb, N. M., Franke, M. L., Ing, M., Wong, J., Fernandez, C. H., Shin, N., & Turrou, A. C. (2014). Engaging with others' mathematical ideas: Interrelationships among student participation, teachers' instructional practices, and learning. *International Journal of Educational Research*, 63, 79–93. <https://doi.org/10.1016/j.ijer.2013.02.001>

- Wegerif, R. (2011). Towards a dialogic theory of how children learn to think. *Thinking Skills and Creativity*, 6(3), 179–190. <https://doi.org/10.1016/j.tsc.2011.08.002>
- Wegerif, R. (2018). A dialogic theory of teaching thinking. In L. Kerslake & R. Wegerif (Eds.), *Theory of Teaching Thinking*. Routledge.
- Wegerif, R., Mercer, N., & Dawes, L. (1998). Software design to support discussion in the primary curriculum. *Journal of Computer Assisted Learning*, 14(3), 199–211. <https://doi.org/10.1046/j.1365-2729.1998.143057.x>
- Wegerif, R., Mercer, N., & Velez, M. (2005). Thinking together in the UK and Mexico: Transfer of an educational innovation. *Journal of Classroom Interaction*, 40(1), 40–48. <https://www.jstor.org/stable/43997884>
- Wells, G. (1999). *Dialogic Inquiry. Toward a Sociocultural Practice and Theory of Education*. Cambridge University Press.
- Wells, G., & Arauz, R. M. (2006). Dialogue in the Classroom. *Journal of the Learning Sciences*, 15(3), 379–428. [https://doi.org/10.1207/s15327809jls1503\\_3](https://doi.org/10.1207/s15327809jls1503_3)
- Whitehead, D. (2010). The year after: Sustaining the effects of literacy professional development in New Zealand secondary schools. *Language and Education*, 24(2), 133–149. <https://doi.org/10.1080/09500780903350273>
- Widjaja, W. (2012). Exercising sociomathematical norms in classroom discourse about data representation: Insights from one case study of a grade 6 lesson in Indonesia. *Mathematics Educator*, 13(2), 21–38.
- Wilkinson, I. A. G., Reznitskaya, A., Bourdage, K., Oyler, J., Glina, M., Drewry, R., Kim, M.-Y., & Nelson, K. (2017). Toward a more dialogic pedagogy: Changing teachers' beliefs and practices through professional development in language arts classrooms. *Language and Education*, 31(1), 65–82. <https://doi.org/10.1080/09500782.2016.1230129>

- Wilson, S. M., & Berne, J. (1999). Teacher Learning and the Acquisition of Professional Knowledge: An Examination of Research on Contemporary Professional Development. *Review of Research in Education*, 24, 173. <https://doi.org/10.2307/1167270>
- Wood, T. (1999). Creating a Context for Argument in Mathematics Class. *Journal for Research in Mathematics Education*, 30(2), 171–191. <https://doi.org/10.2307/749609>
- Wood, T., Williams, G., & McNeal, B. (2006). Children's Mathematical Thinking in Different Classroom Cultures. *Journal for Research in Mathematics Education*, 37(3), 222–255. <https://doi.org/10.2307/30035059>
- Wragg, T. (1999). *An Introduction to Classroom Observation* (2nd Edition). Routledge.
- Yackel, E., & Cobb, P. (1996). Sociomathematical Norms, Argumentation, and Autonomy in Mathematics. *Journal for Research in Mathematics Education*, 27(4), 458–477. <https://doi.org/10.2307/749877>
- Zhang, M., Lundeberg, M., & Eberhardt, J. (2011). Strategic Facilitation of Problem-Based Discussion for Teacher Professional Development. *Journal of the Learning Sciences*, 20(3), 342–394. <https://doi.org/10.1080/10508406.2011.553258>

## APPENDICES

## 1. APPENDIX 1 - INITIAL SURVEY ITEMS

### I. Personal information

1. Name
2. Date of birth
3. School

### II. Professional background

1. What is your profession [undergraduate degree]?
2. How long have you been working in the educational system?
3. How long have you been working at this school?
4. What is your current role in the school where you work? Indicate all that correspond to the year 2017, e.g.: teacher, special educational needs expert, UTP.
5. Have you worked as a mathematics teacher before?
6. If yes, please indicate the levels at which you have taught mathematics

Level	Tick if you have taught at this level
1°	
2°	
3°	
4°	
5°	
6°	

Level	Tick if you have taught at this level
7°	
8°	
I° High school	
II° High school	
III° High school	
IV° High school	

### III. Continuous professional development experience

1. After finishing your undergraduate studies, have you taken part in continuous professional development programmes (e.g.: courses, diploma courses, master's degree)? Please, list the main ones.
2. Have you participated in continuous professional development programmes about classroom dialogue or related topics? If yes, please indicate which programmes.
3. Have you participated in continuous professional development programmes that employed classroom videos? If yes, please indicate which programmes
4. Have you participated in continuous professional development programmes that employ teacher learning communities as their methodology? If yes, please indicate which programmes

5. Do you have any experience as a group facilitator or mediator? If yes, please briefly describe your experience

## 2. APPENDIX 2 – INTERVIEW PROTOCOLS

Notes:

School A and B’s facilitators’ interview schedules were, for the most part, the same. All the questions were shared across schools, except the ones where the school name is written first, and the text is in Italics. School C’s interview schedule is different and thus it is presented separately.

The following printed checklist was used by the main interviewer before the beginning of each interview to ensure the protocol was being followed, and at the end of the interview to secure the data.

**Appendix Table 1 Interview checklist**

<b>Item</b>	<b>Done?</b>
Was the goal of the interview explained?	
Was the confidential nature of the interview stated?	
Was the interviewee given a chance to clarify their doubts?	
Do we have permission to do an audio recording?	
Do we have two recordings operating (laptop and phone)?	
At the end of the interview: was the voice memo on the phone stored and named with an ID?	
At the end of the interview: was the voice memo on the laptop stored and named with an ID?	



## I. Facilitators' interview schedules

### Facilitators of Schools A and B

Introduction: this is (research assistant's name), one of the project's research assistants that will accompany us during the interview. The idea here is to talk about your opinion about this project, about what you learnt through it and how you see it in the future. At the end, we will watch a short clip about your lesson to discuss it. Our conversation will be confidential, and once I analyse the data, I won't make any references that can identify the school or yourself individually. I would like to ask you if I can audio-record the interview, keeping it confidential.

#### You as a teacher

1. How long have you been teaching at this school?
2. How long have you been teaching mathematics?
3. How has your experience been teaching mathematics?

[Introduction] Thinking now about the programme: learning communities to promote dialogue in mathematics teaching

#### TPD design – Facilitator

1. How would you describe your role as facilitator?
  - In the sessions
  - Outside the sessions (consider management)
  - [School B] how did you find it considering that you were the only facilitator?
2. How did you feel in the role?
3. How was your relationship with your colleagues in this regard?
  - In your opinion, were there changes in the group's dynamics during the year?
4. Considering that the group was formed by several teachers that *[School A] were new to the school; [School B] had been working in the school for a long time*, do you think this impacted the way in which the group worked?
5. What do you think that helped you fulfil this role at a personal level?
  - Consider: previous personal experiences
6. [School B] I would like to reconstruct the sessions you had during the year, thinking that not all video-recordings worked
  - Adaptations to sessions plans

- Problems with dates and scheduling
7. Considering that it was possible to implement the project during the year, what do you think that made this possible?
    - Inquire about the work environment
  8. What do you think about the level of preparation and support you received?
    - From the research team
    - From the UTP and leadership team
    - From your colleagues
  9. What do you think about the workload involved?
    - In terms of time
    - In terms of emotional burden
  10. How sustainable in time do you think a project like this could be?
    - Inquire about conditions for sustainability

TPD design – general aspects – programme format and formal aspects

1. What is your opinion of the project?
2. What was your opinion of the session format?
  - For instance: activities, readings, topic
3. Regarding the use of other teachers' videos and of your own videos, what did you think before the videos were used? And what do you think now that you have seen your video?
  - Reluctance to show own video
  - What is learnt from sharing your practice and observing your colleagues'
4. What suggestions do you have to improve this programme's design?
5. If you had to describe this project to a teacher that did not participate: How would you describe it? What would you tell them you learnt?

[Introduction, only if responses to the previous question were vague] We would like to talk in more depth about what you learnt through your participation in this project.

Learning (teacher's and students')

1. Do you think that you have made changes in the way you teach?
  - Could you detail these changes?

- Examples: (1) using ground rules for dialogue; (2) strategies for turn-taking and promoting participation; (3) use of tools to promote (a) expressing ideas, (b) listening to others, (c) reasoning.
  - If the account is too general: could you give me an example?
  - Have you made changes in more than a class or subject?
  - If so, do you see any difference between the changes in the class you are a homeroom teacher for and others?
2. Have you made changes in other aspects of teaching? For instance, in your planning and the kinds of activities you do, or evaluations
    - If the account is too general: could you give me an example?
    - Have you made changes in more than a class or subject?
  3. Have you observed changes in your students as a result of the project?
    - Inquire: changes in participation and inclusion, oracy skills, mathematics learning
    - If the account is too general: could you give me an example?
  4. Could you tell us how the path has been along the year, in terms of the changes you have made?
    - If clarification is required, ask: what did you start with? How do you think it worked? How did you continue?
    - How did your students react?
    - Did you face any obstacles?
    - Was there anything that facilitated the changes?
  5. What is your assessment (or appreciation) of these changes?

[Introduction] Now that we've discussed what you learnt, we would like to look at how you see the relationship between this topic of dialogue in teaching and your context.

#### Project's fit

1. In your opinion, was the topic of dialogue pertinent with your job?
2. How well tuned do you think dialogue (or the changes you have made) are with mathematics teaching?
  - Alignment with the curriculum
  - Alignment with the discipline
3. If you work with different classes or teach several subjects, how do you see dialogue in these varied contexts?

4. How aligned do you see this topic to be with the school?
5. [Consider SIMCE and NTES] if you had the assessment this year, how do you think it worked with the project?

[Introduction] To finish this part of the interview, we would like to talk about how you see the project's future

#### Future projections

1. What do you think the project's future is in this school?
  - How do you feel about that?
2. Are you thinking of continuing to work on aspects of dialogue in the future?
  - Consider aspects that are already established and improvable aspects
3. Considering that the project focused on dialogue between you as the teacher and your students, how do you see the projection of the work to the context of peer dialogue?
4. If you were given the chance to take part in professional development activities in the future
  - Would you do it?
  - What topic would you like it to focus on?
  - How would you like the TPD to be?

[Introduction to their own video] From the lessons we videoed, I selected one of the moments in which I saw there were dialogic elements present that were part of the project. The idea now is to watch it so that you can tell us what your impressions are, and also so that we can give you some feedback. Let's watch the clip, which is around 4 minutes. If there is anything you would like to discuss while we are watching, we can pause it, otherwise we can talk when it finishes.

#### Own video observation

1. What do you notice about the video?
  - Is there anything else you would like to add?
2. Do you remember what you were feeling or thinking back then?
  - If dialogue is not mentioned, do you observe anything that you learnt in the project?

## Facilitators of School C

Introduction – School C: this is ..., one of the project's research assistants that will accompany us during the interview. As I was telling you, some of the interview questions relate to the viability of a project like this, and in this sense the perspective you have to offer is key. So, the idea is to talk a little bit about this. Our conversation will be confidential, and once I analyse the data, I won't make any references that can identify the school or yourself individually. I would like to ask you if I can audio-record the interview, keeping it confidential.

### You as a teacher

1. How long have you been teaching at this school?
2. How long have you been teaching mathematics?
3. How has your experience been teaching mathematics?

### The project

[Introduction] Thinking now about the mathematics and dialogue programme, considering the sessions you did manage to implement

1. What was your initial impression of the project?
2. What was your opinion of the session format?
  - For instance: activities, readings, topic
3. Could you tell us about the sessions that were implemented?
  - Dynamics between colleagues
  - Colleagues' interest level (what did they think of the topic, the materials)
  - Their evaluation of the sessions that took place
  - Did you identify any issues?
4. Considering the point that you reached in the project, how would you describe your role as facilitator until then?
  - In the sessions
  - Outside the sessions (consider management)
  - How did you feel in the role?
  - And in relation to facilitating the sessions for your colleagues
5. What do you think about the level of preparation and support you received?
  - From the research team

- From the UTP and leadership team
  - From your colleagues
6. What do you think about the workload involved?
- In terms of time
  - In terms of emotional burden

#### Obstacles you faced

[Introduction] Given that the project did not continue until the end, I would like to talk a bit about what you see as the causes, thinking there could be more than one.

1. What do you think the obstacles or problems were that led to not finishing the programme?
  - Inquire about the workload: what do you think about the workload?
  - Inquire about the programme design (use of videos, topic, materials, induction)
  - Inquire about support and fit with the school
  - Inquire about the situation with colleagues
2. How was the communication with the leadership team with regards to the project?
  - Information about progress and problems
  - Management and practical aspects
3. There were times in the year in which you said to me that you were considering dropping out, but then you continued. Why do you think things happened like they did?

#### Suggestions

1. Are there any aspects of the project where you think if they were different, maybe it would have worked better?
2. If a project like this was implemented in other schools, what aspects would you consider important?

#### Individual learning

[Introduction] Although the programme was not completed, you got to hear some things about dialogue in mathematics teaching in the induction and the first semester. In this context...

1. Do you think you learnt in the programme?
  - What learning would you highlight?
  - Enquire about: changes in teaching, changes outside the classroom

- If they have made changes: how do you evaluate these changes?
- Did you see any changes in your students as a result of this?

Ask about the possibility of interviewing colleagues and the leadership team.

Thank you (discuss involvement in the project)

## II. Participating teachers interview schedule

Note: many of the questions in teachers' interviews coincide with those of facilitators. To facilitate the distinction, questions that are unique to teachers will be marked using italics.

Introduction: this is ..., one of the project's research assistants that will lead this interview. The idea here is to talk about your opinion about this project, about what you learnt through it and how you see it in the future. At the end, we will watch a short clip about your lesson to discuss it. Our conversation will be confidential, and once I analyse the data, I won't make any references that can identify the school or yourself individually. I would like to ask you if I can audio-record the interview, keeping it confidential.

You as a teacher

1. How long have you been teaching at this school?
2. How long have you been teaching mathematics?
3. How has your experience been teaching mathematics?

[Introduction] Now we would like to discuss about your opinion of the programme: learning communities to promote dialogue in mathematics teaching

TPD design

Programme format and formal aspects

1. What is your opinion of the project?
2. What was your opinion of the session format?
  - For instance: activities, readings, topic
3. What did you think of the programme in terms of the workload?
  - Consider the sense of whether it was worth it
4. Given that the sessions were in group, how did you feel among your peers?
5. In your opinion, were there changes along the year in terms of the group dynamics?
6. Considering the group was formed mostly by teachers that had been working in the school for a short (School A)/long (School B) period of time, do you think this impacted the group in some way?
7. What did you think about the group being facilitated by colleagues?



8. Regarding the use of other teachers' videos and of your own videos, what did you think before the videos were used? And what do you think now that you have seen your video?
  - Reluctance to show own video
  - What is learnt from sharing your practice and observing your colleagues'
9. What suggestions do you have to improve this programme's design?
10. If you had to describe this project to a teacher that did not participate: How would you describe it? What would you tell them you learnt?

[Introduction, only if responses to the previous question were vague] We would like to talk in more depth about what you learnt through your participation in this project.

#### Learning (teacher's and students')

1. Do you think that you have made changes in the way you teach?
  - Could you detail these changes?
  - Examples: (1) using ground rules for dialogue; (2) strategies for turn-taking and promoting participation; (3) use of tools to promote (a) expressing ideas, (b) listening to others, (c) reasoning.
  - If the account is too general: could you give me an example?
  - Have you made changes in more than a class or subject?
  - If so, do you see any difference between the changes in the class you are a class teacher for and others?
2. Have you made changes in other aspects of teaching? For instance, in your planning and the kinds of activities you do, or evaluations
  - If the account is too general: could you give me an example?
  - Have you made changes in more than a class or subject?
3. Have you observed changes in your students as a result of the project?
  - Inquire: changes in participation and inclusion, oracy skills, mathematics learning
  - If the account is too general: could you give me an example?
4. Could you tell us how the path has been along the year, in terms of the changes you have made?
  - If clarification is required, ask: what did you start with? How do you think it worked? How did you continue?
  - How did your students react?
  - Did you face any obstacles?

- Was there anything that facilitated the changes?
5. What is your assessment (or appreciation) of these changes?

[Introduction] Now that we've discussed what you learnt, we would like to look at how you see the relationship between this topic of dialogue in teaching and your context.

#### Project's fit

1. In your opinion, was the topic of dialogue pertinent with your job?
2. How well tuned do you think dialogue (or the changes you have made) are with mathematics teaching?
  - a. Alignment with the curriculum
  - b. Alignment with the discipline
3. If you work with different classes or teach several subjects, how do you see dialogue in these varied contexts?
4. How aligned do you see this topic to be with the school?
5. [Consider SIMCE and NTES] if you had the assessment this year, how do you think it worked with the project?

[Introduction] To finish this part of the interview, we would like to talk about how you see the project's future

#### Future projections

1. What do you think the project's future is in this school?
  - How do you feel about that?
2. Are you thinking of continuing to work on aspects of dialogue in the future?
  - Consider aspects that are already established and improvable aspects
3. Considering that the project focused on dialogue between you as the teacher and your students, how do you see the projection of the work to the context of peer dialogue?
4. If you were given the chance to take part in professional development activities in the future
  - Would you do it?
  - What topic would you like it to focus on?
  - How would you like the TPD to be?

[Introduction to their own video] From the lessons we videoed, I selected one of the moments in which I saw there were dialogic elements that were part of the project. The idea now is to watch it so that you can tell us what your impressions are, and also so that we can give you some feedback. Let's watch the clip, which is around 4 minutes. If there is anything you would like to discuss while we are watching, we can pause it, otherwise we can talk when it finishes.

#### Own video observation

1. What do you notice about the video?
  - Is there anything else you would like to add?
2. Do you remember what you were feeling or thinking back then?
  - If dialogue is not mentioned, do you observe anything that you learnt in the project?

### III. UTP Interview

Introduction: The goal of this interview is to talk about the project, about how you saw its development during the year, so that I can get to know the vision from the standpoint of the leadership team. Our conversation will be confidential, and once I analyse the data, I won't make any references that can identify the school or yourself individually. I would like to ask you if I can audio-record the interview, keeping it confidential.

