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Article

Effect of Mediated Learning in Teacher-Child Interactions in Urban and Rural Primary School Classrooms: An Exploratory Study

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Abstract

The objective is to analyze teacher-child interactions through Mediated Exchanges (ME) for the promotion of autonomous learning in primary education in different socio-educational contexts. We conducted a quasi-experimental study with an intervention group (IG) and control group (CG), composed of 16 teachers of students between 5 and 7 years of age, of urban and rural schools in Chile. In the IG, we implemented a feedback program. In both groups, actual classes were filmed pre- and post-program, and Raven's Colored Progressive Matrices Scale (CPM) was applied to 117 participating students. The results indicate that after the feedback, the frequency of ME in the IG increased significantly compared with the CG, in urban and rural classrooms; the children of the IG significantly increased average score ranges obtained in the CPM test. Rural and urban classrooms differed in the kind of mediated exchanges.

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INTRODUCTION

Studies on teachers' classroom interactions, especially in Latin America, have shown that the teacher does the talking most of the time (De Gregorio and Bruns, 2016; Godoy et al., 2016; Martinic and Villalta, 2015). The teacher is the one who initiates and directs the meaning of possible dialogues (Chin, 2006; Ishino, 2017). What the teacher does or does not do in class affects the type and quality of students' participation in achieving meaningful learning.

Socio-cultural Context and Teaching Classroom Practice

Various factors shape teachers' interactions in the classroom. They constitute the experiences that underpin action in specific contexts (Ruffinelli et al., 2017). In setting up beliefs and reflective processes of the pedagogical action, socio-cultural context of schools has an important influence.

Whereas the relation between socio-economic poverty and poor learning results at school is well known, in Latin America, as well as in Chile, rural areas are even more at risk. In contrast to what happens in urban classroom, teachers in rural areas interact with bilingual students. Next to Spanish, these students mostly speak Mapudungun as mother tongue, the language of the Mapuche (ancestral inhabitants of the southern part of the continent). They lack other sources of socialization offered by urban areas and do not have prior social experiences to school education. This reality is not sufficiently addressed in the national standardized curriculum. Therefore, it is mandatory to re-contextualize teaching in order to promote learning in these different realities (Vera et al., 2012).

Proposals to improve interaction in the classroom, which are favorable to students' learning, have transitioned from behavioral toward reflective process models, which promote changes in attitudes of teachers toward teaching (Pehmer et al., 2015), as well as active participation and self-regulation of students. Methodologies to promote conversation in the classroom, contribute to the development of students' thinking, such as open-ended questions that facilitate the teaching of metacognitive strategies and their transfer to other academic and non-academic areas (Mercer and Howe, 2012). This also develops linguistic competencies to respond in a more adapted way to the students' ability to understand (Houen et al. 2016; Justice et al., 2018).

In Chile and Latin America, studies on reflection about pedagogical practice are mostly done in urban contexts. Research in rural contexts is scarce

(Vera et al., 2012) and highlights reflection contributing to content development and cultural identity (Bezerra and da Silva, 2018). Reflection on their own videotaped dialogic interaction brings about a teacher's awareness favoring learning (Gröschner et al., 2015; Kiemer et al., 2015; Pehmer et al., 2015).

Analysis of Conversation and Theory of Mediated Learning Experience in the Classroom

The type and quality of dialogues that teachers establish with their students, is the subject of much research (Eliasson et al., 2017; Houen et al. 2016; Ishino, 2017; Pas et al. 2015). Ethnographic, sociolinguistic and socio-cognitive studies have used various approaches to analyze classroom dialogues (Gillies, 2014; Hennessy et al., 2016; Howe and Abedin, 2013).

Despite progress made in describing classroom dialogue structures, results of training to improve the effectiveness of teaching are not conclusive in determining the relationship between these types of dialogue and student learning (Hennessy et al., 2016). Teaching practices and students' classroom participation are interdependent of socio-cultural context. The interaction is effective when it manages to significantly mediate between the learner and his culture and not only when this practice conforms to certain patterns of action (Mercer and Howe, 2012; Poehner and Infante, 2015).

In the analysis of verbal interaction, the minimum unit is the 'exchange', i.e. different partners related thematically (Kerbrat-Orecchioni, 1998). In the classroom, such exchanges are of various types, depending on the cognitive demand to the pupil, curricular content and on socio-temporal context (Chin, 2006; Pontefract and Hardman, 2005). As a cultural process, schooling – and, consequently, the type and quality of teacher-children dialogues – affects students' cognitive development (Nisbett, 2009; Eliasson et al., 2017; Mercer and Howe, 2012).

Classroom observation identified exchange structures or units of dialogue, which give greater contextual relevance to the structure 'beginning-response-closure or feedback' (Hennessy et al., 2016). Exchange structures in the classroom have been described according to the cognitive demands made by the teacher to students in vulnerable contexts (Howe and Abedin, 2013); the positive impact of exchanges in time management in primary education in urban areas (Martinic and Villalta, 2015); exchanges associated with academic achievement in secondary education (Villalta et al., 2013).