#### TPD design

##### Format

1. What is your opinion of the programme?
2. What do you think about facilitators being teachers?
  - [School B] Originally, we had decided that UTP-1 would have a more active role in the TPD sessions, do you think that this would have changed in any way the way that the programme unfolded during the year?
3. How do you think this way of working fitted with other activities at school?
  - Could you tell us in detail about other programmes that were in place at the school during the year, in which participating teachers were involved?
  - And others in which they were not involved?
  - How do you think this project interacted with the other programmes in place?
4. What is your opinion on the [programme's] contents?
  - Did you get to know the TPD materials to some extent?
  - What did you think of these?
  - What did you think of the project goals?

#### TPD implementation during the year

1. Considering that it was possible to implement the project during the year, what made it possible in your view?
2. Did you identify any obstacles for its implementation?
  - [School A] We have discussed before, and with the facilitators, about a moment in the year in which they asked you not to continue with the project, could you tell us a little bit about what happened?

- [School B] Part of the issues that [the group] experienced during the year related to changes in the session timeline and cancelling of sessions, partly because of a lack of a meeting space, how did you perceive this issue?
3. What did you think of the level of support that I provided during the year?
  4. What is your impression of the workload it [the project] involved for facilitators?
  5. What is your impression of the workload it [the project] involved for participating teachers?
  6. How do you see the fit between the project and SIMCE and the NTES?

#### Impressions of the results

1. Initially, when the school was interested in participating in the project, there were certain aspects of the project goals that were linked to the school's, how do you think that panned out?
  - [School A] Specifically, something you discussed in the beginning was the need to support the mathematics department, and the impression that teaches needed to improve with regards to how they handled students' responses
  - [School B] Something you specifically touched upon at the beginning was your interest in promoting collaborative work between teachers in your school
2. Have you been able to form an impression about what teachers have learnt?
  - Teachers' own reports
  - Lesson observations
3. Do you use your own observation protocols, or any other lesson observation method?
  - Was the project's work reflected on these protocols in any way? If so, how?
4. How do you evaluate the fact that the project's focus was on mathematics?
  - How do you project the work to other curricular areas?
5. To finalise this part of the interview, what is your overall evaluation of the school's participation in this project?

#### Future projections

1. What is the school planning regarding continuous professional development in the context of the New Teaching Career System Law?
2. Have you disseminated the project among non-participating teachers?
  - In what context?
  - What has the response been like?

3. The research as initially formulated has come to an end, what will happen with the project hereon?
4. If you intend to continue somehow, what would be your goals?
5. What methodology would you employ to do this?
6. Do you think this could be sustainable in time?
  - Consider sustainability of classroom practices versus that of teacher communities

#### Collaboration possibilities

1. If you intend to continue in any way, do you see the research team having any role in it?
  - Elaborating materials
  - Offering consultancy
  - Research-wise
2. How do you see the possibility of engaging in follow-up research activities such as video recordings or interviews?

### 3. APPENDIX 3 - EXAMPLE OF FEEDBACK GIVEN TO THE TEACHERS AFTER OBSERVING THEIR VIDEO CLIPS

Teacher: P16 – 3<sup>rd</sup> grade

I chose this episode because it is a lengthy segment in the lesson that focuses only on one topic, and where the topic is ‘sustained’ instead of you as a teacher solving it straight away. Although two of the classmates had the right solution [written on the board], it is apparent that the student that comes up to the board did not have that level of clarity, and from that starting point, and asking other students to help this boy, it becomes clear that in fact the rest of the class was also unclear about the solution. It is an example of how, through participation and asking students for explanations you can find out what they understand and what they don’t, before they reach the test. You ask students to explain what their classmates have done (Dialogue Goal 4). Additionally, the distribution of turns of speech between you and your students is more or less equitable, which is infrequent.

Your intention to manage participation and who takes the floor by approaching different groups [of tables] and promoting that not only a handful take the floor. Perhaps more techniques to manage the floor could be used as well [to maximise this].

In terms of how to move on from here, I think that in this case, although the students explained how they built their graphs right before the video clip we watched, we could see that the students still did not have much clarity [about what the graph represented]. Thus, maybe you could involve students in asking questions to their classmates at the board to clarify their doubts. In general, you could slowly move on to the discussion being managed by the students through questions or clarifications, rather than acting as the mediator [between them].

#### 4. APPENDIX 4 - INTERVIEW TRANSCRIPTION PROTOCOL

General transcription instructions:

- Verbatim transcription: all that is said is transcribed, even unfinished words or sentences.
- Where appropriate, using punctuation such as: . , and ¿?
- Indicate with a [time stamp] every 5 minutes of audio
- Switch in speaker marked by Intro (new line)
- Speaker indicated with initials and colon (example → EC:)
- Using symbols in the following instances:

**Appendix Table 2 Transcription symbols and notations**

sign	meaning	example
//	Interruption	EC: claro, pero en el fondo // CG: es como EC: tú teniai la noción de... como viene de antes (risa) eso
()	Non-verbal aspects such as laughter, sighs, exclamations, ironic tone	EC: tú teniai la noción de... como viene de antes (risa) eso
#	End of an unfinished word	es primordial para que los chicos ahora en pri# desde primero
...	Short pause (sometimes by making the last vowel sound longer)	como... al final es como lo visible
... ...	Long pause	CG: eh... ... es difícil.
[]	Transcriber clarification	EC: [una palabra inaudible] externa CG: yo con VG trabajamos muy a la par porque somos, estamos en primer ciclo [creo que se refiere a 1º y 2º exclusivamente] las dos, entonces ella también es muy especialista en primero básico
“ “	Encloses things that are said as a direct quote of the interviewee herself or someone else	CG: porque ahí, no sé o de Cs sociales donde como... "y quién votó? y tu mamá ¿por quién votó?"



## 5. APPENDIX 5 - LESSON RECORDING TEMPLATE AND EXAMPLE OF FIELDNOTES

### I.Template

1. Teacher
2. Observer
3. Date
4. Lesson (pre-during-post)
5. Number of students present
6. Number of female students
7. Other adults present in the lesson
8. Technical notes about the video recording
9. Time of the lesson
10. Homeroom teacher (Y/N)
11. Notes about the lesson

### II. Example of notes:

P13, pre-test video, 1<sup>st</sup> grade

The teacher told me that she had already told the students about the recording, but nonetheless I introduced myself and so did the research assistant. The kids asked me if they would appear on TV, and I told them that no-one would see the video except from myself. The kids are sitting in groups of six tables, and the teacher indicates that they are sitting in mixed groups, without any organising criterion such as achievement. The one criterion is that students that have more severe behavioural or learning issues sit closer to the teacher's desk. Due to the tables' shape and orientation, some children actually face away from the whiteboard. On the two occasions that students come up to the board to count the elements on the board, the teacher interacts with them quietly, instead of addressing the whole class.

## 6. APPENDIX 6 - IMPLEMENTATION REPORT QUESTIONS

### 1. Identify the session

- Name:
- N° of session:
- Date:
- Attendees:
- Materials used:

### 2. Plan and implementation

- Were there changes to the initial plan?
- Which changes were there?
- Why did they come about?

### 3. Do you have any other observations?

## 7. APPENDIX 7 - INFORMED CONSENT LETTERS

### I. Informed consent letter for head teachers

Project: Teacher learning communities to promote dialogue in mathematics teaching

Your school has been invited to participate in the doctoral project “Teacher learning communities to promote dialogue in mathematics teaching” by Elisa Calcagni PhD (c), supervised by Dr Sara Hennessy and Prof Christine Howe in the United Kingdom and Dr Valeska Grau at the Pontificia Universidad Católica de Chile.

What is the project’s purpose?

This project seeks to design, support and research the **generation of teacher learning communities in public primary schools**. These communities will have lesson videos of other teachers and of participants as a key resource and will be facilitated by colleagues from the school that will attend an induction. The meetings aim to provide a space where participants can engage in professional collaboration to inquire into and transform their practices, with the support of materials such as activities and readings, and a video camera. This, specifically focusing on addressing the quality of classroom communication **in the mathematics classroom and promoting dialogue exchanges**.

What does your participation involve?

As the head teacher, you have been informed about the characteristics of the project, its benefits and the requirements it involves for your school. In your capacity as school principle, your participation consists of securing the conditions for the project’s implementation, allowing facilitators and teachers to take part in the professional development and research activities during their working hours.

With regards to **professional development**, participation in the project entails:

- Facilitators’ participation in the initial induction in December 2016 and January 2017 (18 hours).
- Teachers’ and facilitators’ participation in learning community meetings during 2017, supported by the materials designed by the research team (app. 10 meetings)

With regards to **research data**, your participation could involve an **interview** at the end of the project to find out about your impressions. Alongside this, teachers and facilitators will take part in:

- **Surveys** to record demographic information (app. 15 minutes)
- **Video observation protocols** at the beginning and end of the process, to find out whether participants observe videos differently after learning about classroom dialogue (app. 40 minutes)
- **Interviews** at the end of the process to know their experience in the programme and what they learnt (app. 30 minutes).
- **Classroom video recordings** done by the research team at the beginning and end of the year, to document the teaching and learning processes related to dialogue.
- Teachers' self-captured video recordings as part of the programme.
- **Video recordings of the community meetings**, to monitor and research the learning process in the teacher community (recording of all sessions).

Does this pose any risks for me?

There are no foreseen risks for participants or your school.

What are the benefits participating?

In participating in this project, your school will be involved without any cost in an innovative and evidence-based professional development programme. It aims to enrich the teaching practices of your teaching staff. Additionally, the learning community will provide them with rich interactions with their colleagues, promoting a culture of collaboration and mutual enrichment.

What will happen with the classroom videos that will be recorded?

This project is in line with the University of Cambridge ethical regulations. The data produced in this study will be employed in the PhD thesis of Elisa Calcagni, and potentially in further publications (research articles, conference presentations and other academic dissemination activities) and in instances of continuous professional development directly managed by the researcher. The data will be stored and administered by the research and will not be used by third parties [e.g. research assistants] without direct supervision. The data will be treated anonymously, which means that no data that would allow for you or your school to be identified will be shared in any way. Pseudonyms will be employed when identification is necessary (unless you decide against this)

Additionally, the treatment of the data will be confidential, only accessible to people directly involved in the project and for research purposes. The data will not be disseminated among anyone that is not directly involved in the project, either within the school or outside of it. The lesson and meeting videos produced by the teachers will be exclusively accessed by the learning community members (teachers and facilitators) and the research team.

Is it mandatory to take part? Can I change my mind after signing [the consent letter]?

Your and your school's participation in this study is **NOT mandatory** in any way. If you agree to take part, you can stop being involved at any time, informing the researcher and facilitators, without any consequences for you. If that is the case, I kindly ask you to contact the researcher.

Who can I contact to find out more about the study, or if I have any questions?

if you have any questions about the research, you can contact Elisa Calcagni, who will be based in the School of Psychology at the Pontificia Universidad Católica de Chile. Her phone numbers are: XXXXXXXXX and XXXXXXXXX, and her email is XXXXXX.

I HAVE HAD THE OPPORTUNITY TO READ THIS INFORMED CONSENT STATEMENT, TO MAKE QUESTIONS ABOUT THE RESEARCH AND I **AGREE FOR THE SCHOOL THAT I RUN TO PARTICIPATE IN THIS PROJECT.**

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Principal's name

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Principal's signature

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Date

---

School

Researcher's signature, María Elisa Calcagni García

(Two copies: one for the researcher and one for the participant)

## II. Informed consent letter for UTPs

Project: Teacher learning communities to promote dialogue in mathematics teaching

You have been invited to participate in the doctoral project “Teacher learning communities to promote dialogue in mathematics teaching” by Elisa Calcagni PhD (c), supervised by Dr Sara Hennessy and Prof Christine Howe in the United Kingdom and Dr Valeska Grau at the Pontificia Universidad Católica de Chile.

What is the project’s purpose?

This project seeks to design, support and research the **generation of teacher learning communities in public primary schools**. These communities will have lesson videos of other teachers and of participants as a key resource and will be facilitated by colleagues from the school that will attend an induction. The meetings aim to provide a space where participants can engage in professional collaboration to inquire into and transform their practices, with the support of materials such as activities and readings, and a video camera. This, specifically focusing on addressing the quality of classroom communication **in the mathematics classroom and promoting dialogue exchanges**.

What does your participation involve?

Your participation entails **supporting the project’s implementation** during the schoolyear and taking part in a **final interview** to find out about your opinion of the project.

Does this pose any risks for me?

There are no foreseen risks for participants.

What are the benefits participating?

In participating in this project, your school will be involved in a professional development programme about dialogue in mathematics teaching. It aims to enrich the teaching practices of your teaching staff.

What will happen with the classroom videos that will be recorded?

This project is in line with the University of Cambridge ethical regulations. The data produced in this study will be employed in the PhD thesis of Elisa Calcagni, and potentially in further publications (research articles, conference presentations and other academic dissemination activities) and in instances of continuous professional development directly

managed by the researcher. The data will be stored and administered by the research and will not be used by third parties [e.g. research assistants] without direct supervision.

The treatment of the data will be confidential, only accessible to people directly involved in the project and for research purposes. The data will not be disseminated among anyone that is not directly involved in the project, either within the school or outside of it. Additionally, the data will be treated anonymously, which means that no data that would allow for you or your school to be identified will be shared in any way. Pseudonyms will be employed when identification is necessary.

Is it mandatory to take part? Can I change my mind after signing [the consent letter]?

Your participation in this study is **NOT mandatory** in any way. If you agree to take part, you can stop being involved at any time, informing the researcher and facilitators, without any consequences for you.

Who can I contact to find out more about the study, or if I have any questions?

if you have any questions about the research, you can contact Elisa Calcagni, who will be based in the School of Psychology at the Pontificia Universidad Católica de Chile. Her phone numbers are: XXXXXXXXX and XXXXXXXXX, and her email is XXXXXXX.

I HAVE HAD THE OPPORTUNITY TO READ THIS INFORMED CONSENT STATEMENT, TO MAKE QUESTIONS ABOUT THE RESEARCH AND I **AGREE TO PARTICIPATE IN THIS PROJECT.**

\_\_\_\_\_  
Participant's name

\_\_\_\_\_  
Participant's signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
School

Researcher's signature, María Elisa Calcagni García

(Two copies: one for the researcher and one for the participant)

### III. Informed consent letter for teacher-facilitators

Project: Teacher learning communities to promote dialogue in mathematics teaching

You and your students have been invited to participate in the doctoral project “Teacher learning communities to promote dialogue in mathematics teaching” by Elisa Calcagni PhD (c), supervised by Dr Sara Hennessy and Prof Christine Howe in the United Kingdom and Dr Valeska Grau at the Pontificia Universidad Católica de Chile.

What is the project’s purpose?

This project seeks to design, support and research the **generation of teacher learning communities in public primary schools**. These communities will have lesson videos of other teachers and of participants as a key resource. Initially, an induction will be carried out with a group of teachers that will then facilitate the community meetings in each school. The learning community sessions aim to provide a space where you can engage in professional collaboration to inquire into and transform your practices, with the support of materials such as activities and readings, and a video camera. This, specifically focusing on addressing the quality of classroom communication **in the mathematics classroom and promoting dialogue** in the whole-class and group work contexts.

What does my participation involve?

Your involvement in the project involves professional development instances and your involvement in data collection.

With regards to **professional development**, your participation entails:

- Participation in the initial induction in December 2016 (18 hours)
- Participation in learning community meetings during 2017, supported by the materials designed by the research team (app. 10 meetings)
- Video recording some of these meetings and to be handed to the research team.
- In some of these meetings, jointly designing activities that involve dialogue, and implementing them in mathematics lessons (occasionally video recording these)

With regards to **research data**, your participation entails:

- **Surveys** to record demographic information (app. 15 minutes)
- **Implementation reports** to be completed after each community meeting (app. 20 minutes)



- **Video observation protocols** at the beginning and end of the process, to find out whether participants observe videos differently after learning about classroom dialogue (app. 40 minutes)
- **Final interview** at the end of the process to know your experience in the programme and what you learnt (app. 30 minutes).
- **Classroom video recordings** at the beginning, middle and end of the year, to document the teaching and learning processes related to dialogue.
- **Video recordings of the community meetings**, to monitor and research the learning process in the teacher community (recording of all sessions).

Does this pose any risks for me?

There are no foreseen risks for participants.

What are the benefits participating?

In participating in this project, you will be involved in professional development activities about facilitating learning communities and dialogic pedagogy. This, with the aim of enriching your professional practice. Additionally, the learning community will provide you with rich interactions with your colleagues, promoting a culture of collaboration and mutual enrichment.

What will happen with the classroom videos that will be recorded?

This project is in line with the University of Cambridge ethical regulations. The data produced in this study will be employed in the PhD thesis of Elisa Calcagni, and potentially in further publications (research articles, conference presentations and other academic dissemination activities) and in instances of continuous professional development directly managed by the researcher. The data will be stored and administered by the research and will not be used by third parties [e.g. research assistants] without direct supervision.

The treatment of the data will be confidential, only accessible to people directly involved in the project and for research purposes. The data will not be disseminated among anyone that is not directly involved in the project, either within the school or outside of it. Additionally, data will be treated anonymously, which means that no data that would allow for you or your school to be identified will be shared in any way. Pseudonyms will be employed when identification is necessary.

Is it mandatory to take part? Can I change my mind after signing [the consent letter]?

Your participation in this study is **NOT mandatory** in any way. If you agree to take part, you can stop being involved at any time, informing the researcher, without any consequences for your relationship with the school.

Who can I contact to find out more about the study, or if I have any questions?

if you have any questions about the research, you can contact Elisa Calcagni, who will be based in the School of Psychology at the Pontificia Universidad Católica de Chile. Her phone numbers are: XXXXXXXXX and XXXXXXXXX, and her email is XXXXXX.

I HAVE HAD THE OPPORTUNITY TO READ THIS INFORMED CONSENT STATEMENT, TO MAKE QUESTIONS ABOUT THE RESEARCH AND I **AGREE TO PARTICIPATE IN THIS PROJECT.**

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Participant's name

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Participant's signature

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Date

Researcher's signature, María Elisa Calcagni García

(Two copies: one for the researcher and one for the participant)

#### IV. Informed consent letter for teachers

Project: Teacher learning communities to promote dialogue in mathematics teaching

You and your students have been invited to participate in the doctoral project “Teacher learning communities to promote dialogue in mathematics teaching” by Elisa Calcagni PhD (c), supervised by Dr Sara Hennessy and Prof Christine Howe in the United Kingdom and Dr Valeska Grau at the Pontificia Universidad Católica de Chile.

What is the project’s purpose?

This project seeks to design, support and research the **generation of teacher learning communities in public primary schools**. These communities will have lesson videos of other teachers and of participants as a key resource and will be facilitated by colleagues from the school that attended an induction session. The learning community sessions aim to provide a space where you can engage in professional collaboration to inquire into and transform your practices, with the support of materials such as activities and readings, and a video camera. This, specifically focusing on addressing the quality of classroom communication **in the mathematics classroom and promoting dialogue**.

What does my participation involve?

Your involvement in the project involves professional development instances and your involvement in data collection.

With regards to **professional development**, your participation entails:

- Participation in learning community meetings during 2017, supported by the materials designed by the research team (app. 10 meetings)
- In some of these meetings, jointly designing activities that involve dialogue, and implementing them in mathematics lessons (occasionally video recording these)

With regards to **research data**, your participation entails:

- **Surveys** to record demographic information (app. 15 minutes)
- **Video observation protocols** at the beginning and end of the process, to find out whether participants observe videos differently after learning about classroom dialogue (app. 40 minutes)
- **Final interview** at the end of the process to know your experience in the programme and what you learnt (app. 30 minutes).

- **Classroom video recordings** done by the research team at the beginning and end of the year, to document the teaching and learning processes related to dialogue.
- **Self-captured classroom videos** for your own reflection and to share with your colleagues.
- **Video recordings of the community meetings**, to monitor and research the learning process in the teacher community (recording of all sessions).

Does this pose any risks for me?

There are no foreseen risks for participants.

What are the benefits participating?

In participating in this project, you will be involved without cost and during your working hours in teacher professional development activities about dialogue in mathematics teaching. This, with the aim of enriching your professional practice. Additionally, the learning community will provide you with rich interactions with your colleagues, promoting a culture of collaboration and mutual enrichment.

What will happen with the classroom videos that will be recorded?

This project is in line with the University of Cambridge ethical regulations. The data produced in this study will be employed in the PhD thesis of Elisa Calcagni, and potentially in further publications (research articles, conference presentations and other academic dissemination activities) and in instances of continuous professional development directly managed by the researcher. The data will be stored and administered by the research and will not be used by third parties [e.g. research assistants] without direct supervision.

The treatment of the data will be **confidential**, only accessible to people directly involved in the project and for research purposes. The data will not be disseminated among anyone that is not directly involved in the project, either within the school or outside of it. Additionally, data will be treated **anonymously**, which means that no data that would allow for you or your school to be identified will be shared in any way. Pseudonyms will be employed when identification is necessary.

Is it mandatory to take part? Can I change my mind after signing [the consent letter]?

Your participation in this study is **NOT mandatory** in any way. If you agree to take part, you can stop being involved at any time, informing the researcher and facilitators, without any consequences for you or your relationship with the school.

Who can I contact to find out more about the study, or if I have any questions?

if you have any questions about the research, you can contact Elisa Calcagni, who will be based in the School of Psychology at the Pontificia Universidad Católica de Chile. Her phone numbers are: XXXXXXXXX and XXXXXXXXX, and her email is XXXXXX.

I HAVE HAD THE OPPORTUNITY TO READ THIS INFORMED CONSENT STATEMENT, TO MAKE QUESTIONS ABOUT THE RESEARCH AND I **AGREE TO PARTICIPATE IN THIS PROJECT.**

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Participant's name

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Participant's signature

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Date

Researcher's signature, María Elisa Calcagni García

(Two copies: one for the researcher and one for the participant)

## V. Informed consent letter for parents and legal guardians

Project: Teacher learning communities to promote dialogue in mathematics teaching

Your child has been invited to participate in the doctoral project “Teacher learning communities to promote dialogue in mathematics teaching” by Elisa Calcagni PhD (c), supervised by Dr Sara Hennessy and Prof Christine Howe in the United Kingdom and Dr Valeska Grau at the Pontificia Universidad Católica de Chile.

What does the project seek to achieve?

This project consists of the design and implementation of a continuous professional development programme for some teachers in your child’s school. In it, teachers will have meetings in which they will discuss mathematics teaching, to promote a better-quality communication in the subject. This will foster important skills in the mathematics curriculum, such as the ability to explain and argue mathematically. These discussions will draw on teachers’ practices, using video excerpts from their classrooms to promote learning.

What does my child’s participation involve?

The teachers’ involvement in the project requires the video recording of some mathematics lessons in your child’s class. Therefore, he or she would appear in video recordings made in this study. Some of these recordings will be done by the research team, and in other cases the teachers themselves will do the videoing. The videos will only be used by the teachers as part of the learning programme, and by the researcher to observe what happens in the classroom. Your child will not be assessed in any way through these videos.

Does this pose any risks for my child?

There are no foreseen risks for participants.

What are the benefits of my child’s participation?

Since the teachers will learn about how to improve classroom communication, your child will be enriched by new opportunities to participate in mathematics lessons. The videoing will allow teachers to analyse their practices, which will be beneficial for them as well as for their students. Also, in allowing your child to participate in these recordings, you will be contributing to the production of high-quality research to promote better teaching in the country’s public schools.

What will happen with the classroom videos that will be recorded?

This project is in line with the University of Cambridge ethical regulations. The data produced in this study will be employed in the PhD thesis of Elisa Calcagni, and potentially in further publications (research articles, conference presentations and other academic dissemination activities) and in instances of continuous professional development directly managed by the researcher. The data will be stored and administered by the research and will not be used by third parties [e.g. research assistants] without direct supervision.

The treatment of the data will be **confidential**, only accessible to people directly involved in the project and for research purposes. The data will not be disseminated among anyone that is not directly involved in the project, either within the school or outside of it. Additionally, data will be treated **anonymously**, which means that no data that would allow your child or their school to be identified will be shared in any way. Pseudonyms will be employed when identification is necessary.

Is it mandatory for my child to take part? Can he or she change their mind after signing [the assent letter]?

Your child's participation in this study is **NOT mandatory** in any way. If they do not want to appear in the recordings, they will be seated in the classroom away from the camera's reach so that they do not feature and their involvement in the lesson is not impeded. If they agree to participate, but later changes their mind, you can ask your child's teacher for them to cease appearing on the videos, without any consequences for your child or your relationship with the school.

Who can I contact to find out more about the study, or if I have any questions?

if you have any questions about the research, you can contact Elisa Calcagni, who will be based in the School of Psychology at the Pontificia Universidad Católica de Chile. Her phone numbers are: XXXXXXXXX and XXXXXXXXX, and her email is XXXXXX.

I HAVE HAD THE OPPORTUNITY TO READ THIS INFORMED CONSENT STATEMENT AND I **AGREE FOR MY CHILD TO PARTICIPATE IN THIS PROJECT.**

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Parent's or guardian's name

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Parent's or guardian's signature

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Child's name and class

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Date

Researcher's signature, María Elisa Calcagni García

(Two copies: one for the researcher and one for the participant)



## VI. Student's assent letter



My teacher and my class have been invited to participate in a study about dialogue in mathematics lessons, led by Elisa Calcagni, doctoral candidate at the Faculty of Education, University of Cambridge (England). In this study, I will be asked to participate in mathematics lessons that will be video recorded.

The video recordings will be done by researchers and/or my teacher.

Some important aspects about my participation:

- The videos will be used for research and **will not be made public** in any way.
- The lessons will be conducted normally while the videos are being recorded.
- If during the recording I feel uncomfortable, or there is something I dislike, I can ask to be out of the camera's reach at any time and this will not have any consequences for me.
- The head teacher has authorised this research, and my parents or guardians have been informed as well.
- I can contact the main researcher: XXXXXXXX, or XXXXXXXX, whenever I feel is necessary to ask about my involvement in this study.

Your participation in this project will help us understand how dialogue can be implemented in mathematics lessons. If you agree to participate, please sign below. If there is anything you do not understand, please let us know so we can help you.

I (your name) \_\_\_\_\_, from the class \_\_\_\_\_ agree to participate in this study voluntarily.

## 8. APPENDIX 8 - ETHICAL COMMITMENT FOR PARTICIPANTS

Work in a professional community depends on participants generously sharing their teaching experiences among colleagues. Acting as ‘critical friends’ to one another will have benefits for all, promoting critical reflexivity and improvement. Although fruitful, the exercise is not without challenge: openness can sometimes feel threatening, and people might feel like they need to defend themselves, or to protect others from their critique. Such experiences are normal, especially at the beginning of such an exciting endeavour!

To kick-start the process, an initial ethical commitment agreed between participants and signed by them is advised, so that all involved (including pupils in participants’ classes) feel protected. This document suggests a baseline agreement and some extra space for adding commitments if the groups agrees to do so.

### Commitment

I \_\_\_\_\_ (name) want to be a part of this teacher community. I acknowledge that private and confidential matters will be addressed as part of the community’s activities. Therefore, I am committed to:

- Attend to community meetings and arrive punctually.
- Treat all of the conversations held in the community’s meetings as confidential and avoid discussing them with other people.
- Treat all lesson videos from community members as confidential and avoid discussing them with other people.
- Refer to members of the school community (both present and not) respectfully.
- Offer my honest and respectful views to other members of the community.
- (additional commitments)

Signature:

Date:

## 9. APPENDIX 9 - EXAMPLE OF PERSONAL WORK

Personal work 2 – how do we use talk in my class?

Interrogating questions<sup>53</sup>

Consider this checklist before some of your lessons and when you finish teaching, answer it indicating **yes** or **no** according to what you've done. Use this checklist to monitor a series of lessons and get a sense of how you use questioning in your teaching.

**Appendix Table 3 'Questioning questions' checklist**

Key aspects	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Did I prepare questions as part of my lesson preparation?					
Did I make sure to use a variety of questions during my lesson?					
Did I always count to 3 (to pause) after posing a question?					
Did I make sure that most students got an opportunity to answer a question?					
Did I actively engage all students in thinking?					
Did I use a variety of prompts to encourage further reasoning and answers?					
Did I use student answers as a start for further (probing) questioning?					
If a student gave a wrong answer, did I try to follow the line of thought?					
After one student gave their answer, did I involve other students in the discussion?					

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<sup>53</sup> Translated and adapted from: Lead & Learn Zambia (2011). Questioning the questions, obtenido de [http://www.vvob.org.zm/cms/sites/default/files/learning\\_files\\_3\\_-\\_questioning\\_the\\_questions.pdf](http://www.vvob.org.zm/cms/sites/default/files/learning_files_3_-_questioning_the_questions.pdf)

10. APPENDIX 10 - CODE BOOK STUDY 1

Appendix Table 4 Themes and examples Category 1, Study 1

Theme name	Theme description	Examples (by sub-themes)
<p><b>Contents</b></p>	<p>Reported positive perceptions about the programme's contents and their applicability to participants' classroom realities and their ability to own and adapt the proposed strategies.</p>	<p><b>Applicable proposals:</b> It was something that you could add to the lessons, to the same, to the same didactic that we employ, but now using these questions. So, it was something so specific that it was something good in, there was a very good reception (P21-F)</p>
		<p><b>Good contents and structure:</b> I think that we could work really well, the materials were very clear. If you ask me whether there was clarity in those documents, very clear, there weren't any major problems (P16)</p>
<p><b>Structure and sessions</b></p>	<p>Suggestions and criticism about the programme design in its format and the proposed activities. In part, the criticism focused on the need to make the proposals more tailored to mathematics and to different grade levels. Other suggestions referred to the need for more time to practice and, likewise, to the inclusion of more practical components over and above theoretical ones.</p>	<p><b>More practical and less theoretical:</b> From my experience, if this [programme] were to be replicated elsewhere, I feel that the material should be much more concise, more practical, that's in the first place. And ideally it would be much more graphic, much more audio-visual, because teachers arrive at 3 PM, after the 8, practically 8 hours before so many kids (...) you have to think most of them are lethargic (P20-F)</p>
		<p><b>More structure and specificity:</b> I think ideally [the Project] should be supplemented with other things to see more results [I: things like what?] say, for instance, relating it more the specific content with the aspect of dialogue in maths, ok? Uhm... I mean not on your side, but us as teachers have a separate TPD to relate the contents directly with dialogue (P15-F)</p>
		<p><b>More time to practice:</b> We needed more time to organise ourselves, say, 10 months, one strategy per month, like I mean, something like that (...) what's most important, dialogue with children, right? 'how are we going to produce dialogues', ok 'with this strategy, this one, this one' and so, trialling all strategies (P18)</p>

<p><b>Learning community</b></p>	<p>Participants appreciated the fact that the learning activities were based on a peer meetings and discussions, emphasising the collaborative aspect and collegiality.</p>	<p>I think that that was really enriching about the meetings, being able to get together and share, I mean, one of the aspects about teachers that we always emphasise is the learning community, which is precisely that, sharing experiences [I: right] so we, it's like they forced us to do it once a month and it was like, at the beginning it was like, well, a little forced, but then it was like 'you know what? Let's make the most of our time, let's share these experiences' 'how do you do it? How do you do it?' (...) looking there uhm... for answers and making a learning community (P13)</p>
<p><b>Classroom videos</b></p>	<p>References to the use of classroom videos in the programme. They were acknowledged as an important component. Their use provoked mixed feelings in participants, especially concerning their own videos.</p>	<p><b>Learning from observing:</b> In the end you feel very... uhm happy when showing your recording they said 'no, is that 5th grade? I didn't know that 5th grade' there really was an image of my class... ugly from last year, so achieving a lesson like that, fun, it's great (P14-F)</p> <p><b>Learning how to observe:</b> Yeah, clearly the way of watching videos [changed] because... well I don't know, we had the same experience at the facilitators' induction, we watched the first videos and right away we started criticising, right? Although here we still continued to criticise, uhm... (P15-F)</p> <p><b>Mixed reactions to being videoed:</b> I don't get embarrassed, not at all [I: ok, you don't] no, no, last year I was recorded even just in case, they went to my classroom, people from the corporation, people from the Educational Quality Agency came to my classroom to film, so I don't... it's not a problem for me to be recorded, not at all (P10-F)</p>

Appendix Table 5 Coding matrix Category 1, Study 1

Themes and sub-themes	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTP-B	N° sources
<b>Contents</b>	2	4	2	1	1	7	6	1	2	2	4	2	1	0	13
Applicable proposals	1	2	1	1	1	5	5	0	2	2	3	2	1	0	12
Good contents and structure	1	2	1	0	0	2	1	1	0	0	1	0	0	0	7
<b>Structure and sessions</b>	1	0	3	4	5	6	3	6	6	2	2	0	0	0	10
More practical and less theoretical	1	0	2	1	3	1	3	0	1	1	1	0	0	0	9
More structure and specificity	0	0	1	3	1	5	0	3	2	0	1	0	0	0	7
More time to practice	0	0	0	0	1	0	0	3	3	1	0	0	0	0	4
<b>Learning community</b>	4	0	1	2	1	1	1	0	0	1	0	1	0	3	9
<b>Classroom videos</b>	2	2	4	4	4	5	8	6	3	2	0	1	1	0	12
Learning from observing	1	1	2	2	3	0	2	2	1	0	0	0	0	0	8
Learning how to observe	0	0	0	3	1	2	3	1	1	0	0	1	0	0	7
Mixed reactions to being videoed	1	1	2	1	0	3	3	5	1	1	0	0	1	0	10

Appendix Table 6 Coded sources per school, Category 1, Study 1

Themes and sub-themes	Araucaria School	Boldo School	Canelo School
<b>Contents</b>	11	18	6
Applicable proposals	7	14	5
Good contents and structure	4	4	1
<b>Structure and sessions</b>	13	23	2
More practical and less theoretical	7	6	1
More structure and specificity	5	10	1
More time to practice	1	7	0
<b>Learning community</b>	8	6	1
<b>Classroom videos</b>	17	24	1
Learning from observing	9	5	0
Learning how to observe	4	7	1
Mixed reactions to being videoed	6	13	0
Criteria - Schools A and B: high 12+; medium 6-11; low 5-; School C: high: 4+; medium 2-3; low 1-			

Appendix Table 7 Themes and examples, Category 2, Study 1

Theme name	Theme description	Examples (by sub-themes)
<p><b>Participants' characteristics</b></p>	<p>Participants' perceptions of themselves and their peers and their willingness to change varied: some found that it was positive and some negative. Teachers' previous experiences in TPD was also discussed in relation to their reactions to the current programme.</p>	<p><b>Positive disposition to change:</b> The mathematical Project and what was being proposed, the teachers believed in it (UTP-A)</p>
		<p><b>Negative disposition to change:</b> I think the problem with teachers, I think that they get used to doing things at their own pace, and when the UTP is laissez faire and has no business with your work, we [colleagues and myself] feel like we are behind a wall, in a fortress and when someone wants to, for instance, come and video your lesson, it's as if they were insulting you (P20-F)</p>
		<p>Disjointed ambient TPD: <i>participants' previous TPD experiences ranged from no previous courses specific to mathematics, to having teaching diplomas in the area</i></p>
<p><b>Group development during the year</b></p>	<p>The theme describes the evolving reactions of participants towards the programme, starting from their initial feelings to their changing attitudes, sometimes shifting to a more positive view.</p>	<p><b>Mixed reactions to the programme:</b> They had a good disposition, sometimes we were overwhelmed with work and we always left that aside, and they always took the time, it was never like 'let's just leave soon' (P14-F).</p>
		<p><b>Favourable trajectory:</b> We started really unmotivated, actually, (...) later as the sessions progressed, we started enjoying it more, because we started to share, we started to look at [other's] experiences and all of that (P10-F)</p>
		<p><b>Obstacles and problems:</b> [a problem were] the excess of other tasks besides the project that we had to... that made the project be considered as something that wasn't our top priority compared to other things at times. (...) on many occasions we didn't have the time or the physical space to have the meetings. (P15-F)</p>