From the perspective of Feuerstein's historical-cultural psychology, several situations have been analyzed in which the educator, formal or informal, is a significant mediator between culture and apprentices, in developing the necessary cognitive prerequisites for autonomous learning.

Feuerstein's theory of Structural Cognitive Modifiability states that higher mental processes and adaptive behavior are developed through Mediated Learning Experiences (MLE) (Feuerstein et al., 2015). Following Vygotsky's sociocultural theory, Feuerstein maintains that development of higher cognition is accompanied by an enrichment of vocabulary, which is in itself a consequence of MLE (Kozulin and Presseissen, 1995). This means that educators who use a more mediating interactive teaching style should have a positive effect on children's learning. Studies in this regard highlight the fundamental role of the mediator. The impact on the development of cognitive resources needed in problem solving has been demonstrated in various situations of vulnerability (Guerra and Figueroa, 2017; Haywood and Lidz, 2006; Kozulin, 2015).

The quality of mediating interaction is highlighted by the presence and frequency of mediation criteria. MLE theory recognizes three universal mediation criteria – present in any significant educational relationship in all cultures – and nine differentiating mediation criteria – specific to the situation of the learner, with varying consequences in different countries and cultures (Feuerstein et al., 2015; Feuerstein et al., 1991). Studies in primary urban and rural area education have found complementarity between exchanges in the classroom and MLE criteria. Mediation is associated with cooperative and expository exchanges, (Villalta et al., 2013); regulatory and expository exchange are associated with universal MLE criteria. It has been possible to establish the configuration of Mediated Exchanges [ME] in the classroom (Villalta et al., 2018), i.e., dialogue structures in the classroom that contain mediation criteria.

The mediation criteria are based on careful observation of educators in a variety of situations (Kozulin et al., 2010). The 'mediated exchanges' (ME) highlight the role of the educator in promoting the autonomy of the student's learning, through exchanges that organize speaking turns, which broaden the learning possibilities for all students (Hennessy et al., 2016; Ishino, 2017). ME can be considered practical knowledge of teachers, discovered in reflecting on their practice.

The objective of this study is to analyze how teacher-child interactions through Mediated Exchanges effect their relation to autonomous learning in young children in urban and rural socio-educational contexts. The study will try to answer two questions: (A) if the ME are part of the practical knowledge of teachers, can they be promoted? Would they increase if teachers learn to become more aware of them? And (B) are these ME different according to socio-educational urban and rural schools' contexts?

METHODOLOGY

Study Design. We conducted a quasi-experimental pre- and post-intervention study with an intervention (IG) and control group (CG) (Figure 1). Teachers of the IG participated in a *Pedagogical Accompaniment Program (PAP)* to strengthen the interactions with their students through the reflection on their own practice, incorporating theoretical-practical elements underlying ME. The intervention was implemented partly in distance learning, and two face-to-face meeting days, one at the beginning and one at the end of the process. Activities consisted of: (a) report a weekly story of any classroom situation to reflect upon, and (b) a monthly 2–3 minutes record of self-filmed classes and the reflection on that segment. Feedback was provided for both activities, promoting teachers' awareness of their communicative actions, using the conceptual notions underpinning the ME. The intervention lasted 6 months, completing 120 hours of work. The teachers of CG participated in the two in-house sessions, but not in the online feedback (Figure 1).

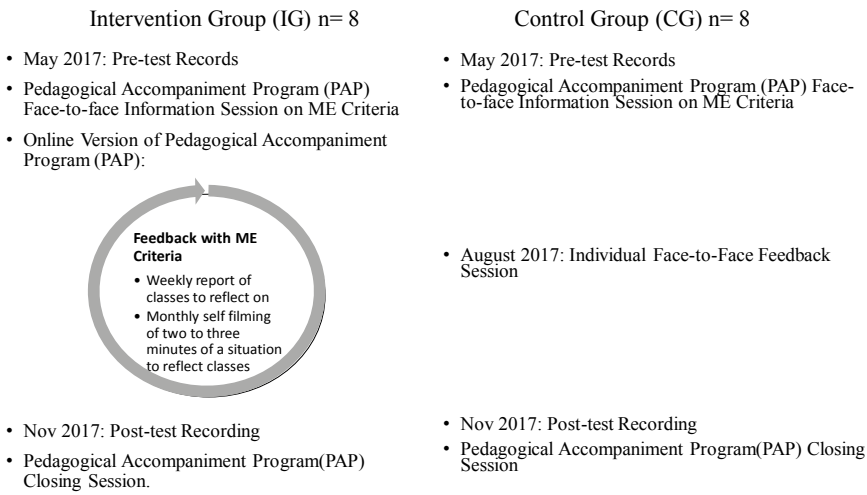

Figure 1. Design of the study.

Case Study. Participants were first grade teachers and 5–7-year-old children. The teachers were selected according to the following criteria: (A) to be valued positively by their peers and management teams for their outstanding pedagogical practices; (b) having over 3 years of teaching experience; and (c) classroom teachers having a group of students under their responsibility. Sixteen teachers corresponding to 14 schools, 8 from rural areas in the Region of Araucanía and 8 from the Metropolitan Region of Chile (Table 1) were selected. The teachers did not differ significantly in the characteristics

regarding their experience. Teachers were allocated to IG and CG according to their availability for participation (Table 1).

Table 1. Description of the cases by socio-educational context, *School Vulnerability Index*, subject and assignment as control (CG) and intervention (IG) group.

Case No.	Socio-educational Context	School Vulnerability Index (SVI)	Pre/post PAP Subject	Assignment Group
1	Rural	High	Language/ Language	CG
2	Rural	High	Mathematics / Mathematics *	IG
3	Rural	High	Language/ Language	IG
4	Rural	High	Language/ Language	CG
5	Rural	High	Natural Sciences *	CG
6	Rural	High	Language/ Language	CG
7	Rural	High	Language/ Language	IG
8	Rural	High	Language/ Language	IG
9	Urban	High	Language/ Language	CG
10	Urban	High	Language/ Language	IG
11	Urban	High	Mathematics / Language *	IG
12	Urban	High	Language / Mathematics *	CG
13	Urban	High	Language/ Language	CG
14	Urban	High	Language/ Language	IG
15	Urban	Middle	Language/ Language	IG
16	Urban	Low	Language/ Language	CG*

Since the type of subject chosen would most likely affect the possible dialogues in the classroom, comparative analyses of ME were performed with the 12 teachers who taught the subject of language in pre- and post-PAP. For the other analyses, we worked with the data of the 16 teachers.

Urban and rural contexts of classrooms are different. In Chile, the School Vulnerability Index (SVI) has been created as an indicator of the lack of effective school learning, which significantly increases the risk of school drop-out. The SVI is calculated by measuring a set of variables such as parents' educational level, access to health services, type and quality of parental employment, all associated with the students' socio-economic status. The higher the SVI, the higher the risk of school failure. According to ministerial data, high SVI is the reality of rural schools in Chile (Chile Junaeb Abierta, 2016). The selection of schools for the study reflects this. Socio-demographic and socio-economic urban/rural differences are manifested in the composition of the classrooms and the socialization experiences of the children.

The classrooms of rural schools of the study, in addition to having the highest school vulnerability in the country, are made up of small groups – between 5 and 15 students. They operate in multi-grade modalities, having a high ethnic component and where children are bilingual – Spanish and Mapudungun. Moreover, they are far from an urban center. Attending rural school is an external experience to the daily lives of children, where the relationship with adults is governed by traditional rules of silence, listening and obedience.

Classrooms in urban schools are made up of more than 30 students. Levels of school vulnerability vary – two of the groups in the study are of low vulnerability; the number of students allows for high social interaction among peers and adults within and outside the classroom. The urban school is a more social experience embedded in a broad set of socialization stimuli for children, who come to the classroom with previous experiences of school socialization.

Information Recording Instruments

Videotaped classes. Thirty-two classes of about 50 minutes each were recorded using two Sony HDR-CX440 camcorders, placed at a fixed position at the back of the classroom and another one facing the students next to the blackboard.

Raven Colored Progressive Matrix Scale (CPM). In the context of education, the scale of Raven's Progressive Matrices has been used as an indicator of the effects of mediated exchanges on developing reasoning in children with difficulties in learning and adapting to school (Haywood and Lidz, 2006; Kozulin et al., 2010), as well as on the development of cognitive skills of teachers in training (Kozulin, 2015). Specifically, the CPM scale has been designed for young children (5–10 years). It is easy to apply, it is culture-independent; it does not require a linguistic repertoire to respond to the items; it has a progressive construct of reasoning and it has been validated in many languages and countries. The CPM scale reports the children's ability to compare and reason by analogy through eductive mental activity (Raven et al., 2014), that is, the ability to use abstract reasoning to solve problems that were not taught in school (Rossi-Case et al., 2015).

437 children participated in the study, 677 pre- and post-PAP CPM scales could be applied. The scale was applied collectively. Discrepancy of responses for all applications was calculated to control for possible random answers; in this way, we selected only the children with consistent answers and respondents to the scale in pre and post PAP; these were 173 children, corresponding to 346 CPM scales applied. Follow-up was carried out 7 months later, with 117 children, because some children changed schools or moved away.

Mediated Exchanges (ME). The teachers of the IG received feedback during the PAP with the ME criteria. MEs are operationally defined by the intersection between one of the six types of exchange with one or more ME criteria (Table 2). MEs are distinguished according to containing Universal or Differentiated MLE criteria. The Universal criteria define the mediated interaction as systematic, conscious, and intentional modalities of exchange between the mediator and mediatee in a shared experience, while Differentiating MLE criteria are more situational (Feuerstein et al., 2015). We chose to focus on the Universal criteria given their relevance in Mediated Learning Experience theory.

The categorization of video-recorded classes was carried out independently in two stages, as defined in the study by Villalta et al., (2018): the types of Exchange and the criteria of the MLE. Their relationship is shown in Table 2. The coding of the Exchanges and the MLE criteria was done with Videograph software (Rimmele, 2009).

Table 2. Exchange and mediation that configure the Mediated Exchange (ME) (adapted from Villalta et al., 2018).