<p><b>Technical issues</b></p>	<p>Reports of poor functioning of resources such as video cameras and internet access, and the availability of printed materials which affected the programme implementation.</p>	<p>I was in charge of the materials you left us at the beginning, at first the flash drive wasn't working, and you [the researcher] even witnessed that it wasn't functioning, then you sent me one with the research assistant and it didn't work either, so I had to rely on the printed materials and the set wasn't even complete (P14-F)</p>
<p><b>Problems with time and timetable</b></p>	<p>Participants referred to the availability of time and scheduling as major issues in implementing the programme throughout the year. Meanwhile, they did acknowledge the programme did not take up too much of their time.</p>	<p><b>Attendance problems:</b> [I: how do you think that your absence from some of the meetings impacted your participation?] I was lost about some things, uhm, but the group was very, very affirmative, so they all explained things to me. (P19)</p> <p><b>Constant rescheduling:</b> If you have a set time to work on this, I think that what bothered me the most was that the time kept changing. That is, the time to work on this was not respected. (P16)</p> <p><b>Low workload for teachers:</b> Well, we had to set some time aside but truth be told... no, being really honest I think that it was mainly in the moment, being there [at the meeting] after work and everything and then I was like oh [signalling discontent]... 'I have to do this and that and I have 10 things on my to-do list' but once I was there, we started to have a chat and that was actually really fluent, and it lost the sense of burden (P12)</p> <p><b>Problems with chosen time:</b> I would have had the meetings after children left the school instead (...) Because of the lack of space at school, the lack of a place to have the recordings [TPD meetings], because of the noise, because of the extra-curricular activities, the million changes we had to make to the project scheduling (P15-F)</p>

Appendix Table 8 Coding matrix, Category 2, Study 1

Themes and sub-themes	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTP-B	N° sources
<b>Participants' characteristics</b>	0	1	1	4	1	2	2	4	1	1	2	1	5	2	13
Positive disposition to change	0	0	0	0	0	0	0	1	0	1	0	0	2	0	3
Negative disposition to change	0	0	0	2	1	2	1	0	0	0	2	0	0	0	5
Disjointed ambient TPD	0	1	1	3	0	0	1	3	1	0	0	1	3	2	9
<b>Group development during the year</b>	3	2	3	5	6	4	1	1	2	3	6	5	2	4	14
Mixed reactions to the programme	1	0	2	4	5	1	1	0	1	0	4	5	1	0	10
Favourable trajectory	3	2	2	2	2	2	0	1	2	3	0	2	0	3	11
Obstacles and problems	0	0	0	0	0	1	0	0	0	0	3	0	1	1	4
<b>Technical issues</b>	1	0	1	0	2	3	1	0	1	0	1	0	0	0	7
<b>Problems with time and timetable</b>	1	0	3	1	3	6	4	6	5	1	4	7	2	1	13
Attendance problems	0	0	0	0	0	2	1	1	3	1	1	0	0	0	6
Constant rescheduling	0	0	0	0	2	4	3	4	2	0	2	5	0	1	8
Low workload for teachers	0	0	2	1	0	0	1	1	1	0	0	1	0	0	6
Problems with chosen time	1	0	2	0	1	1	0	0	0	0	1	2	2	0	7

Appendix Table 9 Coded sources per school, Category 2, Study 1

Themes and sub-themes	School A	School B	School C
<b>Participants' characteristics</b>	12	13	3
Positive disposition to change	2	2	0
Negative disposition to change	3	3	2
Disjointed ambient TPD	8	8	1
<b>Group development during the year</b>	21	16	11
Mixed reactions to the programme	13	3	9
Favourable trajectory	11	11	2
Obstacles and problems	1	2	3
<b>Technical issues</b>	4	5	1
<b>Problems with time and timetable</b>	10	23	11
Attendance problems	0	8	1
Constant rescheduling	2	14	7
Low workload for teachers	3	3	1
Problems with chosen time	6	1	3
Criteria - Schools A and B: high 12+; medium 6-11; low 5-; School C: high: 4+; medium 2-3; low 1-			

Appendix Table 10 Themes and examples, Category 3, Study 1

Theme name	Theme description	Examples (by sub-themes)
Conditions for sustainability	Comments about if and how the programme could be sustained. The conditions discussed included coherence with the approach, the presence of experts and a required level of work certainty.	<b>Coherence at school and teacher levels:</b> They'll kill me [for saying this] but I think it shouldn't only be us, you see? (...) the other teachers, and... maybe also the UTP should be there (...) (P12)
		<b>Need for external expert:</b> [the project] is very good. But the issue is that if... one wants to sustain it in time, there needs to be someone to be there permanently that specialises on the topic (...) for instance, that comes to the classroom and tells us '(...) you could've improved this activity, you could've changed this, included that' (P10-F)
		<b>(Un)certain work environment:</b> [I: Do you foresee the work around the project continuing next year?] difficult (laughter) [I: why?] because I'm not even sure if I'm continuing at the school, or with which class I'll be working, they haven't even called us in to tell us yet, we don't know anything, so I couldn't really answer that because first I'd need the reassurance that I'll continue in my post, and that I'll get to keep my class. (P-15)
Projection - learning communities	Participants' views about the likelihood and interest on the continuation of learning communities as a mode of work in the school	I don't know if they'll continue on with the Project. There, I think it's going to be a big challenge, uhm... no, I think that, in reality, I don't see much of a future [for the Project] at the school (...) teachers here are very scared of this issue of change, and of the way of changing their methodologies. (P16)

<b>Projection - classroom dialogue</b>	Participants' views about the continuation of classroom dialogue and dialogic teaching in their professional activities.	<b>Leadership team - fuzzy interest:</b> [I: have you thought about how you would like to go about this idea of widening the scope of the programme to include more teachers?] UTP-A: no, we haven't really thought about it yet. The first thing we had thought was to continue with the working group that is already working with this...methodology, and the other thing is that we've thought that you [the researcher] could maybe come and help us out with all the teachers, if you could come and give a talk, I don't know, something to motivate them or the like, to show the methodology because as the other teachers say, no man is a prophet in his own land
		<b>Participants - individual intention to continue:</b> [I: Do you intend to continue working on this?] Yes, yes, yes because since you left me the binder with all the materials I can, I can go back and check

**Appendix Table 11 Coding matrix Category 3, Study 1**

<b>Themes and sub-themes</b>	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTP-B	<b>N° sources</b>
<b>Conditions for sustainability</b>	2	0	4	1	3	5	1	1	0	0	1	1	3	1	11
Coherence at s. and t. levels	1	0	4	1	3	3	0	1	0	0	0	1	1	0	8
Need for external expert	1	0	0	0	0	1	0	0	0	0	1	0	2	0	4
(Un)certain work environment	0	0	0	0	0	1	1	0	0	0	0	0	0	1	3
<b>Projection - learning communities</b>	0	0	2	1	1	0	2	1	1	0	0	0	1	4	8
<b>Projection - classroom dialogue</b>	1	1	1	3	2	2	1	2	2	1	0	0	4	2	12
Leadership team - fuzzy interest	0	0	0	0	0	0	0	0	0	0	0	0	4	2	2
Participants - individual intention to continue	1	1	1	3	2	2	1	2	2	1	0	0	0	0	10

Appendix Table 12 Coded sources per school, Category 3, Study 1

Themes and sub-themes	Araucaria School	Boldo School	Canelo School
<b>Conditions for sustainability</b>	13	8	2
Coherence at s. and t. levels	10	4	1
Need for external expert	3	1	1
(Un)certain work environment	0	3	0
<b>Projection - learning communities</b>	5	8	0
<b>Projection - classroom dialogue</b>	12	10	0
Leadership team - fuzzy interest	4	2	0
Participants - individual intention to continue	8	8	0
Criteria: presence or absence of intentions to continue			

Appendix Table 13 Themes and examples, Category 4, Study 1

Theme name	Theme description	Examples (by sub-themes)
Sustaining the project	Accounts of the facilitators' role as the key factor permitting the implementation of the programme. This was achieved through their commitment, and the role was sometimes considered very demanding. Additionally, they had diverse views about the preparedness and adequacy of peers acting as facilitators.	<b>Commitment to the project:</b> You can't go back on something you've started, I've always been of the policy that if one starts with something, one has to finish. Come what may, but finish it (P15-F)
		<b>Demanding role:</b> I think that the facilitators did a very good job, they were... I insist, I think that they did as much as they could possibly do (laughter) within their possibilities, because they had a much bigger responsibility (P13)
		<b>Adequacy of peer-facilitation:</b> I think that you learn more this way [versus working with an external expert], besides, these are practices that are there on the spot (P12)
Preparing for the sessions	The role of facilitator required of them reading the materials in advance and having a sense of the activities before the sessions.	To prepare a good session we had to read [the materials] beforehand, but when could we get the time do that, really? I mean, I'm already taking other work home, tests, things to mark, worksheets and what not, and on top of everything, these readings. It was a lot. (P10-F)
Leading sessions	Facilitators' functions included managing the TPD sessions on the spot, with different aspects to the task including establishing an amiable working climate, taking part as learners, and guiding their peers through the proposed activities.	<b>Establishing a learning environment:</b> At first it worked, I think that at first, they got motivated, they participated, the meetings started in a good fashion, in fact we organised them so that it was like a tea party (P20-F)
		<b>Contributing as a peer:</b> You know what, it wasn't that much [the difference between facilitators and participants], no, because in general it was like a work we all did together, it wasn't like I was the facilitator, but the situation was more like... I mean obviously I guided... the activity, but it was a shared [learning] situation (P10-F)
		<b>Guiding the group:</b> The facilitators were very focused on the topic, so I think that it was, like, easy to follow things with them (P11)



**Appendix Table 14 Coding matrix, Category 4, Study 1**

Themes and sub-themes	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTP <sub>S</sub> -B	N <sup>o</sup> sources
<b>Sustaining the project</b>	4	0	1	2	5	2	0	1	1	2	5	4	6	2	12
Commitment to the project	0	0	0	0	3	2	0	0	0	0	1	0	3	1	5
Demanding role	2	0	0	1	2	1	0	0	0	0	2	2	3	0	7
Adequacy of peer-facilitation	2	0	1	1	0	0	0	1	1	2	2	2	0	1	9
<b>Preparing for the sessions</b>	3	0	0	0	1	3	0	0	0	0	1	2	0	0	5
<b>Leading sessions</b>	1	1	0	0	4	6	1	2	3	1	1	2	0	0	10
Contributing as a peer	1	0	0	0	2	0	0	0	1	1	0	0	0	0	4
Establishing a learning environment	0	0	0	0	1	5	0	2	1	0	1	0	0	0	5
Guiding the group	1	1	0	0	1	1	1	0	2	1	0	2	0	0	8

Appendix Table 15 Coded sources per school, Category 4, Study 1

Themes and sub-themes	Araucaria School	Boldo School	Canelo School
<b>Sustaining the project</b>	18	8	9
Commitment to the project	6	3	1
Demanding role	8	1	4
Adequacy of peer-facilitation	4	5	4
<b>Preparing for the sessions</b>	4	3	3
<b>Leading sessions</b>	6	13	3
Contributing as a peer	3	2	0
Establishing a learning environment	1	8	1
Guiding the group	3	5	2
Criteria - Schools A and B: high 12+; medium 6-11; low 5-; School C: high: 4+; medium 2-3; low 1-			

Appendix Table 16 Themes and examples, Category 5, Study 1

Theme name	Theme description	Examples (by sub-themes)
Kickstarting project	Reports about the leadership team's role in getting their schools involved in the project, including establishing links between the TPD and their own agenda and selecting suitable facilitators.	<b>Selecting facilitators:</b> P10-F, she's on the side of relationships, she smoothes things out, she's enthusiastic, she's... conciliatory if you like. And P14-F is the complete opposite! So it was, it was like black and white having the two of them but... P10-F has a very good attitude. (UTP-A)
		<b>TPD agenda:</b> First we realised that each of us was like an island, and that it is essential the, the conversation, reflection on practice, listening to others, the, lowering the, the anxieties and also the fears of being observed, of others knowing what I do [in my practice] (UTPB-1)
Time and resources allocation	Identified as the main role of UTPs, including setting aside time and spaces for the TPD to take place.	We tried to, regardless of the, the, emergencies, because [at schools] we always work in a state of emergency. Trying not to touch that space, because it is considered important" (UTP-B1)
Monitoring	Reports of UTP's actions directed at checking the state of the implementation of the programme (or lack thereof).	We didn't have a specific time set aside for this, so there were informal situations but they were always reporting on what they were doing and what they were working on, who was going to come to the school, who was going to come and film, how the sessions were going, I told them 'when you finish, let me know how it went' (UTP-A)
Support	The level of direct support provided by UTPs was considered low in general but did involve stopping the schools dropping out of the programme when facilitators considered this possibility.	<b>Little direct involvement:</b> I don't think that, that they [UTPs] even understand the project. (P19)
		<b>Sustaining school involvement:</b> I spoke to UTP-A personally and she said 'look, P14-F, we know how you've worked so try to go through with this project with the best of attitudes, giving it your best, but don't get overwhelmed' because it was overwhelming (P14-F)

Appendix Table 17 Coding matrix, Category 5, Study 1

Themes and sub-themes	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTP-B	N° sources
<b>Kickstarting project</b>	0	0	0	0	0	0	0	0	1	0	1	0	2	5	4
Selecting facilitators	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3
TPD agenda	0	0	0	0	0	0	0	0	1	0	0	0	1	4	3
<b>Time and resources allocation</b>	2	0	0	0	0	0	0	2	0	0	1	1	2	3	6
<b>Monitoring</b>	0	0	0	0	0	0	0	0	0	0	2	1	10	3	4
<b>Support (lacking)</b>	0	0	0	0	1	1	0	0	0	1	2	2	1	0	6
Little direct involvement	0	0	0	0	0	1	0	0	0	1	0	1	0	0	3
Sustaining school involvement	0	0	0	0	1	0	0	0	0	0	2	2	1	0	4

Appendix Table 18 Coded sources per school, Category 5, Study 1

Themes and sub-themes	Araucaria School	Boldo School	Canelo School
<b>Kickstarting project</b>	2	6	1
Selecting facilitators	1	1	1
TPD agenda	1	5	0
<b>Time and resources allocation</b>	4	5	2
<b>Monitoring</b>	10	3	3
<b>Support (lacking)</b>	2	2	4
Little direct involvement	0	2	1
Sustaining school involvement	2	0	4
Criteria, schools A and B and C: high 4+; medium 2-3; low 1-			

**Appendix Table 19 Themes and examples, Category 6, Study 1**

Theme name	Theme description	Examples (by sub-themes)
<b>Presence and pressure</b>	Perceptions about the research team's role as giving the project continuation through their presence in the school and putting pressure on facilitators to pursue implementation.	It's a strength and at the same time a weakness that you were putting pressure on us but unfortunately, we [teachers] are like that, if we're not pressed, well, we'll do it for a while and then, well uhm... we'll just let things slide (P14-F).
<b>Support</b>	Perceptions about the research team's role as giving providing tailored support with regards to both its contents and to technical support on site.	We would speak for a long time on WhatsApp (...) and then it was clear, so, that, uhm, was nice because you managed the contents in the way it was supposed to be, and not how one thinks it should be. Because sometimes on paper, one reads in a way, but can interpret it differently [I: right]. Therefore, I think that the support of clarifying the sessions was fantastic. (P15-F)

**Appendix Table 20 Coding matrix, Category 6, Study 1**

Themes	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	UTP-A	UTPs-B	N° sources
<b>Presence and pressure</b>	1	0	0	1	4	1	0	0	0	0	1	0	4	0	6
<b>Support</b>	2	0	0	0	0	4	0	0	0	0	0	0	0	1	3

**Appendix Table 21 Coded sources per school, Category 6 Study 1**

Themes	Araucaria School	Boldo School	Canelo School
<b>Presence and pressure</b>	10	1	1
<b>Support</b>	2	5	0
Criteria, schools A and B and C: high 4+; medium 2-3; low 1-			

11. APPENDIX 11 - SUMMARY OF RESEARCHER TRIANGULATION IN STUDY 1

Appendix Table 22 Researcher triangulation comments and decisions, Study 1

Themes, interviews and comments	Decisions
<b>Perceptions of the TPD programme (Florencia Canessa)</b>	
Contents (P10, P15): Quotes contained positive aspects and improvement suggestions, which was considered confusing	No changes made, because the longer quotes were selected to provide context and thus the suggestions were not the focal points in coding these segments
Applicable contents (P12, P16, P19, P14, UTP-A): Quotes contained references to applicability and improvement suggestions (for context), which was considered confusing. Some of the criticised quotes referred to the application in the NTES, which was part of the category, and some others were considered too broad and not signalling specific applicability.	Quotes considered to contain positive and negative perceptions and those referred to the NTES were kept. Three quotes where references were too implicit were uncoded.
Structure and sessions - More structure and specificity (P13): two references to the fit between the programme and the teacher's knowledge were considered as referring to previous education rather than the programme design.	No changes made, the comments refer to the need for specificity in the design given the participant's knowledge
Learning community (P12, P15, UTP-B): two comments referred to the possibility of continuing with communities in the future and one mentioned the positive experience of the facilitator as well as participants.	The comments referring to continuing with the community were uncoded, and the one about positive facilitator and participants' experience was not changed
Classroom videos - learning from observing (P13, P14, P16, P18, P19): some quotes referred to participants' reflection or insights without being linked explicitly to video observation.	Four quotes were uncoded for not being explicit enough and two were left unchanged since in the context they did refer to video.

<b>Implementation</b> (Francisco López)	
Unwillingness to change: theme name reflects some of the quotes but not others in which difficulties with changing are attributed to resistance or to teachers being too set in their ways	This theme and "well-prepared and willing to change" were renamed to capture the disposition of teachers towards changing their practice and labelled as "positive" and "negative". Disposition is more encompassing than willingness
Participants' initial characteristics - disjointed ambient TPD (P17): quote referred to the teacher's existing questioning style, but this was not explicitly linked to previous TPD.	Quote was uncoded because the reference to questioning style and previous TPD was explicit elsewhere in the interview but not in this extract.
Group trajectory - favourable trajectory (P18): reference to trajectory considered too tenuous	No changes made since there was a reference to overcoming resistance to observe each other's videos, which is part of the theme
<b>Project's future</b> (Valentina Munizaga)	
Conditions for sustainability - planning and commitment: theme name reflects some aspects of the quotes, but most refer to institutional or systemic changes that need to happen in the school for the programme to be sustained in time.	Changed theme name to "coherence at school and teacher levels" and adjusted the description to fit this focus. Planning and commitment are still part of this, but the focus has shifted.
Conditions for sustainability - planning and commitment (P14): a quote referred to the need for someone in the institution to put pressure for the project to continue, which was interpreted as the need for an external expert.	No changes made since the pressure was discussed as internal to the school.
Conditions for sustainability - need for external expert (P15): participant mentioned the need for a curriculum expert to be involved, which was considered to belong in the "coherence" theme instead.	Recorded reference: to the suggested code. The reference to the curriculum expert refers to an internal rather than external expertise.
Projection - broadening or ending learning communities (UTP-A, UTP-B): unclear references to learning communities in two cases, and source pertaining to another theme as well.	No changes made in two of the quotes, which made sense in context. One source was coded applying the suggested additional theme,
Projection - continuing with dialogue participants' intention to continue (P14, P15, P17): two quotes referred to institutional changes rather than personal ones, and two other quotes referred to aspects of change that did not have such a clear relationship with dialogue itself	The two quotes about institutional level were recoded, and of the other two one was kept and the other one uncoded.



<b>Facilitator's role</b> (Valentina Munizaga)	
Sustaining project - time consuming role	Name of the theme changed to "demanding role" to capture demands that were not only related to time and stressed the responsibility involved
Sustaining project - time consuming role (P12, P14, P15, P21, UTP-A): references were problematic since they focused on aspects of facilitation but not all had to do with time and commitment.	Name of the theme was changed and description reconsidered. Five of the quotes were kept and three were recoded or codes were added.
Sustaining project - adequacy of peer facilitation (P21): link with theme was unclear.	No changes made, the quote makes sense in contexts since it compares peers versus external facilitators
Leading sessions - acting like a peer (P14): aspect of the quote refers to the willingness to engage in the project as key to facilitating.	Added "commitment" theme as suggested.
<b>Role UTP</b> (Valentina Munizaga)	
Kickstarting project - establishing links with TPD agenda (UTP-B): link was considered unclear	No changes made, reference to school priorities in TPD considered relevant to theme
Kickstarting project - selecting facilitators (UTP-A, UTP-B): suggestions to recode as "commitment" since there are references to facilitators' engagement	One source was left and the other one was added to the commitment theme
Monitoring (UTP-A): quotes referred to observed changes in teachers' classrooms and were considered too implicit	No changes made, references corresponded to monitoring practices
<b>Role research team</b> (Valentina Munizaga)	
No comments	

12. APPENDIX 12 - CROSS-SCHOOL COMPARISON OF THEMES IN STUDY 1

Notes:

1. N corresponds to the total number of interviewees.
2. The numbers in parentheses represent the total number of coded extracts corresponding to the theme(s) or categories in all interviews.

Appendix Table 23 Cross-school theme comparisons, Study 1

Category	Key aspects	Araucaria School (N=6)	Boldo School (N=6)	Canelo School (N=2)
1. Programme's perceptions	<b>Engagement with materials</b> (positive aspects and detailed suggestions)	high (24)	high (41)	medium (8)
	<b>Making the most of videos</b> despite initial rejection	high (19)	high (25)	low (1)
2. TPD Implementation	<b>Favourable trajectory</b> despite initial negative reactions	present (11)	present (11)	mixed views (2)
	Lack of time and <b>problems with scheduling</b>	occasional (10)	persistent (23)	persistent (11)
3. Future of the programme	<b>Need for coherence</b> at school and teacher levels	high (10)	medium (4)	low (1)
	UTPs - intention to <b>continue with communities</b>	present (5)	present (8)	non-applicable
	Teachers - intention to <b>continue with dialogue</b>	present (8)	present (8)	non-applicable

Category	Key aspects	Araucaria School (N=6)	Boldo School (N=6)	Canelo School (N=2)
4. Facilitators' role	<b>Commitment</b> to the role	medium (P10-F) and high (P14-F) (6)	high (3)	low (P20-F) and medium (P21-F) (1)
	Demands involved in <b>sustaining the programme and planning</b>	high (16)	medium (9)	high (9)
	Planning - <b>modifying sessions</b>	occasional (2)	frequent (3)	absent (0)
	Understanding about what <b>leading the sessions</b> meant	guiding and acting like a peer (6)	guiding and establishing learning environment (13)	guidance and expertise (2)
5. UTP's role	<b>Articulation</b> with TPD interests	strategic (1)	strategic (5)	general (field notes)
	<b>Allocating time</b> as part of their role	main task (4)	main task (5)	non-applicable
	Level of <b>progress monitoring</b>	high (10)	medium (3)	low (1)
	<b>Quality of support</b> (according to others)	when necessary (2)	low (2)	ineffective (4)
6. Research team's role	<b>Perceived pressure</b>	high (10)	low (1)	medium-low (1)
	<b>Perceived support</b>	medium-low (2)	high (5)	low (0)

### 13. APPENDIX 13 - CODING RULES FOR THE ACTIVITY CODING SCHEME

Adapted from original document by Annabel Amodia-Bidakowska (unpublished)

#### 1. Segmenting the lesson

##### Key definitions

Lesson: a lesson is typically 60 minutes. Each lesson is made up of one or more episodes.

Episode: an episode is characterised as having a broad aim, with clear start and finish points. An episode is typically divided into three activity segments: 1) introduction by teacher, 2) set activity, and 3) follow up. However, there is often more than one set activity; for example, an aim to write a stanza of a poem may include three independent set activities: 1) discussion about rhyme schemes in groups, 2) spider diagrams of ideas in pairs, and 3) writing a stanza of a poem individually. Each of these activities contributes to the broad aim and they are labelled as activity segments. A lesson may include only one episode or multiple episodes.

Activity Segment: activity segments are periods of time that are characterised by a particular feature (e.g. participant structure, task format etc.) that distinguishes them from the previous segment. An activity segment occurs within an episode to fulfil the broad aim set by the teacher and holds an established purpose, topic and organisation of participants. Changes in the organisation of participants always initiate a new activity segment for example when a whole class discussion is followed by pair work.

Activity coding will take place at the activity segment level. Identification of an activity segment is based upon the teachers' instructions i.e. what a teacher states is the next activity students need to complete. A teacher may explicitly state the change in activity through his/her instructions e.g. "I would like you to stop working through the task sheet and now I'd like you to tell your partner what you know about measurement of liquids". Alternatively, a teacher may implicitly change the activity type through a question that changes the focus of the discussion e.g. a discussion to recap about the events in a chapter followed by "how we do know the author is describing 18<sup>th</sup> century England?".

Process of identifying activity segments: The criteria for activity segmenting was discussed and agreed upon through examination of videos and transcripts. The definition of the activity segment was used to partition each lesson into activity segments. During the training phase, activity segments were identified by one coder and checked by a second coder. Any discrepancies led to modification of the lesson segments and refinement of the activity segment definition. During the reliability trial, that same coder segmented the lessons and sent them to the second coder without discussing the lesson.

## 2. Coding Rules regarding organisation of participants, activity format and activity function:

### General rules

- Assign ONE code from each of the dimensions to each segment of the lesson.
- If more than one activity format/function is present, then code the MAIN activity.
- If the teacher splits the class into different activities, then only code the activity where the teacher is present. For example, the teacher may set a task for the whole class but take a group of students aside to carry out a more basic task. You should code the activity wherever the dialogue is taking place.
- 'mini whole-class': Sometimes the teacher will split the class into groups based on their ability. She may set a task for one group to work individually on a worksheet (coded as individual, table work) and she may take another group to one side and teach them separately (e.g. using a smaller whiteboard) – this would be coded as 'whole class' rather than 'group work' as it is viewed as a 'mini whole class' setting.
- Some aspects of the lesson will be left uncoded e.g. teacher doing the register

### Rules about specific codes

- If *joint construction* task is set as a discussion activity – Activity format should be coded as 'Exchange' not 'Collaborative Construction'
- Often a teacher sets an activity in groups (e.g. investigation on parallel circuits) and follows by a whole class discussion activity to share group ideas with class. In some instances, the same activity logic/function is kept in the whole-class follow up activity, for example students may explain the process of arriving at a solution in the whole-class discussion (e.g. 'we first did X, then realised we needed two blubs so we decided to do X and this resulted in X) here the process of the investigation was explained and therefore should maintain the same activity function as the previous group task (i.e. 'Investigation').

In some instances, however, the follow up activity just requires students to report their findings (e.g. ‘we made two bulbs light up’) and therefore the activity function is ‘Reporting’.

- Some activities involve the teacher simply asking YES/NO ‘hands up’ questions e.g. “hands up who managed to make the bulb light up?... hands up who managed to make the bow tie spin?”. These types of activities should be coded as *‘monologue/direct instruction/lecturing’* as there is little input from students and the activity function should be coded as *‘reporting’*.
- *Exchange* should only be coded when the sole purpose of the activity is to talk e.g. whole class discussion or ‘talk to your partner about X’ (as exchange can occur alongside any activity). There is one exception to this rule:

Exchange plus Reading should be coded as ‘exchange’ NOT ‘reading’ e.g. “I want you to read the first paragraph and discuss it with your partner”. Here, exchange is the **main** activity as reading is a basic skill practising task. These two scenarios would both be coded as ‘exchange’: 1) “talk to your partner about what’s happening in the first paragraph”(which would require students to read it) AND 2) “read the first paragraph and talk to your partner about what’s happening”

14. APPENDIX 14 - INITIAL THEMES AND OPEN CODES IN STUDY 2

Appendix Table 24 Initial themes and open codes, Study 2

Initial Themes	Initial Subthemes and open codes
1. Managing tasks	<b>1.1 Framing tasks and sessions:</b> 1. setting up activity (goals and/or steps); 2. marking activity and session boundaries; 3. connecting (with previous activities)
	<b>1.2 Adjusting tasks:</b> 4. giving options; 5. giving suggestions; 6. adapting activities
	<b>1.3 Sustaining tasks:</b> 7. distributing turns; 8. asking questions to move the discussion forward; 9. re-focusing discussion
	<b>1.4 Sorting confusion</b>
2. Introducing authoritative perspective	<b>2.5 Introducing TPD contents:</b> 11. reading out loud from presentations; 12. answering/giving explanations about TPD; 13. praising TPD contents/materials/mode; 14. introducing contents
	<b>2.6 Employing concepts during tasks:</b> 15. use of concepts during tasks; 16. modelling task completion
	<b>2.7 Stressing the limits of dialogue in their context/practice:</b> 17. discussing the limits of dialogue; 18. criticising the TPD
3. Mediating the conversation	<b>3.8 Opening up the conversation:</b> 19. inviting participants to share; 20. asking 'honest questions' to teachers presenting their videos
	<b>3.9 Accepting participants' contributions:</b> 21. agreeing with participants' contribution; 22. paraphrasing contributions
	<b>3.10 Pressing participants to develop their ideas:</b> 23. asking follow-up question; 24. challenging participant's contributions; 25. asking for agreement or disagreement
	<b>3.11 Summarising</b>
4. Showing responsiveness to participants	<b>4.12 Welcoming participation:</b> 27. accepting contributions; 28. encouraging participants who are giving answers; 29. thanking or praising participation
	4.13 Showing empathy towards participants
5. Stressing confidentiality	- 31. stressing confidentiality
6. Using humour	- 32. using humour
7. Contributing with own perspective	- 33. sharing own opinion; 34. sharing own answer; 35. sharing own experience
8. Developing other's contributions	- 36. building on participant's contribution

15. APPENDIX 15 - SUMMARY OF RESEARCHER TRIANGULATION IN STUDY 2

I. List of examined extracts

2-A-8, 4-B-8, 5-A-2, 3-A-15, 8-A-14, 2-A-22

II. Identified issues considering preliminary theme or sub-theme, problems and decision made. Most of the issues related to more than one of the examined extracts.

**Appendix Table 25 Researcher triangulation comments and decisions, Study 2**

Theme	Issue	Decision
Sustaining tasks	It appears that the main topic is focusing participants on tasks, name may need revising to indicate this more precisely	Divided into managing tasks and mediating conversation to distinguish the operational-organisational functions from directing the conversation as such, including managing the floor as part of the subtheme 'inviting participation'
Sustaining tasks	Managing the floor is part of the actions that were included here but it appears to be better suited as mediating the conversation than the task, and thus specifically these segments will need revising and re-coding as part of mediating conversations	
Introduce authoritative perspective	Consider renaming looking at T-SEDA codes	Subtheme name changed to 'using concepts during tasks'
Introducing TPD contents	Is this not only an activity that is part of some sessions	Keeping the theme but renaming to 'Introducing contents', because it comprises presenting materials as well as using concepts during tasks, and thus it is not matched one to one to an activity and can be done at other times. 'Authoritative perspective' was not clear so the theme name was simplified.
Stressing the limits of dialogue	This was a problematic category to begin with, since it has a component of contributing as a peer, but they do this from their position of authority. However, the 'introducing authoritative perspective' category relates more with bringing in the voice of the TPD/researcher/materials and thus it will be moved to contributing. Name may need revising too	Subtheme was moved to 'Contributing as a peer' and renamed 'Discussing concerns/limitations of dialogue'

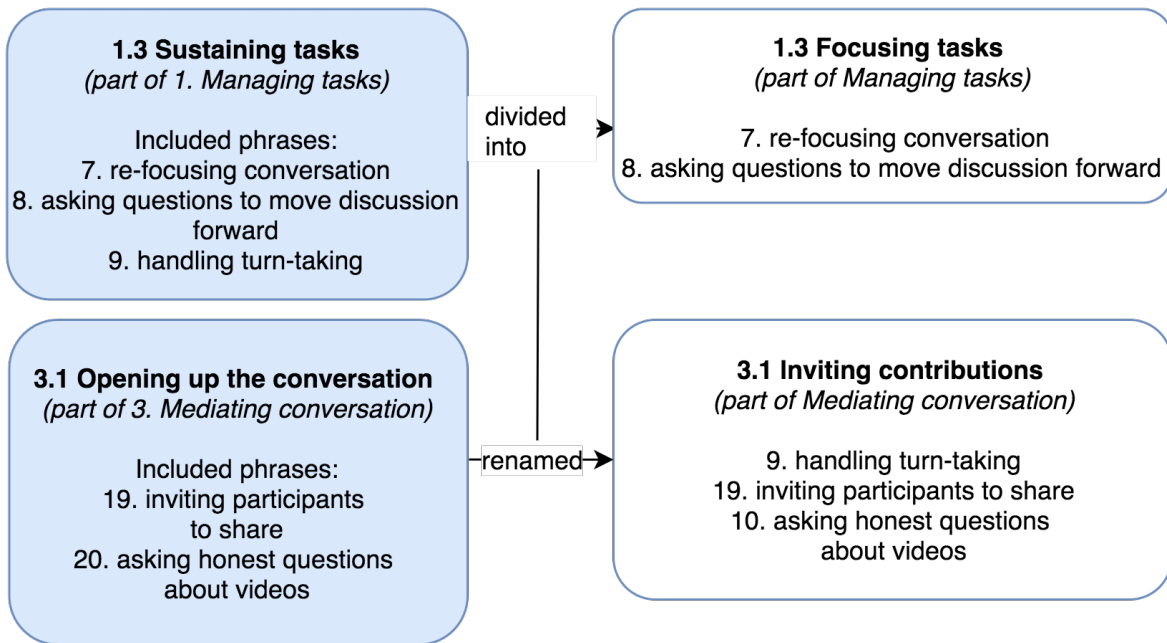


Opening up the conversation	This is a dialogic function and Ana Laura suggested maybe re-thinking the name based on SEDA codes	Theme was renamed 'Inviting participation' to capture the aspect of opening the conversation to more participants and/or different contributions
Accepting participants' contributions	These themes have an evaluative character and thus the question was whether they belong in the "introducing authoritative perspective" theme since they involve relating contributions to the contents of the TPD. On the other hand, accepting and rejecting/challenging are classic forms of mediating the conversation.	Both themes were moved to the new theme 'Mediating conversation', capturing evaluative aspects of facilitation in reaction to participants' comments
Pressing participants to develop their ideas		
Establishing learning environment	New name suggested: establishing a safe learning environment	Suggestion was discarded, since safe was not the only aspect of the environment that facilitators promoted.
Contributing to conversation with own perspective	If stressing the limits of dialogue is moved here it will need to be distinguished from this theme which is broader and could be thought of as encompassing both "positive" "neutral" and "negative" views of dialogue. They thus need revising in relation to each other	New themes were created to accommodate these distinctions: the more abstract contributing as a peer and within it sharing one's perspective with three sub-themes and building on other's ideas as a separate aspect.

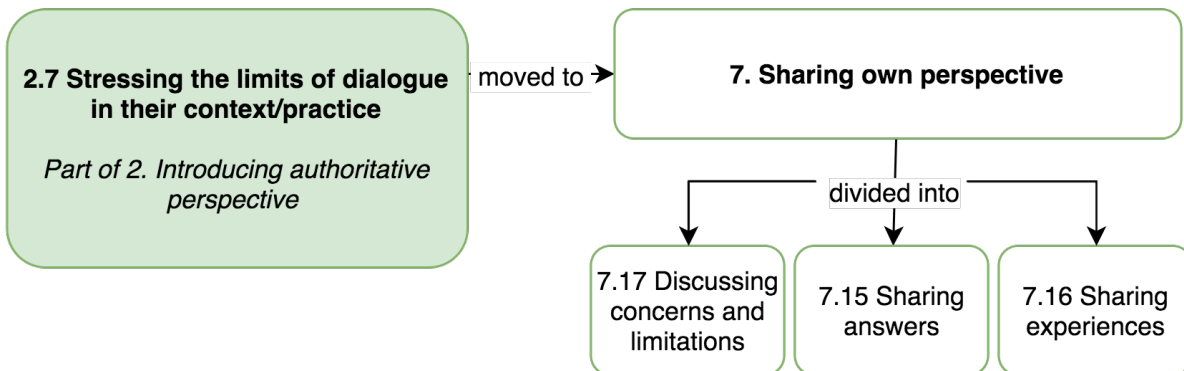
### III. Themes requiring substantive rearrangement

1. In case 1, the main function of the open code '9. handling turn-taking' was reconsidered from its original place in the managing tasks theme (sub-theme 1.3 'sustaining tasks') and it was moved to the mediating conversation theme (specifically, 3.1 'inviting contributions').
2. In case 2, sub-theme 2.7, originally considered part of theme '2. Introducing authoritative perspective', was relocated to theme 7, which focuses on facilitators sharing their perspective. In this way, theme 2 focused only on facilitators sharing the TPD contents, and their stance on the programme's limitation was considered part of their contributions as peers.

1. Rearranging descriptive phrases to reformulate sub-themes



2. Moving sub-theme from one theme to another



Appendix Figure 1 Main decisions after researcher triangulation, Study 2

## 16. APPENDIX 16 - CODING MATRICES STUDY 2

Note: theme descriptions are not provided here because they are part of the Chapter.