Exchange
1. *Expository*. The central theme is transmission of curricular content.
2. *Co-formed*. The central theme is assessment of a content or procedure.
3. *Regulatory*. The central theme is regulation of the order of participation of students in the class.
4. *Explanatory*. The central theme is understanding a content or procedure. It is initiated by the student who asks the teacher for information on the curricular content of the class.
5. *Cooperative*. The central theme is generation of new information on the part of the student to complete a previously started task.
6. *Collaborative*. The central theme is reflection or analysis done by the student or teacher about their own acting or intervention to solve or address an issue or problem that does not have predefined processes or responses.
Universal Mediation Criteria
1. Intentionality and Reciprocity. The teacher motivates the student to be involved in the learning experience, making objectives explicit and adapting necessary stimuli.
2. Meaning. The teacher adds an extra personal, emotional value or cultural meaning to the topic to be dealt with.
3. Transcendence. The teacher goes beyond the specific situation she addresses, broadening experience into related curricular or extracurricular situations.

The encoders of exchanges and MLE were trained for the task, and were blind regarding the IG and CG assigned to each record.

Data Analysis. Using the Exchange and MLE records, inter-observer concordance analysis was conducted with a Kappa test ranging from 0 = null

concordance to 1 = total concordance; results between .89 and .99 were observed for MLE criteria, and between .92 and .93 for the exchange types, which is interpreted as considerable and almost perfect. The convergence in the duration of an Exchange with an MLE criterion configures the ME category.

Since the type of sampling used is non-probabilistic and intentional, the analysis of ME data and CPM testing is performed using non-parametric statistics. Mann Whitney's non-parametric U test was used for comparisons between IG and CG. The Wilcoxon non-parametric test was used for the IG pre and post PAP comparisons of the CPM test. With respect to frequencies, the non-parametric Chi square statistic was used. A level of significance of .05 was considered in all the tests.

Procedure. Informed Consent protocols were designed for school principals, teachers and parents, as well as consent letters for minors. After the study and after having verified its benefits, in 2018 the CG teachers also received the PAP intervention together with the same participating children. These procedures were validated by the research ethics committee of the sponsoring institution. After the study's ethical procedures were established, female teachers were interviewed to coordinate CPM test application actions and class filming records at the beginning (May 2017) and at the end of the school year (November 2017). The teachers chose the subject and time in which they would register in the pre and post PAP activities, the duration of the class, the subject in which they would be observed and their participation in the IG or CG.

RESULTS

Mediated Exchanges in pre- and post-Pedagogical Accompaniment Program

Table 3 shows the differences in ME in pre- and post-PAP (Pedagogical Accompaniment Program) by Control (CG) and Intervention Group (IG) in the subject of Languages. The increase in time of the Universal and Differentiating MEs is statistically significant in the post-PAP of the IG and it decreases in the CG.

In urban and rural schools, the time of the Universal MEs increases significantly in the post-PAP of the IG and decreases in the CG, except for the Rural CG where no significant decrease was found.

Table 3. Universal ME (Mediated Exchanges) in pre- and post-PAP (Pedagogical Accompaniment Program) by Control Group (CG) and Intervention Group (IG) in the Subject of Language.

Universal ME	CG and IG Groups	Pre-PAP (Seconds)	Post-PAP (Seconds)	Chi square pre/post	Chi square post control / intervention
Total	CG	241	180	8.838*	278.373*
	IG	268	665	168.927*	
	Total 1	509	845		
Rural	CG	50	36	2.279	6.898*
	IG	23	62	17.894*	
	Total 2	73	98		
Urban	CG	191	144	6.594*	282.036*
	IG	245	603	151.137*	
	Total 3	436	747		

* p<.05

Table 4. Types of Universal ME in pre- and post-PAP by CG and IG.

	Control group (CG)			Intervention Group (IG)			
Universal ME	Pre PAP (Seconds)	Post PAP (Seconds)	Chi square pre/post CG	Pre PAP (Seconds)	Post PAP (Seconds)	Chi square pre/post IG	Chi square Post PAP CG/IG
Expository	93	0	(+)	124	348	106.305*	(+)
Co-formed	108	7	88.704*	2	158	152.100*	138.188*
Regulatory	0	12	(+)	1	1	(+)	9.308*
Explanatory	0	17	(+)	0	20	(+)	0.243
Cooperative	0	136	(+)	27	73	21.160*	18.990*
Collaborative	40	0	(+)	114	65	13.413*	(+)

* p<.05; (+) Evident differences evident in the data

The time of the Universal Expository and Co-formed MEs increases significantly in the post-PAP of the IG and decreases in the Universal Collaborative ME. The presence of 0 in the data (Table 4 and later), indicates that an intersection between MLE criteria and conversation analysis was not found.

The Expository structure contains significantly more time of Universal MEs; also, the Co-formed structures stand out significantly in the Universal MEs. It would be interesting to know whether being in an urban or rural zone affects these results.

Regardless of the area, the time of the Expository Universal increases in the post-PAP of the IG and it decreases in the CG. The Expository structure is the only one that increases in the post-PAP of the Universal ME of the IG of the rural zone; in the others it decreases significantly.

Table 5. Socio-educational context and types of ME by pre- and post-PAP in CG and IG.

	Control group (CG)			Intervention Group (IG)			
RURAL AREA							
	Pre PAP (Seconds)	**Post PAP (Seconds)**	**Chi square pre/post CG**	**Pre PAP (Seconds)**	**Post PAP (Seconds)**	**Chi square pre/post IG**	**Chi square Post PAP CG/IG**
Universal ME							
Expository	50	0	(+)	23	62	17.894*	(+)
Co-formed	0	7	(+)	0	0	0	(+)
Regulatory	0	0	0	0	0	0	0
Explanatory	0	17	(+)	0	0	0	(+)
Cooperative	0	12	(+)	0	0	0	(+)
Collaborative	0	0	(+)	0	0	0	0
URBAN AREA							
Universal ME							
Expository	43	0	(+)	101	286	88.437*	(+)
Co-formed	108	0	(+)	2	158	152.100*	(+)
Regulatory	0	12	(+)	1	1	0	9.308*
Explanatory	0	0	(+)	0	20	(+)	(+)
Cooperative	0	124	(+)	27	73	21.160*	13.203*
Collaborative	40	0	(+)	114	65	13.413*	(+)

* p<.05; (+) Evident differences evident in the data

In the urban area, in addition to the Expository Universal ME, in the post-PAP of the IG, Co-formed, Explanatory increase and significantly decrease for Collaborative ME (Table 5).

The following examples illustrate the more frequently observed Universal MLE called Intentionality and Reciprocity in teaching language subjects in the observed urban and rural classrooms:

Example 1: Expository Exchange, Universal MLE criterion Intentionality and Reciprocity in urban classroom

1. Teacher: (addresses the whole group) the crossword puzzles do not exist just for fun of making them, which effectively allows learning to be a little more entertaining, it also has to do with remembering what exactly a letter is missing in that word, you can imagine and can complete, but more important to me is that you also allow yourself to work with your colleagues, help each other, now?

2. Students: (in silence, a majority facing the teacher, or looking in the direction of her open books)
3. Teacher: if speaking softly there is no problem that you ask your classmate (changing the tone of her voice) 'hey, how do you spell this word? It seems that I forgot a letter, it does not fit'. Help yourself, no problem.
(Time: 00:55:38 – 00:56:20 Teacher 10, urban classroom, IG, post-PAP)

Example 2: Expository Exchange, Universal MLE criterion Intentionality and Reciprocity, rural classroom.

1. Teacher: When we pronounce the sound of this letter (points to the letter CH poster attached to the blackboard in the room), what is it like? Let's see, help me, all of you together so that it can be heard well (makes the onomatopoeic sound of the letter / Ch /): / Ch /
2. Students (in chorus): / Ch /
3. Teacher: (gestures the pronunciation) The little mouth out / Ch / And when we pronounce this letter (indicates the letter Ll to the blackboard now), how does it sound?
4. Students (chorus): La / Ll /
5. Teacher: You have to stretch your lip, all together, help me / Ll / (makes the onomatopoeic sound of the letter / Ll /)
6. Students: / Ll /
7. Teacher: Very good!
(Time 00:08:46 – 00:09:00 Teacher 8, rural classroom, IG, post-PAP)

Example 3. Co-formed Exchange, Universal MLE criterion Intentionality and Reciprocity, urban classroom.

1. Teacher: (two children come to present their notebooks with the exercise of joining syllables to read a word) join, here it says: pa (waits approximately 1 sec)
2. Student 1: (points to the letter, but does not speak, it seems that he is trying to help his partner) (1 sec)
3. Teacher: ya ::: (lengthens the vowel "a" giving time for student 2 to complete)
4. Student 2: (silence, looks at the teacher)
5. Teacher: (onomatopoeic sound) / s /
6. Student 2: (smiling) payaso [clown].
7. Teacher: That's it!
(Time 00:34:22 – 00:34:37 Teacher 14, urban classroom, IG, Post PAP)

In the urban classroom (example 1 and 3), while the teacher is presenting the contents, she manages the interventions in order to reduce the noise of parallel conversations in the classroom – there are 25–30 students in the room-; on the other hand, in the rural classroom, as there are fewer students, there is less noise, and the teacher can present the contents to the class without there being parallel conversations of the students or interruptions to the class (example 2).

The time for the *Expository* ME increased in the post-PAP in the classroom in urban and rural areas. In the structure of this type of ME the criterion called *Intentionality and Reciprocity* (Examples 1, 2 and 4) is seen frequently. It is the most frequent exchange structure in the first and last minutes of class. Classes usually begin with the presentation of the objective of the lesson, and end with the summary or synthesis of what was worked during the lesson. In the Expository exchange structure the teacher is the one who initiates the exchange and, in her intervention, she seeks to capture the attention of children through information on the objectives and activities to be carried out in class.