**Appendix Table 26 Overall coding matrix, Study 3**

Segment type	Introduction	Instructions	Closure	Presentation	Structured discussion	Semi-structured discussion	Total instances subtheme
Total segments all meetings	11	25	5	13	30	11	95
Subthemes per segment type							
Framing tasks and sessions	8	23	5	6	20	6	68
Adjusting tasks	1	13	0	2	2	0	18
Focusing tasks	0	0	2	0	10	5	17
Sorting confusion	3	1	0	0	0	0	4
Presenting from TPD materials	1	5	2	13	7	2	30
Using concepts during tasks	0	5	0	3	19	6	33
Inviting participation	0	0	2	1	28	9	40
Accepting participants' contributions	0	1	2	0	17	9	29
Pressing participants to develop their ideas	0	1	0	0	16	6	23
Summarising the conversation	0	0	0	0	4	0	4
Welcoming participation	0	0	4	0	18	6	28
Showing empathy towards participants	0	0	1	0	2	4	7
Showing Responsiveness	0	0	4	0	19	7	30
Stressing confidentiality	0	0	2	1	0	0	3
Humour	0	1	2	2	4	2	11
Sharing answer to task	0	0	2	0	18	5	25
Sharing own experience	0	0	0	1	4	8	13
Discussing concerns/limitations of dialogue	0	0	1	0	4	7	12
Developing other's contributions	0	0	1	0	13	6	20
<b>Total themes segment type</b>	<b>13</b>	<b>50</b>	<b>30</b>	<b>29</b>	<b>205</b>	<b>88</b>	<b>415</b>

**Appendix Table 27 Araucaria School coding matrix, Study 2**

Segment type	Introduction	Instructions	Closure	Presentation	Structured discussion	Semi-structured discussion	Total instances subtheme
<i>Total segments Araucaria School</i>	<i>6</i>	<i>19</i>	<i>5</i>	<i>10</i>	<i>18</i>	<i>11</i>	<i>69</i>
Subthemes per segment type							
Framing tasks and sessions	3	17	5	5	12	6	<b>48</b>
Adjusting tasks	1	11	0	1	0	0	<b>13</b>
Focusing tasks	0	0	2	0	8	5	<b>15</b>
Sorting confusion	3	1	0	0	0	0	<b>4</b>
Presenting from TPD materials	1	3	2	10	5	2	<b>23</b>
Using concepts during tasks	0	3	0	2	12	5	<b>22</b>
Inviting participation	0	0	2	1	17	9	<b>29</b>
Accepting participants' contributions	0	1	2	0	10	8	<b>21</b>
Pressing participants to develop their ideas	0	1	0	0	7	6	<b>14</b>
Summarising the conversation	0	0	0	0	2	0	<b>2</b>
Welcoming participation	0	0	4	0	9	5	<b>18</b>
Showing empathy towards participants	0	0	1	0	2	4	<b>7</b>
Showing Responsiveness	0	0	4	0	10	6	<b>20</b>
Stressing confidentiality	0	0	2	1	0	0	<b>3</b>
Humour	0	1	2	2	4	2	<b>11</b>
Sharing answer to task	0	0	2	0	12	5	<b>19</b>
Sharing own experience	0	0	0	1	4	8	<b>13</b>
Discussing concerns/limitations of dialogue	0	0	1	0	4	7	<b>12</b>
Developing other's contributions	0	0	1	0	8	5	<b>14</b>
<b>Total themes segment type</b>	<b>8</b>	<b>38</b>	<b>30</b>	<b>23</b>	<b>126</b>	<b>83</b>	<b>308</b>

**Appendix Table 28 Boldo School coding matrix, Study 2**

Segment type	Introduction	Instructions	Closure	Presentation	Structured discussion	Semi-structured discussion	Total instances subtheme
<i>Total segments Boldo School</i>	5	6	0	3	12	0	26
Subthemes per segment type							
Framing tasks and sessions	5	6	0	1	8	0	20
Adjusting tasks	0	2	0	1	2	0	5
Focusing tasks	0	0	0	0	2	0	2
Sorting confusion	0	0	0	0	0	0	0
Presenting from TPD materials	0	2	0	3	2	0	7
Using concepts during tasks	0	2	0	1	7	1	11
Inviting participation	0	0	0	0	11	0	11
Accepting participants' contributions	0	0	0	0	7	1	8
Pressing participants to develop their ideas	0	0	0	0	9	0	9
Summarising the conversation	0	0	0	0	2	0	2
Welcoming participation	0	0	0	0	9	1	10
Showing empathy towards participants	0	0	0	0	0	0	0
Showing Responsiveness	0	0	0	0	9	1	10
Stressing confidentiality	0	0	0	0	0	0	0
Humour	0	0	0	0	0	0	0
Sharing answer to task	0	0	0	0	6	0	6
Sharing own experience	0	0	0	0	0	0	0
Discussing concerns/limitations of dialogue	0	0	0	0	0	0	0
Developing other's contributions	0	0	0	0	5	1	6
<b>Total themes segment type</b>	<b>5</b>	<b>12</b>	<b>0</b>	<b>6</b>	<b>79</b>	<b>5</b>	<b>107</b>

## 17. APPENDIX 17 - CODING MATRICES STUDY 3

Note: theme descriptions are not provided here because they are part of the Chapter.

**Appendix Table 29 Coding matrix Study 3, General teaching pre and post**

Pre	P10	P11	P12	P13	P14	P15	P16	P17	P18	Overall
<b>O.1 Teacher as authority</b>	3	1	0	0	0	3	0	1	3	<b>11</b>
1. Teacher clarity	2	0	0	0	0	1	0	0	1	<b>4</b>
2. Adequate use of voice	1	0	0	0	0	1	0	1	2	<b>5</b>
3. Teacher's authoritative role	0	1	0	0	0	1	0	0	0	<b>2</b>
<b>O.2 Classroom Environment</b>	3	1	3	1	0	1	3	1	0	<b>13</b>
4. Active student engagement	2	1	0	1	0	0	2	0	0	<b>6</b>
5. Effective classroom management	0	0	2	0	0	0	1	1	0	<b>4</b>
6. Affective proximity	1	0	1	0	0	1	0	0	0	<b>3</b>
<b>O.3 General Teaching Strategies</b>	1	0	1	0	2	2	1	1	1	<b>9</b>
7. Contextualising the lesson theme	0	0	1	0	1	1	0	0	0	<b>3</b>
8. Activating previous knowledge	0	0	0	0	1	0	0	0	0	<b>1</b>
9. Formality	0	0	0	0	0	0	1	1	0	<b>2</b>
10. Employing different modes of representation	1	0	0	0	0	1	0	0	1	<b>3</b>
<b>Overall - Other themes</b>	<b>7</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>33</b>
Post	P10	P11	P12	P13	P14	P15	P16	P17	P18	Overall
<b>O.1 Teacher as authority</b>	0	2	0	0	0	1	0	1	2	<b>6</b>
1. Teacher clarity	0	0	0	0	0	0	0	1	1	<b>2</b>
2. Adequate use of voice	0	0	0	0	0	1	0	0	1	<b>2</b>
3. Teacher's authoritative role	0	2	0	0	0	0	0	0	0	<b>2</b>
<b>O.2 Classroom Environment</b>	3	3	0	0	0	2	0	2	1	<b>11</b>
4. Active student engagement	1	2	0	0	0	0	0	1	1	<b>5</b>
5. Effective classroom management	2	1	0	0	0	0	0	1	0	<b>4</b>
6. Affective proximity	0	0	0	0	0	2	0	0	0	<b>2</b>
<b>O.3 General Teaching Strategies</b>	1	0	1	0	2	2	1	1	1	<b>9</b>
7. Contextualising the lesson theme	0	0	0	0	0	0	0	0	0	<b>0</b>
8. Activating previous knowledge	1	0	0	0	2	0	0	0	0	<b>3</b>
9. Formality	0	0	0	0	0	0	0	0	1	<b>1</b>
10. Employing different modes of representation	1	0	0	0	1	0	0	0	0	<b>2</b>
<b>Overall - Other themes</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>26</b>

**Appendix Table 30 Coding matrix Study 3, Dialogue categories pre**

Pre	P10	P11	P12	P13	P14	P15	P16	P17	P18	Overall
<b>D.1 Dialogue Format</b>	0	0	2	1	0	0	0	0	0	<b>3</b>
11. Dialogue between teacher and students	0	0	0	0	0	0	0	0	0	<b>0</b>
12. Dialogue between students	0	0	2	1	0	0	0	0	0	<b>3</b>
<b>D.2 Promoting Dialogue - Teacher</b>	0	1	1	5	2	2	4	0	1	<b>16</b>
13. Teacher's role as mediator/facilitator	0	1	0	3	2	0	1	0	1	<b>8</b>
14. Mistakes as learning opportunities	0	0	1	1	0	1	2	0	0	<b>5</b>
15. Exploring students' ideas	0	0	0	1	0	1	1	0	0	<b>3</b>
16. Teacher building on students' ideas	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>D.3 Promoting Dialogue - Student</b>	1	2	4	3	3	0	2	1	0	<b>16</b>
17. Promoting inclusive participation	1	0	1	0	0	0	1	0	0	<b>3</b>
18. Opening up space for students	0	1	1	2	2	0	1	0	0	<b>7</b>
19. Students' agency	0	1	0	1	1	0	0	1	0	<b>4</b>
20. Respect among students	0	0	2	0	0	0	0	0	0	<b>2</b>
<b>D.4 Talk Tools</b>	0	0	0	0	0	0	0	0	0	<b>0</b>
21. Strategies for turn-taking	0	0	0	0	0	0	0	0	0	<b>0</b>
22. Goals and tools for dialogue	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>D.5 Oral Mathematics</b>	0	0	2	0	0	0	1	0	1	<b>4</b>
23. Promoting various ways of solving problems	0	0	0	0	0	0	1	0	1	<b>2</b>
24. Students' justifications	0	0	1	0	0	0	0	0	0	<b>1</b>
25. Teacher withholds evaluation	0	0	1	0	0	0	0	0	0	<b>1</b>
26. Peer support in mathematics	0	0	0	0	0	0	0	0	0	<b>0</b>
27. Checking results	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Overall - Dialogue themes</b>	<b>1</b>	<b>3</b>	<b>9</b>	<b>9</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>1</b>	<b>2</b>	<b>39</b>

**Appendix Table 31 Coding matrix Study 3, Dialogue categories post**

Post	P10	P11	P12	P13	P14	P15	P16	P17	P18	Overall
<b>D.1 Dialogue Format</b>	4	0	2	2	0	0	1	1	3	<b>13</b>
11. Dialogue between teacher and students	2	0	2	2	0	0	1	1	1	<b>9</b>
12. Dialogue between students	2	0	0	0	0	0	0	0	2	<b>4</b>
<b>D.2 Promoting Dialogue - Teacher</b>	1	0	4	4	3	1	2	3	0	<b>18</b>
13. Teacher's role as mediator/facilitator	1	0	3	1	1	1	1	1	0	<b>9</b>
14. Mistakes as learning opportunities	0	0	0	1	0	0	0	0	0	<b>1</b>
15. Exploring students' ideas	0	0	0	0	1	0	1	0	0	<b>2</b>
16. Teacher building on students' ideas	0	0	1	2	1	0	0	2	0	<b>6</b>
<b>D.3 Promoting Dialogue - Student</b>	1	0	8	6	3	4	4	1	1	<b>28</b>
17. Promoting inclusive participation	0	0	1	2	1	2	0	0	0	<b>6</b>
18. Opening up space for students	0	0	3	2	2	1	3	0	1	<b>12</b>
19. Students agency	1	0	2	2	0	1	1	1	0	<b>8</b>
20. Respect among students	0	0	2	0	0	0	0	0	0	<b>2</b>
<b>D.4 Talk Tools</b>	0	0	1	0	1	3	0	0	0	<b>5</b>
21. Strategies for turn-taking	0	0	1	0	0	1	0	0	0	<b>2</b>
22. Goals and tools for dialogue	0	0	0	0	1	2	0	0	0	<b>3</b>
<b>D.5 Oral Mathematics</b>	0	2	0	1	1	3	6	4	2	<b>19</b>
23. Promoting various ways of solving problems	0	0	0	1	1	1	1	1	1	<b>6</b>
24. Students' justifications	0	1	0	0	0	0	2	0	0	<b>3</b>
25. Teacher withholds evaluation	0	1	0	0	0	0	2	0	0	<b>3</b>
26. Peer support in mathematics	0	0	0	0	0	1	0	0	0	<b>1</b>
27. Checking results	0	0	0	0	0	1	1	3	1	<b>6</b>
<b>Overall - Dialogue themes</b>	<b>6</b>	<b>2</b>	<b>15</b>	<b>13</b>	<b>8</b>	<b>11</b>	<b>13</b>	<b>9</b>	<b>6</b>	<b>83</b>



18. APPENDIX 18 - STUDENT PARTICIPATION RATINGS AND RULES

I. Dimensions and scoring Rubric

Appendix Table 32 Student participation scoring rubric

Dialogic Practice	Not observed (0)	Observed (1)
<p><b>Lengthy student contributions in public exchanges</b></p>	<p>There is maximum one lengthy student contribution in whole-class exchanges.</p> <p>This is either because there are students' public contributions but these are succinct (1-3 words) or because they don't have opportunities to discuss their ideas publicly at all</p>	<p><b>At least two instances</b> of students expressing their ideas publicly <b>at length</b> (4+ words) in whole-class exchanges - where audio is usable. This includes spontaneous or teacher-prompted participation.</p> <p>At length versus succinct: phrases or sentences with 4 or more words including when previous contributions are repeated adding something.</p>
<p><b>Engagement with other's ideas in public exchanges</b></p>	<p>Students who contribute to the public exchange do not engage with other students' ideas</p>	<p>When contributing to a public discussion, at least one student <b>engages with another student's idea.</b></p> <p>This can be, for example, by agreeing or disagreeing, stating an idea is right or wrong, referring back to a classmate's contribution (in current or previous lesson activities), challenging or elaborating on them, asking a classmate an on-task question or making suggestions. This includes spontaneous or teacher-prompted participation and can include students nonverbal expressions of assessment, agreement or disagreement (e.g. raise your hand if you think this is correct).</p>

## II. Rules for scoring

### Rating

- Rating is assigned only to whole-class interaction segments (activity segments with a “3” in the **participant arrangement** dimension).
- Each segment is assigned **only one rating on each category**: #, 0 or 1.
- Use # for missing data when *enough* students’ contributions are fully inaudible in the segment that they lead to none of them meeting the criteria for rating 1; in other words, do not use # when only a few minor contributions are inaudible but otherwise the segment meets the criteria.
  - Exceptions:
    - Use \* to indicate when a TA or other adult is leading the interaction and the segment is coded 8888 (even if the teacher makes a few comments).
    - Use / to mark segments that are 1, 2 or 0 in the ‘participant arrangement’ dimension and thus left uncoded.
    - Exceptions for the word count: Figures count as one word (e.g. “nine hundred and ninety” is “990” or three-quarters is 3/4). Students reading out loud and vocatives are excluded.

### Aspects of interaction to be considered

- Focus on students’ contributions in whole-class interactions to rate but consider what the teacher says to understand the context.
- Failed attempts to promote contributions or engagement with others’ ideas are not considered to decide the rating score.
- Talk that is between the teacher and one student (e.g. at the student’s desk) is not considered ‘public’.
- Only talk that is **on task** will be considered (excluding organising materials, disruptive behaviour, etc.).
- Writing at the board is not considered as a ‘contribution’ unless there is also talk directed at the whole class.
- Commenting verbally about something that is written on the board by a student can be considered as discussing other student’s ideas, as long as the student(s) that did the writing is/are involved or referred to in some way, for instance by being mentioned, participating or standing next to their answer.

## 19. APPENDIX 19 - CAMBRIDGE DIALOGUE SCHEME ANALYSIS

Source: internal project document

### I. Codes

- Use for all turns except for fillers (e.g. 'ok', 'yeah', 'hm' – with some exclusions as below)
- For single-utterance turns, use only ONE of the seven codes in this category (if they apply)

#### Invite elaboration (EL-I)

Invites building on/elaboration/evaluation/clarification of own or another's contribution (R & X variation explained in 'Rules for coding').

It includes:

- Asking participant(s) to critique, evaluate or comment on or compare, agree, disagree with another's contribution or an idea.
- Questions that are left incomplete intentionally so that someone else can complete them (e.g. T: All the?, S: Sides meet at a right angle). When these are asking students to complete maths calculations, then this should be coded as OI (see OI category).
- In Maths, when the teacher asks students to transform calculations and express numbers in different ways (e.g. decimals to percentages, decimals to fractions, division to fractions)

It does **not** include:

- Cases where the coder has no access to the ideas or work being addressed, because these are not visible or audible.

Procedural questions that could be building on previous contributions.

#### Elaboration (EL)

Builds on, elaborates, evaluates, clarifies own or other's contribution (if own, it should be on separate turns) within an exchange. This adds substantive new information or a new perspective beyond anything said in previous turns, even by one word. Includes completing an idea or introducing a new idea explicitly related to a previous contribution. Building can be on something that is written down, as long as this is read out first. In case there are multiple responses to a teacher's invitation, they should **not** be coded as EL if they could have occurred in a different order.

### Invite reasoning (RE-I)

Explicitly invites explanation/justification of a contribution or speculation (new scenarios) /prediction/hypothesis (R & X variation explained in 'Rules for coding').

- If the speculation question asks for the procedure/process of arriving at the answer, then it should be coded as IRE. If it simply asks for an answer and it is not part of a series of questions (i.e. IEL), then it should be coded as OI (see relevant code below).
- Includes asking for evidence (e.g. from a text or poem), analogies, distinctions, meanings or categorisations.

Keywords include 'why?', 'how?' 'what caused...?' or 'what if...?'.  
Keywords include 'why?', 'how?' 'what caused...?' or 'what if...?'.

### Reasoning (RE)

Provides an explanation or justification of own or another's contribution. Includes drawing on evidence (e.g. identifying language from a text/poem that illustrates something), drawing analogies, making distinctions, breaking down or categorising ideas. It can include speculating, hypothesising, imagining and predicting, so long as grounds are provided. Keywords include 'because', 'if...then', 'so', 'therefore', 'not...unless', 'would', 'could', 'might'.

### Agreement (A)

Explicit acceptance of or agreement **with a statement(s)** (e.g. 'Brilliant', 'Good', 'Yeah', 'Okay').

- Includes the result of seeking agreement after discussing a task, issue or problem, agreeing a course of action and repeating a preceding utterance to indicate acceptance.
- Includes a simple 'yes' response when it signals agreement, but not when it answers a question in an affirmative way. It also includes repeating or rephrasing an immediately preceding utterance to show acceptance of an idea (it excludes repetitions that indicate lack of agreement through repetition with incredulity or sarcasm).
- Excludes cases where 'yeah' is immediately followed by a challenge (i.e. Q). For example, 'Yes, but...'

Includes reading out ideas from students' written work or the whiteboard and accepting them

### Querying (Q)

Doubting, full/partial disagreement, challenging or rejecting a statement. Challenging should be evident through verbal means. Includes:

- A simple 'no' response when it shows rejection of an idea; **not** when it is in response to a question.

- Questioning (simply stating a different view is insufficient)
- Stating that one or more participants disagree with others, i.e. positioning in relation to others.

Repetitions that indicate lack of agreement through repetition with incredulity or sarcasm

#### Reference back (RB)

Introduces reference to previous knowledge, beliefs, experiences or contributions (includes procedural references) that are **common** to the current conversation participants. This **should refer** to a specific activity or time point, not just simple recall (e.g. ‘Do you remember what we call it?’). Contributions could have come from the current or previous lessons (e.g. from student groupwork) and have been common to the whole group or a subset of participants (minimum 2: can be 1 child and the teacher).

- Includes *inviting* reference back (do not code other Invitation codes) .
- Includes reference back to prior learning from interaction with texts (including or multimedia resources linked to present activities.
- Includes referring to conversations held with different participants in the same lesson (not the immediately preceding conversation).

It does **not** include reference to contributions within the current exchange, although the historical event may be, e.g. a maths problem solved a few minutes earlier, followed by another intervening problem/topic before referring back to it.

#### Reference to wider context (RW)

Making links between what is being learned and a wider context by introducing knowledge, beliefs, experiences or contributions from outside of the subject being taught, classroom or school.

- Includes *inviting* reference to wider context.
- Includes generalising to other similar instances/contexts, or using them as examples.

Includes invoking voice/perspective of expert from beyond the present dialogue and introducing technical terms.

#### Other Invitations (OI)

Includes:

- Invitations of all kinds of verbal contributions (e.g. opinions, ideas, beliefs), except for those coded as IEL, IRE or IC (the OI code excludes explicit invitations to non-verbal contributions, e.g. request for thumbs up/thumbs down, nodding head).

- Open or closed questions (R & X variation explained in ‘Rules for coding’)
- Yes/No questions
- Dichotomous questions (i.e. questions which give two answering options, e.g. ‘Was the main character young or old?’)
- Turns with student nominations only, or turns coded with non-invitational codes and end with a nomination.
- Invitations on a new topic if this does not fall in any of the other three invitation codes
- Procedural questions

In maths lessons, when the teachers give the details of a maths calculation then that would be OI

## II. Rules for coding

- Useful definitions:
  - Turn = Any contribution that begins and ends with a speaker switch or audience change;
  - Utterance = Any contribution to a turn that ends in the transcript with a full-stop or question mark
  - Unit of analysis: An utterance that has one function. An act is defined by a single participant but it may include more than one turn in exceptional cases where there is a minor interruption or parallel / off-task talk that does not affect the path of thinking, i.e. the original contributor resumes the same line of argument, or continues making the contribution, with no change of content or function. These interruptions should be ignored and the cells of the relevant rows should be merged into one (for each of the three communicative acts categories).
- Invitational codes (IEL, IRE, OI):
  - Note that **not all** invitations are questions; a statement may invite a response. Likewise not all statements that end with a question mark are invitations, in the sense that they expect a reply. Some of them function as rhetorical questions or as prompts for student thinking that are *followed* by invitations for verbal contributions. The four invitational codes should exclude questions that do not expect a reply and only capture invitations that expect a verbal response.
  - **R/X code variations:** All invitations should be coded in the appropriate column for whether taken up (i.e. R variation for ‘reply’) or not taken up (i.e. X variation).

Note the distinction between ‘response’ and ‘reply’. A ‘response’ here is an answer to a question, whereas a ‘reply’ is a relevant contribution which does not attempt to answer the question. We are coding R when an invitation receives a reply (including non-verbal replies, e.g. nodding), regardless of whether this responded to the invitation.

- X: Indicators of an invitation that was not taken up include:
  - When the reply is off-task
  - When the reply has no content (i.e. ‘um’)
  - When there is no reply and only silence (i.e. pause)
  - When the invitation was not taken up, i.e. it was ignored by continuing previous turn.

**Note:** If the reply is inaudible, it still counts as a reply. We can judge whether the inaudible reply is off-task from the subsequent line.

- If there are more than one invitations of the same type in the same turn, note that R is applied if there is a response to ANY of these invitations, e.g. if there are 3 x IEL, code a single IEL, and then if any of those got a response, code the IEL with R. A “response” needs to offer some indication that the respondent has heard the speaker. For example, proposing an alternative relevant idea (on the same topic) but not directly building on the first speaker’s idea counts.
  - Note that not all invitations are necessarily followed by the type of reply they invite. For example, not all IREs should necessarily be followed by REs.
- 
- Distinction between IEL/Q (for challenging): If in doubt, IEL trumps Q
  - Distinction between IEL/OI: If a new question then it’s OI. If the question follows on from the previous turn, then it’s IEL.
  - Non-verbal requests: If the teacher asks the students to complete a non-verbal action (e.g. ‘Have a chat’, ‘Have a think’), this invitation should remain uncoded. It is likely the teacher will revoice the question once chatting or thinking have finished, and that is the invitation that should be coded (if not revoiced, leave uncoded anyway).
  - RB/RW: If in doubt (or if it’s both), RW trumps RB.
  - E1 & E2 SEDA codes: In the SEDA scheme, E1 is the code for ‘Inviting relevant contributions’ and E2 is the code for ‘Relevant contributions’. E1 is represented by OI in this coding scheme. E2 however, is not represented by a code in this scheme. Therefore, E2 should not be confused with EL, as not all relevant contributions are building or elaborating on own or others’ contributions.

- EL can appear in a question format if it fulfills the criteria of EL but phrased in a question. This turn should be coded as EL and OI. An example is the teacher asking ‘so you think that might be a bit of an opinion?’ and the student replying ‘yes’.
- Coding only includes teacher-student and student-student interaction; not teacher-teacher interaction.
- If a single-utterance turn includes both EL and RE, then this is coded as RE.
- After a challenge, the subsequent answer should be coded as EL if the contribution being challenged is reformulated, or left uncoded if a completely different answer is given.
- It is important to take into account the prior and subsequent (immediate and extended) context of an act before determining how to code it. If there is little or no agreement to code something, if it turns out to be hard to explain, or if it may not be clear to external observers, then it should not be coded. However, potentially dialogic initiating moves (eg ask for explanation) are coded even if there is no take-up (no explanation is provided).
- Providing informative feedback on which others can build (formative/diagnostic feedback) can often be captured by Agreement/Querying plus a dialogue move, typically EL or RE. It may also be RC for example. If feedback is observed but not captured by one of the dialogue moves, it is still rated in the separate adapted FFT/MET scales.



20. APPENDIX 20 - CODE BOOK STUDY 4

Appendix Table 33 Themes and examples, Category 1, Study 4

Theme name	Theme description	Examples (by sub-themes)
<p><b>Reactions to the programme</b></p>	<p>Reported attitudes and opinions about the programme, and changes in these attitudes. These can be positive or negative. Positive reactions included interest, especially regarding novelty. Two teachers expressed initial negative reactions towards it because they found it imposed or unnecessary, but then reported positive attitudes.</p>	<p><b>Negative reactions:</b> (...) [I] didn't have a lot of... a lot of hope in seeing something, in learning something because, since we've been working for a very long time, we've seen it all, I mean we've done, there aren't any new things arriving [in the school], but it can be [new] in the way of doing things. I mean that's what's new, I feel that, we could reflect about how to teach students things we already knew, but to scrutinise it (P18)</p>
		<p><b>Positive reactions:</b> I liked working on a different topic, having to sometimes change a few things. (P16)</p>
<p><b>Attitudes towards maths</b></p>	<p>Teachers expressed strong feelings about mathematics as a subject, both negative and positive. The former includes feeling unprepared to teach the subject and/or finding it challenging to teach mathematics, and some thought their students really struggled with the subject as well. Additionally, some teachers comment they personally dislike the subject and had bad experiences as students. The latter includes teachers feeling confident in their disciplinary knowledge and linking the subject</p>	<p><b>Favourable attitude toward maths:</b> I love maths, in fact... I have a maths teaching diploma so... ever since I left high school I never stopped studying maths. I studied at LC school, an emblematic school, highly demanding for students and where I had really great teachers. Then beginning with my undergraduate studies in education we continued to strengthen our maths knowledge, and I keen strengthening it (...) (P11)</p>
		<p><b>Unfavourable attitudes:</b> The issue of discipline, as I was saying, is not my strong suit (...) in mathematics. But, say, I really like history, so one can inquire and and make dialogue much more fluent maybe in a history lesson (P13).</p>

<p><b>Teaching style (directive)</b></p>	<p>The theme was referred by some teachers who discussed their own usual teaching style contrasting it with dialogic teaching and pointing to it as something that had to be challenged or changed to adopt dialogue. They described this pattern as being structured and directive, sometimes also mentioning how students were used to responding to this scripted style.</p>	<p>And with me they are used to finishing my sentences, because I give them space like, they are aware [of it] and they finish what I start to say... they need to know that and several times... they know they need to finish my sentence (P17)</p>
<p><b>Classroom climate</b></p>	<p>Aspects of the classroom environment such as relationships, discipline and students' respectfulness were mentioned as factors that affected teachers' ability to adopt more dialogic practices. The first sub-theme captures teachers' perceptions of aspects that facilitated dialogue, such as students' willingness to participate and cooperate with proposed activities. The second sub-theme refers to aspects of climate that were difficult and obstructed dialogue for different reasons. Among them, teachers mentioned disruptive behaviour and students' difficulties with listening to each other and sharing the floor.</p>	<p><b>Supportive climate:</b> They [students] are very talkative, I mean [with the project] they had the opportunity to express themselves (P14)</p> <p><b>Obstructive climate:</b> (...) because you know that a lot of dialogue in the classroom, it's going to become complicated because the others start talking and they don't let others speak, so... (P18)</p>
<p><b>Characteristics of the class</b></p>	<p>Diverse aspects of their classes were mentioned by teachers as potential factors affecting the possibility of engaging students in dialogue (sometimes referring specifically to dialogue in maths). Among them, class size was key, with some stating that it was especially hard to work with whole-class dialogue with big classes. Other aspects were students' age, especially re. younger students, and participants being homeroom teachers and knowing students well.</p>	<p>I really like working in maths because one has loads of manipulatives... and the kids are really... I teach 3rd and 4th grades, so the kids are like, like they are more easily drawn towards the maths side, so it's easier to teach maths (P18)</p>

<b>Room to make changes in practice</b>	<p>Participants discussed the possibilities that they had as part of their job and/or because of school characteristics, that meant that they had more or less room to make changes. These differed within and across schools, and comprise two sub-themes, often mentioned simultaneously by participants. First, some teachers stressed the autonomy they had to change aspects of their work and bring about change with regards to lesson planning, use of teaching time across subjects, and even altering the timetable or prioritising mathematics teaching over other subjects. Second, many teachers referred to pressures in their everyday work that limited the extent to which they could make changes, especially with regards to time pressures and the crowded curriculum forcing them to adopt a more traditional teaching style</p>	<p><b>Autonomy in managing teaching:</b>          (...) I gave myself the time [I needed]. I replaced some of the artistic education lessons [for maths lessons] and I tried for them to participate more and I think that I achieved important changes, which is what I care about, really.</p>
		<p><b>Time and curriculum pressures:</b> (...) if we see that we have to go through certain contents, with dialogue, it would take much longer because we would have to teach a lesson initiating a dialogue, but it would lack the skills practicing element. And in maths, contents are always behind, I mean it's too much content... to work only through dialogue (P17)</p>

Appendix Table 34 Coding matrix, Category 1, Study 4

Coded sources	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	N° sources
Reactions to the programme	0	1	0	3	1	1	1	0	3	1	7
Negative reactions	0	0	0	1	0	0	0	0	2	0	2
Positive reactions	0	1	0	2	1	1	1	0	1	1	7
Attitudes towards maths	1	1	4	3	1	2	1	0	2	2	9
Favourable attitude toward maths	0	1	1	0	1	1	1	0	1	1	7
Unfavourable attitudes	1	0	3	3	0	1	0	0	1	1	6
Teaching style (directive)	0	2	1	0	1	0	0	2	1	0	5
Classroom climate	2	2	5	2	3	1	3	3	5	8	10
Supportive climate	1	0	3	0	1	0	1	0	1	4	6
Obstructive climate	1	2	2	2	2	1	2	3	4	4	10
Characteristics of the class	0	0	3	3	1	2	4	2	1	1	8
Room to make changes in practice	1	1	4	1	3	9	8	5	2	0	9
Autonomy in managing teaching	1	0	3	1	1	2	5	0	1	0	7
Time and curriculum pressures	0	1	1	0	2	7	3	5	1	0	7
<b>Total coded extracts</b>	<b>4</b>	<b>7</b>	<b>17</b>	<b>12</b>	<b>10</b>	<b>15</b>	<b>17</b>	<b>12</b>	<b>14</b>	<b>12</b>	<b>-</b>

**Appendix Table 35 Themes and examples, Category 2, Study 4**

Theme name	Theme description	Examples (by sub-themes)
<b>Something known done more systematically</b>	The theme captures the sayings of some participants who thought dialogue was something they already knew how to do and practiced, at least to some degree. However, many of them indicated that the programme provided them with a more systematic and explicit framework to understand dialogue and talk in teaching.	I did... engage in this work [of dialogue] but perhaps I wasn't systematic when doing it, or across all subjects. (P14)
<b>Demanding but fruitful</b>	Teachers stressed that dialogue was a demanding activity in terms of the time and engagement it required. While some only emphasised the demands, others also acknowledged that their efforts were rewarded with students' involvement, deeper understanding and overall development.	We talked in mathematics [lessons] but we ended up discussing a bunch of other things, and perhaps to others this may seem like a waste of time but truth be told I feel that... my intention is that somehow they raise their cultural level and I feel that that's something you do in society, and that [the class] is a small society right there. (P12)
<b>Changes teacher's and students' roles</b>	Some participants referred to dialogue requiring a shift in the way they as teachers and their students were positioned in the classroom. The change of stance as a teacher was discussed using different terms that pointed to leaving the centre of the stage to assist students in becoming protagonists in their learning. They indicated that this meant that students needed time to adjust to the new practices.	I'm no longer a lecturer, but I co-construct with them (P19)

<p><b>Applicable to different subjects</b></p>	<p>Participants reflected on the suitability of dialogic teaching in mathematics and other subjects. Indeed, many of them indicated that they saw it as more naturally fitting in other subjects, but they did not agree upon which these were (language, science and history were mentioned). With regards to mathematics, they pointed out that dialogue had a place in it, but this required overcoming the reigning more traditional and algorithmic view of the subject, which required subject knowledge.</p>	<p><b>More suited for other subjects:</b> In language it [dialogue] happened... it happened like, because of the contents [I: ok] (...) we worked with critical texts, literary critique, opinion pieces (...) (P12)</p> <p><b>Application in maths is not straightforward:</b> This Project makes you (...) believe that... maths is not only numbers and results... nor... subtraction or... the four basic operations, there is something beyond that (P10)</p>
<p><b>Dialogue as interaction (naïve understanding)</b></p>	<p>The theme groups responses that were indicative of an understanding of dialogue that substantially differed from the view that the programme intended to promote. First, some conflated dialogue and more general terms, especially communication. Second, they referred to changes they made in their practice based on the project that held no relation to it whatsoever, like using ICTs.</p>	<p>[regarding changes she made in her practice] I, I made 'active pauses' during the lessons, for instance, we're in the middle of an explanation and they're a bit restless, and yea 'everybody stand up, hands up, hands on your sides, hands on your head, hands on your mouth' and so forth, ok? (P11)</p>

Appendix Table 36 Coding matrix, Category 2, Study 4

Coded sources	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	N° sources
Something known done more systematically	1	1	2	1	1	3	1	3	5	5	10
Demanding but fruitful	1	0	7	0	1	0	3	3	1	1	7
Changes teacher's and students' roles	3	0	4	4	3	1	6	1	3	2	9
Applicable to different subjects	7	0	3	6	2	8	2	1	2	2	9
More suited for other subjects	2	0	1	2	1	4	1	0	0	0	6
Application in maths is not straightforward	5	0	2	4	1	4	1	1	2	2	9
Dialogue as interaction (naïve understanding)	0	6	0	0	0	0	0	1	1	1	4
<b>Total coded extracts</b>	<b>19</b>	<b>7</b>	<b>19</b>	<b>17</b>	<b>9</b>	<b>20</b>	<b>14</b>	<b>10</b>	<b>14</b>	<b>13</b>	<b>-</b>

**Appendix Table 37 Themes and examples, Category 3, Study 4**

Theme name	Theme description	Example
<b>Dialogue as an inclusive space</b>	The theme refers to teachers' accounts of dialogic teaching in practice as requiring ample participation, especially inviting those that usually are not involved. This requires other students to listen to their classmates. While stressing the importance of inclusion, some participants referred to students' difficulties in engaging in such listening,	(..) generating strategies so that the ones that are always quiet can participate, ok, that for me has been a change like... it was like saying 'ok, this has to happen' (P12)
<b>Dialogue as a joint construction</b>	Participants characterised dialogue as a collective endeavour, whereby participants built on each other's ideas, and also brought their existing knowledge and everyday experience to the fore.	Students learnt about that (...) that their classmate is part of the class and that they need to interact with each other to learn (P16)
<b>Dialogue as an expression and deepening of thinking</b>	As part of their references to dialogic teaching, some participants referred to the expression of ideas and reasoning as a component, usually related to teachers' prompting and scaffolding through questions and/or tasks.	That's the thing about dialogue in maths, you asked [the students]: 'but, what did you feel? Why do you think that this is right or wrong? Why did you do it?' So that was something, that way one repeats this on an everyday basis the kids learn that things can be solved differently. (P16)
<b>Dialogue as reflexive action</b>	Dialogue was related by a handful of participants with being critical and able to go beyond their first thoughts, being able to change their minds or questioning knowledge.	That students acquire a routine and ask themselves 'yea... right, the answer is $2+2=4$ , but why' now they are capable of reaching that answer, and not only sticking with 'yeah, that's the right answer' (P15)