In the urban classroom, the mediation criterion *Intentionality and Reciprocity* in the Expository exchange is evidenced in clarifying the meaning of the activity and encouraging students to participate, in order to elaborate their answers. In intervention 1 of the expository exchange (example 1) the teacher describes the activity; then, in intervention 3, she points out the importance of collaboration between students without making too much noise with their conversations. The dialogue structure as a whole describes the mediation of Intentionality and Reciprocity, as it expresses the meaning of the teaching activity, in this case teaching vocabulary, and the use of words to interact on a daily basis.

In the Co-formed exchange (example 3), the teacher reviews the work of one child, and accepts the collaboration of another, insisting and supporting the evaluation of the expected response by the child (interventions 5 and 7). In the urban classroom, the teacher has to manage the speaking turns of several children simultaneously. In this sense, the mediation of learning requires a constant verbal confirmation from the children that they understand and share the pedagogical intention expressed in the teacher's interventions.

Meanwhile, the teacher of the rural classroom has a speech more focused on the task of learning. The teachers constantly ask the students if they understood what they are proposed to do (intervention 1 in example 2, interventions 1, 3, and 5 in example 4); students give non-verbal answers: look at the teacher or nod. Teachers in the rural classroom allow time for children to respond. There are no distractors from other voices in the classroom, which, apparently, is considered a non-verbal confirmation of the teacher's intervention sufficient for her to go on with her intervention. The Expository exchange

adjusts to the communicative dispositions of the children in the classroom in a context where the organizational conditions of the classroom favor face-to-face verbal communication.

Example 4. Cooperative Exchange, Universal MLE criterion Meaning and Transcendence, urban classroom

1. Teacher: (reads a story to the whole class about a witch – The witch Winnie – who lived in a house where everything is black. Her cat was also black. The teacher presents the figures of the story to the students after reading each page, promoting dialogue with students about what will happen on the next reading page)
2. Student: Auntie I had a connection! ('Connection' is what they call a relation of ideas)
3. Teacher: Let's see Juan José (that's the name of the student), what is her connection?
4. Student: My connection is that when you said that everything was black, it is like 'Black and white', the story (it refers to another story).
5. Teacher: Like the story that we read true, Black and White, very good. I congratulate you Juan José (and continue with the next page).
(Time 00:08:24 – 00:08:45 Teacher 14, urban classroom, IG, post-PAP)

As we can see, in the urban classroom, the Cooperative Exchange structures increased in the post-PAP, associated with the Universal MLE criteria Transcendence and Meaning. As seen in example 4, the teacher encourages the students to participate in the interpretation of the events in the story, trying to establish relationships (or 'connections') between the stories presented. These associations are made possible by understanding the meaning of the words.

Example 5: Co-formed Exchange with MLE Criterion 'Transcendence'

(A language class. At the end of the lesson, the teacher reviews together with the children the reading of the book entitled *From Here and There,* which they read during the lesson)

1. Teacher: … what was this book talking about? Nestor wants to say something (points to a child who has raised his hand), tell me, what was the book about?
2. Child: of houses and people
3. Teacher: and people! Do people only from Chile live here in Chile? Naomi
4. Girl: no (other children also say it in chorus)
5. Teacher: no (accepting the answer)! From where, let's see, from where else?

6. Boys and girls: (different participants say countries and the teacher receives the answers) Peru, France, Japanese, from America
7. Teacher: Peru, France, Japan, from America too. From what countries in America are there people living here? (pointing to the world map pasted on the blackboard), I mentioned some cases.
8. Child: Haiti
9. Teacher: Haiti, yes, in fact, Haiti is part of America, kids. They are absolutely right, many people from the world have come to live in Chile, indeed.

(Time 00:08:24 – 00:08:45 Teacher 10, urban classroom, IG, post-PAP)

In the Co-formed structure, the teacher evaluates reading comprehension of a text that refers to people of different nationalities that build the identity of a nation. The mediation criterion *Transcendence* is observed from intervention 3, where the teacher relates the reading to the reality of Latin American immigration that is part of daily life in urban areas of Chile. This structure increases in time and frequency in urban sector teachers.

Cognitive Development. A pre- and post-Feedback on Practice

A Kolmogorov-Smirnov goodness-of-fit test was calculated to know the type of statistic to be used for comparisons. The result indicates that the scores are not distributed according to a normal curve, so it is necessary to use non-parametric statistics, Wilcoxon for related samples and Mann Whitney U to compare independent groups.

Table 6. Comparison of average ranges with Wilcoxon's test of the scores of the CPM scale of the intervention group (IG) between pre- and post-Pedagogical Accompaniment Program (PAP), in total sample, urban and rural area.

	Range	n	Average Range	Sum of Ranges	Z
Pre- and post-PAP total sample	Negative ranges	22[a]	31.02	682.5	-5.680b *
	Positive ranges	70[b]	51.36	3595.5	
	Neutral	6[c]			
	Total	98			
Pre- and post-PAP of the IG of urban area	Negative ranges	8[a]	18.63	149	-4.398b *
	Positive ranges	39[b]	25.1	979	
	Neutral	2[c]			
	Total	49			
Pre- and post-PAP of the IG of rural area	Negative ranges	14a	14.46	202.5	-3.563b *
	Positive ranges	31b	26.85	832.5	
	Neutral	4c			
	Total	49			

[a] post-PAP < pre-PAP; [b] post-PAP > pre-PAP; [c] post-PAP=pre-PAP; *p<.001

The comparison of the results indicates that the ranges of scores obtained by the children in the Intervention Group (IG) rose significantly, in the total group and in the urban and rural areas, at the end of the pedagogical accompaniment program (PAP) in November 2017 (Table 6).