**Appendix Table 38 Coding matrix, Category 3, Study 4**

<b>Coded sources</b>	<b>P10</b>	<b>P11</b>	<b>P12</b>	<b>P13</b>	<b>P14</b>	<b>P15</b>	<b>P16</b>	<b>P17</b>	<b>P18</b>	<b>P19</b>	<b>N° sources</b>
Dialogue as an inclusive space	0	0	3	3	1	1	4	1	2	2	<b>8</b>
Dialogue as a joint construction	2	0	2	8	1	4	0	1	1	4	<b>8</b>
Dialogue as an expression and deepening of thinking	0	2	0	2	1	3	5	0	2	0	<b>6</b>
Dialogue as reflexive action	0	0	1	2	4	8	0	0	0	0	<b>4</b>
<b>Total coded extracts</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>15</b>	<b>7</b>	<b>16</b>	<b>9</b>	<b>2</b>	<b>5</b>	<b>6</b>	<b>-</b>

Appendix Table 39 Themes and examples, Category 4, Study 4

Theme name	Theme description	Examples (by sub-themes)
<p><b>Promoting participation and inclusion</b></p>	<p>The theme captures reported strategies to enhance inclusive participation. This was done by managing the floor with different strategies, especially using random selection. Others asked more students to respond, and furthermore shared a strategy to manage inclusively situations in which students could not answer.</p>	<p>By doing it randomly [assigning the floor] not only the one that raised their hand was the one that... that could say the answers, but because it was done randomly one that didn't understand could also [take part] (P17)</p>
<p><b>Promoting joint and collaborative construction</b></p>	<p>Participants made changes with regards to enabling or sustaining collaborative construction between students, emphasising mutual help (in group work), and in teacher-led whole-class dialogue stressing building on each other's ideas.</p>	<p><b>In the whole class:</b> Facing mistakes as learning opportunities [<i>I: and how have you done that? With regards to mistakes specifically, how have you?</i>] trying to look for, I mean, from the mistake, that one says something that's not [right], and it's like looking for the alternative among their peers... trying to help him out: 'who can help him?' 'ok, I can help' 'ok' and then going back 'and you, did you get it now? what... what did tell you? What answer did he give you?' (...) (P12)</p> <p><b>In groupwork:</b> I always sat them strategically... say, I, I have on# two kids that aren't readers yet [in 3rd grade], so I sat them with students that were, they were very capable. So they helped them, they helped them, and sometimes they learn best among peers. (P18)</p>

<b>Inviting and probing students' thinking</b>	<p>Different strategies were mentioned that aimed to give students opportunities to express their ideas and push them to develop these further by questioning them. This was done in three different ways: by giving students' thinking more space during the lessons, giving them time and opportunities to engage in and expressing their thinking; by inquiring when students made mistakes, allowing them to clarify their reasoning as opposed to evaluating their answers immediately. Finally, one teacher mentioned practices she had stopped engaging in (like extensive writing time and use of manipulatives), seeking to prioritise dialogue.</p>	<p><b>Giving students' thinking more space:</b> For students to ask each other questions, yeah, I had never done that before, ok? [<i>I: ok</i>] I mean, I tried it there and the only thing that I had changed was opening up dialogue, I mean honestly I'm like really very structured, and so for me the big change was like giving way for them to... giving more time for this thing where they raise their hand, and not leaving them hanging with what they've got to say (P12)</p>
		<p><b>Inquiring when students make mistakes:</b> They tried themselves, in trying to explain their exercise they realised their mistakes, and that was really important for them, saying 'I was wrong', 'no, it wasn't like that', 'no, this one's ok', but it was because they saw themselves that they had done something wrong. (P16)</p>
		<p><b>Abandoning teaching practices:</b> [I used to use] an 'exit ticket' [<i>I: ok</i>] and with this [dialogue] I realised that I didn't need the exit ticket, because I used the exit ticket to see how they were doing, and to re-do my planning (...) it's a question that encompasses all the contents seen in class [<i>I: right</i>] and this [dialogue] helps me to find out who understood, who didn't understand, what is it that I need to revise. However, [with] a lesson like this, with... dialogic, with... with reflection, with argumentation, I don't need the ticket. (P14)</p>

<p><b>Creating activities to promote reflection</b></p>	<p>Only two teachers mentioned strategies that aimed to foster students' critical and reflective thinking, by reformulating the lesson goals in these terms or designing activities for that purpose.</p>	<p>Say, on the class book (...) we always wrote the lesson objective, for instance, identifying the number line, decimal numbers. Instead, when had I ever written a lesson objective that was reflecting about the importance of addition in maths (...) never!</p>
<p><b>Application beyond mathematics teaching</b></p>	<p>Teachers commented using many of the strategies across subjects. Especially, those related with inclusion and promoting participation from all students, but also in terms of changing the kinds of questions and tasks to prioritise inviting students' contributions.</p>	<p>[for instance] in language lessons, about a text, comments... 'what did you make of this? Why did you see it that way? What is it you're telling me?' Why is it that they're not telling me [other things]? (P14)</p>

**Appendix Table 40 Coding matrix, Category 4, Study 4**

<b>Coded sources</b>	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	<b>N° sources</b>
Promoting participation and inclusion	0	1	2	1	1	3	2	2	4	2	<b>9</b>
Promoting joint and collaborative construction	2	1	5	2	1	2	2	1	2	2	<b>10</b>
In the whole class	2	1	4	2	0	2	1	1	0	1	<b>8</b>
In groupwork	0	0	1	0	1	0	1	0	2	1	<b>5</b>
Inviting and probing students' thinking	1	2	3	3	4	1	6	1	2	0	<b>9</b>
Giving students' thinking more space	1	2	1	2	1	1	3	1	0	0	<b>8</b>
Inquiring when students make mistakes	0	0	2	1	0	0	3	0	2	0	<b>4</b>
Abandoning teaching practices	0	0	0	0	3	0	0	0	0	0	<b>1</b>
Creating activities to promote reflection	0	0	0	0	1	1	0	0	0	0	<b>2</b>
Application beyond mathematics teaching	0	1	2	2	2	4	2	1	2	2	<b>9</b>
<b>Total coded extracts</b>	6	8	20	13	14	14	20	7	14	8	-

Appendix Table 41 Themes and examples, Category 5, Study 4

Theme name	Theme description	Example
<p><b>Increased respect, participation and support</b></p>	<p>This theme captures teachers' perceptions about the effects of their changes in their classes with regards to the classroom environment and relationships. It comprises three sub-themes. First, improved participation with regards to how much and who took part in lessons, in part because some students lost the fear of making mistakes and started coming forward. Some students were not yet able to do this, but teachers expected all of them to be able to do this eventually. Second, participants observed better listening and respect among students, including respecting turn-taking systems, which meant an improvement from the obstacles they identified in classroom climate and enabled more participation. Finally, four teachers stressed that the effects were specially observed among marginalised students, such as underperforming students and/or those with special educational needs.</p>	<p><b>Improved participation:</b> My colleagues and I agreed to use the lolly stick strategy (...) So for students that was a fantastic strategy, we obtained very good results because we made students participate that had never taken part in previous years. Indeed, I tease my students, huh 'Hey! This year, Javiera has spoken up and is able to state her opinion. And it's all thanks to these magical lolly sticks' I tell them. (P15)</p>
		<p><b>Better listening and respect:</b> There's a strategy, the one with the lolly sticks for instance, that worked out great because students would wait for their turn (P18)</p>
		<p><b>Beneficial for marginalised students:</b> Students with learning difficulties (...) can be helped by their classmates, I always sat them strategically... say, I, I have on# two kids that aren't readers yet [in 3rd grade], so I sat them with students that were, they were very capable. So, they helped them, they helped them, and sometimes they learn best among peers. (P18)</p>

<p><b>Socio-emotional benefits</b></p>	<p>The theme refers to important improvements in social and emotional aspects of classroom life. With regards to the social aspects, an important change in classroom climate was observed by five participants, with increased order and an improved working climate. The emotional benefits of dialogue were outlined by some teachers who stated that their improved their self-esteem and confidence through more opportunities to contribute.</p>	<p><b>Improved classroom climate:</b> [I have seen changes] in students' behaviour, of course. I started with a real battle in my class and based on conversation and on what the other felt about this aggressiveness, they did change. Today I've got a class where a teacher can come in and teach a lesson without any serious problems. There will be issues, but not major ones. (P16)</p> <p><b>Students' emotional wellbeing:</b> Those that didn't take part, I think that they felt that they had a chance to, to give their opinions, even if it wasn't the full concept, or, but they could contribute. I feel that on that area, it helped them to participate and helped me to realise that they could also contribute, and that, that their shyness or low self-esteem could improve with these things, with these small participation details. (P19)</p>
<p><b>Learning progress</b></p>	<p>Only a few participants referred to their students making progress in their learning as a result of the programme. The changes they observed included deeper understanding of subject matter contents, or students being more articulate, even in their writing.</p>	<p>I felt that only like through the conversation the kids managed to do it [to learn], and you know? Later, in the next lesson we did a recap because we then had to move on, and I started to ask around and, you know? Most of them raised their hands and talked about population, about... about sampling, about the types of sampling and with, the TA and I looked at each other and said (...) it was all very clear [after the dialogic lesson] (P12)</p>

<b>Students' ideas inform teaching</b>		<b>Valuing students' ideas:</b> I went and bought a microphone, because I felt that students' opinions weren't, I wasn't able to hear them, and that it was important to listen to students' opinions, so now I've bought it for next year (...) for maths lessons which will be done through conversation. (P18)
	While other themes in this category refer to student effects, teachers also mentioned that these improvements made them change as well, informing their teaching through a reflective process	<b>Considering students' ideas to inform teaching:</b> You know what? I feel that students had, uhm, they have that ability to express what they learn, and you don't give it to them [the opportunity]. Truth be told, one believes oneself omnipotent in front of students, so when they explain how they did it (...) one also learns from them, from the mistakes. Because there you realise you did something wrong when explaining a content, because they themselves tell you the mistakes you made as they explain what they understood. (P19)
<b>General effects - differences with 'external' colleagues</b>	The theme reflects one teacher's comments about having observed or taught in classes at her school and noticing big differences between participating teachers' classes and students of teachers who were not part of it. These differences related to students' responsiveness and willingness to engage and participate meaningfully.	The 5th graders are lacking with regards to the Project and that was observable during the lessons, ok? Although I don't teach maths to 5th grade, I teach them history uhm... I tried to sometimes mix some topics within history which is more reflexive, and was ideal to implement with this Project, and... I felt that they didn't have the acquired tools, like the 6th grade did, like the 3rd grades did, like the 4th grades did... (P15)



**Appendix Table 42 Coding matrix, Category 5, Study 4**

<b>Coded sources</b>	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	<b>N° sources</b>
Increased respect, participation and support	2	1	5	0	4	10	9	2	5	4	<b>9</b>
Improved participation	2	0	4	0	1	7	2	0	1	1	<b>7</b>
Better listening and respect	0	1	1	0	2	0	1	2	3	3	<b>7</b>
Beneficial for marginalised students	0	0	0	0	1	3	6	0	1	0	<b>4</b>
Socio-emotional benefits	1	1	2	0	2	7	2	0	2	1	<b>8</b>
Improved classroom climate	0	1	1	0	2	3	2	0	0	0	<b>5</b>
Students' emotional wellbeing	1	0	1	0	0	4	0	0	2	1	<b>5</b>
Learning progress	1	0	2	0	2	5	0	0	1	0	<b>5</b>
Students' ideas inform teaching	0	0	4	0	4	0	6	2	2	1	<b>6</b>
Valuing students' ideas	0	0	3	0	0	0	2	0	2	1	<b>4</b>
Considering students' ideas to inform teaching	0	0	1	0	4	0	4	2	0	0	<b>4</b>
General effects - differences with 'external' colleagues	0	0	0	0	0	4	0	0	0	0	<b>1</b>
<b>Total coded extracts</b>	<b>7</b>	<b>4</b>	<b>24</b>	<b>0</b>	<b>22</b>	<b>43</b>	<b>34</b>	<b>8</b>	<b>19</b>	<b>12</b>	<b>-</b>

21. APPENDIX 21 - SUMMARY OF RESEARCHER TRIANGULATION STUDY 4

**Appendix Table 43 Researcher triangulation comments and decisions**

<b>View of dialogue</b> (Florencia Canessa)	
Demanding but fruitful (P10, P12, P17): quotes stressed the demanding aspects but not the fruitful one	Adjusted the theme description to clarify that the 'demanding' and 'fruitful' did not need to feature in the same quote.
Demanding but fruitful (P12, P13, P15): quotes that stressed spontaneous use of dialogue and did not capture either fruitful or demanding aspects	Quotes were uncoded. They came from the open code 'dialogue is partly improvised', referred to dialogue being implemented spontaneously rather than planned for. I had included it as part of the theme but agreed that it did not belong there.
Applicable to different subjects (P10, P13): quotes that referred to transference or value of dialogue in different subjects rather than applicability.	Uncoded two of the sources, and added context to another one.
Application in mathematics not straightforward (P14, 18, P19): quotes that refer to the link between dialogue and the mathematics curriculum	I revised the code description to clarify that it includes fit with the curriculum and typical mathematics tasks.
Dialogue as interaction (P11): quote's indication of lack of understanding seemed unclear.	Coding left unchanged, in the context of the interview it matches the theme description
Dialogue changes teacher's and students' roles (P14, P18): the link to the theme description is unclear, focus appears to be how demanding implementing dialogue is.	Coding left unchanged, the theme description includes that changing roles takes time, which is what the quotes refer to.
Something known done more systematically (P10, P11): link is unclear.	Coding left unchanged, the quotes are lengthy to avoid losing context, and in them teachers refer to dialogue as something they already practiced.

<b>Factors - teachers</b> (Florencia Canessa)	
Positive attitude towards mathematics (P13): quote refers to difficulties and lack of disciplinary knowledge.	Coding changes to "negative attitudes towards mathematics".
Positive attitude towards mathematics (P19): quote refers to positive attitudes towards science, not mathematics	Uncoded the source. It had been mistakenly added here given its open code "positive attitudes towards subject" in general.
Negative attitude towards mathematics (P12, P15): quotes refer to students' attitudes and difficulties rather than teachers	Coding left unchanged, it matches the theme description.
Negative attitude towards mathematics (P13): quote refers to difficulties with implementation rather than the subject.	Coding left unchanged, it matches the theme description.
Teaching style (P17): two quotes' link with theme unclear, they refer to teaching more generally.	Coding left unchanged after revisiting the quotes in the context of the interview. They match the theme description.
Initial reactions to the programme (P11, P13, P14, P14): quotes refer to reactions but not necessarily initial ones.	Theme name changed to "reactions to the programme" because indeed some teachers do not place their reactions in time or do not locate them at the beginning of the programme. However, these reactions are expressed by them as a factor.
<b>Factors - context</b> (Francisco López)	
Positive classroom climate (P10): quote captures negative and positive aspects of climate, suggestion to recode as "Obstructive climate"	Coding left unchanged, the quote had been code in positive and obstructive climate given its reference to both

<b>Understanding of dialogue in practice</b> (Valentina Munizaga)	
Dialogue as expression and deepening of ideas (P13): suggestion to recode as "joint construction" because it talks about inquiring further with students stressing the joint aspect.	Source was re-coded following the suggestion.
Dialogue as expression and deepening of ideas (P16): grounds for coding unclear, suggestion to re-coded as "inclusive space"	Coding left unchanged in the first quote because it matched the theme, new coding suggestion added to the second quote.
Dialogue as joint construction (P13, P15): suggestions to add coding "expression and deepening of ideas" because quotes refer to both topics, and in two of P13 to code as "inclusive space".	Sources were re-coded following the suggestion.
Dialogue as inclusive space (P16, P19): suggestions to recode as "joint construction" and "expression and deepening" due to overlap.	Coding left unchanged, reasons given for changes actually fit in the original theme descriptions.
<b>Changes in practice</b> (Valentina Munizaga)	
Inviting and probing student thinking (P10, P14): quotes do not match theme.	Coding left unchanged, they do match the theme description after checking the quotes in context.
Inviting and probing student thinking (P12, P13): quotes only indicate implementing more dialogue but do not refer specifically to aspects of thinking	Uncoded the sources, indeed they were not specific enough to be considered here.
Promoting joint and collaborative construction (P12, P14): links to the theme seen as too tenuous.	Coding left unchanged, they do match the theme description after checking the quotes in context.
Promoting participation and inclusion (P16): two quotes signal lack of change rather than change.	Coding left unchanged, but theme description added to clarify that some changes were adopted by most teachers but not P16.
Promoting participation and inclusion (P11): quote also reflects "joint construction".	Source was re-coded following the suggestion.
<b>Effects</b> (Francisco López)	
Increased respect, participation and support (P11, P13): quotes indicates aspects of dialogue in the classroom related to ground rules, but it was unclear if this was due to the project or something independent.	Sources were un-coded following the suggestion.

## 22. APPENDIX 22 – PILOT OF STUDENT MEASURES

The possibility of including distal measures of the programme impact (Wayne et al., 2008) was assessed, and student performance in mathematical was contemplated. These are important intended effects of dialogic pedagogy as conceived here, but their use in TPD research remains rare (Howe & Abedin, 2013). An initial possibility was to use existing curriculum-based tests available in Chile (Hein & Taut, 2010). However, the costs were prohibitive.

The pilot focuses thus on ad hoc measures I designed jointly with a Chilean mathematics teacher and researcher that contributed to the TPD materials as well. These focused on students' mathematical written and oral discourse in the context of problem solving, as a curriculum area that could illustrate relevant impact (Ministerio de Educación, 2012). Building on mathematical assessment literature, open mathematical tasks were selected and piloted in written and oral formats (Hunting, 1997; Sullivan & Clarke, 1992). Three forms were designed covering six years of primary including arithmetic problems and questions focused on mathematical sequences. The tests covered from 3<sup>rd</sup> to 8<sup>th</sup> grade of primary. 3<sup>rd</sup>-4<sup>th</sup>, 5<sup>th</sup>-6<sup>th</sup>, and 7<sup>th</sup>-8<sup>th</sup> grades were paired bases on curricular proximity, and the tests were built based on the lower grade's curriculum.

A low-SES primary municipal school similar to the targeted schools took part in the pilot in November 2016. Each class completed the written form and 2-4 high- and low-achieving students selected by the homeroom teachers took part in interviews about the same tasks. Interviews were conducted in parallel by a research assistant and myself and were videoed for analysis. The pilot followed the ethical guidelines outlined in the Methodology Chapter.

Upon reflection on the pilot, I decided to exclude the measures because of three reasons: (1) overall, the measures and responses seemed hardly comparable across the wide grade range; (2) students barely produced written accounts of their reasoning in the pen-and-paper tests; (3) students' responsiveness to the individual interview varied, with some being visibly nervous and others acting more confidently. Their analysis was anticipated to be labour-intensive, especially considering the juxtaposition of verbal and non-verbal cues.