To analyze the stability of the results we applied the CPM test six months after the completion of the pedagogical accompaniment program (June 2018). The comparison of the results in each group indicates that the average range scores obtained by the children of the IG increased significantly after six months. In CG the average ranges also increased, but the differences are not significant (Table 7)

Table 7. Comparison of average ranges with Wilcoxon's test of CPM scale results between Nov 2017 and Jun 2018 in CG and IG.

	Range	n	Average Range	Sum of Ranges	Z
CPM comparison Nov 2017 and Jun 2018 PAP of IG	Negative ranges	27[a]	33.17	895.5	-2.350b **
	Positive ranges	45[b]	38.5	1732.5	
	Neutral	3[c]			
	Total	75			
CPM comparison Nov 2017 and Jun 2018 PAP of CG	Negative ranges	18[a]	19.72	355	-0.489b
	Positive ranges	21[b]	20.24	425	
	Neutral	3[c]			
	Total	42			

[a] CPM Jun 2018 < CPM Nov 2017; [b] CPM Jun 2018 > CPM Nov 2017; [c] CPM Jun 2018 = CPM Nov 2017; *p<.01, **p<.05

Table 8 shows the analysis of the differences observed in the post-PAP between the CG and IG groups with the Mann-Whitney U test. We compared the results obtained immediately at the end of the program (Nov 2017) and six months later (Jun 2018)

Table 8. Comparison of average ranges with Mann-Whitney U test of total CPM scale scores, applied to IG and CG students, after the program was applied.

	Group	n	Average Range	Sum of Ranges	U	Z
Comparison Nov 2017	Intervention (IG)	75	55.65	4173.5	1323.5	-1.432
	Control (CG)	42	64.99	2729.5		
	Total	117				
Comparison Jun 2018	Intervention (IG)	75	59.33	4450	1550	-0.142
	Control (CG)	42	58.4	2453		
	Total	117				

*p<.01; **p<.05

The results indicate that in November 2017, the differences in average range between the IG and CG in the test CPM were in favor of CG, but the difference is not significant. Six months later (June 2018) the differences in average ranges between CG and IG are not significant, either; however, the average range of IG is slightly higher than CG.

DISCUSSION

With regard to the first question of the study, the data suggest that feedback on the quality of teacher's mediated interactions has a significant and sustainable effect on teachers' exchanges that are directed at promoting the children's autonomous learning process. In particular, this kind of feedback, likely increases the time for 'universal mediated exchanges'. This is theoretically explainable, given that Universal MLE criteria are basic and necessary parameters of any mediated interaction. There is no great difference between IG and CG groups, possibly because the control group was also subjected to intervention through other training activities taken by the teachers, and also because the feedback on pedagogical practice in the classroom was relatively limited in time. In both groups, we worked with teachers who were recognized by their peers and pedagogical teams; the feedback on their practice gave the teachers in the intervention group a reflective awareness of the theoretical and empirical value of classroom dialogues. Although it was not a random choice, it had a possible advantage in avoiding selection bias, in the sense that both IG and CG groups had likely the 'better teachers'. It is therefore to be expected that all participating teachers, independent of feedback, did reflect and modified their pedagogical practice, in order to increase autonomous learning processes of their pupils. This helps to understand the results of the CPM test that evaluated the children's deductive reasoning.

As other studies have pointed out, the use of video-recorded classes enables reflection on one's own pedagogical practice and a productive dialogue in the classroom (Gröschner et al., 2015; Pehmer et al., 2015).

Although the relationship between schooling and cognitive development has been well researched (for a review, see Nisbett, 2009), our research adds to the insight in the reasons of such relationship. In analyzing dialogical structures of the intervention group (IG) and the control group (CG), we note that the ME with Expository dialogical structure, after feedback, contains a longer time of universal mediations, in urban and rural socio-educational contexts. Various studies stress that the Expositive structure in which the teacher's speech is hegemonic; the time of class is also hegemonic (Howe and Abedin, 2013). In this sense, it is possible that feedback on interactions reinforces

confidence of women teachers in the quality of this structure for both rural and urban socio-educational contexts, as a resource to mediate learning.

Regarding the second question of the study, referring to the contextual nature of the ME, results indicate that the effects of feedback on classroom interaction are different according to socio-educational context. Time increases in Expository Universal ME in a rural context and in addition to Expository, in an urban context, time for Co-formed Universal ME. The teachers in the rural context tended to increase mediated exchanges that favored their own verbal intervention; while in the urban context classrooms the teachers tended to increase mediated exchange structures where, in addition to their verbal intervention, there are verbal interventions by the students that respond to the interventions that the teachers do. Thus, elements of socio-educational context affect these results.

The use of mediation relevant to each micro situation and context may follow two tracks, differentiated by urban and rural areas: (1) rural teachers' self-awareness of their action in the classroom entails a significant increase in the time of expository mediated exchanges (ME), possibly because it increases readiness to adapt verbal language to pupils' capacities to receive the delivered information; (2) urban teachers' self-awareness of their action, entails an increase in time for expository and co-formed ME, i.e., in addition to the efforts of language adaptation, there is the intentionality of guiding children's participation toward the activities and contents of the class.

Considering the demographic isolation of rural schools in Chile and the lack of students' socialization in school culture, it is understandable that rural teachers' mediations contain more self-awareness of their actions through expository structures, in which they observe and empathize with adaptation conditions of their students. On the other hand, the fewer ME observed in rural classrooms, compared to urban classrooms, can be an expression of the distance between the cultural codes of the school and the cultural codes of primary socialization of students. In the rural classroom, the teacher resolves these by strengthening the intentionality and transcendence of the knowledge transmitted by the school, which is manifested in the Expository type exchanges.

The presence of ME exhibition structures in rural classrooms, where children are vastly bilingual, shows they live in a reality which does not limit their participation in a school experience that is commonly expository. It suggests the importance of infusing this very common structure of exchange with mediation.

The urban classroom is composed of children who are mostly willing to take initiative, to participate and express their emotions of joy or displeasure. The teacher's challenge is to organize participation and drive it toward

the intended objectives and activities. In this sense, it is understandable that teachers tend to channel participation with co-formed and explanatory mediated dialogues.

The ranges of scores in the CPM scale rose in children in the intervention group (IG) at the end of the accompaniment program and tended to be higher than that obtained by the children of the CG. Six months later, this significant increase continues to rise; however, in the average range of CG there is no significant variation. These results are consistent with Feuerstein's theory of cognitive structural modifiability (Feuerstein et al., 1991). In line with other studies (Hennessy et al., 2016; Ishino, 2017), these results suggest that when the teacher promotes exchanges that involve children, the possibilities of learning and cognitive development are widened in them. This requires time and constant reflection that guides the mediating action on the part of educators.

The CPM test is an indicator of non-verbal reasoning ability. Its results should be viewed with caution in this study, given the limitations of controlling all variables involved in real practice contexts: (1) It is not necessarily a direct effect of ME feedback, as there are other more complex processes of children's lives in and out of school that are not controlled by the study and may influence results; and (2) data analysis indicates some biases, possibly associated with the conditions of collective test application, that relativize the results.

Moreover, it was not possible to apply the CPM test to all participants given the high mobility of students because of change of address and school or absences on evaluation days. These are difficult to be controlled in a study, and it shows the unstable reality that teachers manage daily in the classroom.

One of the weaknesses of this study methodology is that there is no direct assessment of the quality of mediated exchanges. Although it can be argued that a quantitative methodology which measures mediated exchange time could be interpreted as an indicator of mediation quality, it would nevertheless require a qualitative analytic phenomenological method.

With these reservations, it is important to consider some findings: (a) Teachers' interactions are related to the development of children's autonomy of thought, evaluated by CPM test; (b) Awareness of their action, offered by accompaniment and feedback, has added a greater cognitive momentum to the teacher's practice, whose impact on children's cognitive processes requires more time. This impact can be deduced from the observation that cognitive results improve in the IG when results are evaluated six months later, which does not happen in the CG, suggesting, therefore, that changes occur slowly, and in this case, the need for a longer longitudinal study would be considered.

Our findings bear some relevance to sociocultural theory and language. According to Feuerstein, mediated exchanges are particularly highly loaded in enriching language. E.g. mediation of Transcendence particularly mediates the use of superordinate concepts, categories, abstracting rules, and generalizations. Mediation of Intentionality and reciprocity particularly mediate a dialogue about task description, problem definition and solving strategies. Mediation of Meaning, by adding a cultural, social, or emotional meaning to stimuli, enriches the vocabulary repertoire of the child.

The results also shed more light on the relationship between feedback on practice and actual practice in the classroom. It is not possible to control all the variables that the teacher must take into account in the real context of a class, such as the children's interests and motivations, previous school socialization, and the diversity of learning styles-especially in the first years of schooling, among other aspects that are difficult to control in real contexts of observation. Although this study focused on teachers mediating interactions in relation to children's learning autonomy, it would be interesting to explore in future studies the effect on language acquisition in urban and rural (especially ethnically different) classrooms.

The reported results open the possibility of future studies on teachers' reflective processes that guide classroom action, considering the conditions of diversity in the micro situation of the classroom.

CONCLUSIONS

Feedback to teachers on verbal exchanges and the way they mediate improves their pedagogical practices by increasing the time to favor exchanges with ME criteria. These changes are differentiated by the urban and rural sociocultural context of the classroom. ME has a durable effect on the children's thinking processes. This has important consequences for educational policy makers. There should be an investment in teacher training, particularly in offering feedback opportunities, in order to turn teachers into real mediators, thereby taking into account the differential cultural backgrounds.

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