

Interventions and Classroom Contexts That Promote Self-Regulated Learning: Two Intervention Studies in United Kingdom Primary Classrooms

Intervenciones y Factores Contextuales del Aula que Promueven la Auto-regulación del Aprendizaje: Dos Intervenciones en el Aula Primaria en el Reino Unido

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This paper has 2 aims: (a) identify pedagogical practices and classroom arrangements that foster self-regulated learning (SRL) on the basis of extant research and (b) illustrate, through the description of 2 intervention studies conducted in the United Kingdom, how those SRL promoting features can be used to design educational interventions appropriate for young students. Through a purposive sample of primary schools, both studies investigated the effects of collaborative problem solving, play, and dialogue on children's SRL and academic achievement, following quasi-experimental pre- and post-test designs, comprising concurrent (Study 1) and retrospective (Study 2) comparison groups. Assessment and intervention data was video recorded and coded. In Study 1 the intervention group (57 1st grade students) participated in 8 collaborative problem-solving activities. ANOVAs analysis revealed improvements in declarative and monitoring aspects of SRL with enhanced improvements for initially low SRL students. In Study 2 (ongoing; 108 1st, 3rd, and 5th grade students) participants engage in 12 episodes of pretence and constructional play involving LEGO[®], used to stimulate the generation of different genres of texts. Preliminary findings indicate positive uptake of the programme by students and teachers.

Keywords: self-regulated learning, early childhood, classroom interventions

Este artículo tiene 2 propósitos: (a) identificar prácticas pedagógicas y contextos de aula que, según la literatura, promueven el aprendizaje auto-regulado y (b) a través de la descripción de 2 intervenciones realizadas en el Reino Unido, ilustrar cómo dichos factores pueden utilizarse en el diseño de programas que fomentan el aprendizaje auto-regulado de estudiantes de enseñanza primaria. Utilizando una muestra intencionada de escuelas primarias, ambos estudios investigaron el efecto de prácticas dialógicas, juego y aprendizaje colaborativo en la auto-regulación del aprendizaje y rendimiento académico. El diseño fue cuasi-experimental pre y postest, con grupo control (simultáneo en Estudio 1 y retrospectivo en Estudio 2). Los datos fueron grabados y codificados. En el Estudio 1, el grupo experimental (57 alumnos de primer grado) participó en 8 actividades grupales sobre resolución de problemas. Los ANOVAs revelaron un mejoramiento en aspectos declarativos y en el monitoreo de la auto-regulación, particularmente en estudiantes con bajos niveles de auto-regulación iniciales. En el Estudio 2 (en desarrollo; 108 alumnos de primer, tercer y quinto grado) los alumnos participan en 12 actividades de juego imaginativo y constructivo usando LEGO[®], como estímulo para la creación de textos de diferentes géneros. Los resultados preliminares muestran una respuesta positiva de alumnos y profesores al programa

Palabras clave: aprendizaje auto-regulado, educación primaria, intervenciones en aula

Self-regulated learning (SRL) is defined as goal-directed learning that is guided by *metacognition* (awareness of own learning processes and knowledge), *strategic action* (planning, monitoring, and outcomes evaluation), and *mastery orientation* (pursuit of learning goals and cognitive challenge) and it is a well-established construct within the social-cognitive literature (Zimmerman & Schunk, 2011). Numerous studies carried out with late primary and secondary students (9-17 years old) in European countries and the United States (US) have shown that SRL predicts academic achievement, independently from general intelligence (Van der Stel & Veenman, 2014) and is subject to improvement through classroom-based interventions (Dignath, Buettner, & Langfeldt, 2008). In spite of SRL appearing to be critical in explaining academic success, its nature during the first years of formal education and the impact of educational environments on its development are issues that remain relatively underexplored (Perry, 2013).

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Consistent with this literature, classroom-based interventions designed to encourage SRL in older students (8 years and older) have resulted in positive effects. Intervention studies in reading, mathematics, and science have shown significant gains in students' verbalization and use of strategies, as well as improvements in their performance in curriculum-based and standardized assessments (Adey & Shayer, 1993; Brown, Pressley, Van Meter, & Schuder, 1996; Leidinger & Perels, 2012; Mevarech & Amrany, 2008; Palincsar & Brown, 1984; Perry & Winne, 2006; Verschaffel et al., 1999). These positive outcomes are reflected in the results of two meta-analyses of SRL interventions conducted with primary- and secondary-aged students (Dignath et al., 2008; Hattie, Biggs, & Purdie, 1996). These studies have provided clear evidence of the positive effects of SRL instructional programmes on children's academic achievement, showing effects sizes higher than 0.50.

Despite the positive character of these findings, it is important to point out that most of the studies published in this area have been conducted in European countries and in the US, reducing generalization to other contexts, including Latin America. Having said that, recent small-scale intervention studies carried out in Chile, for example, show consistent findings to those previously discussed. A family intervention program designed to support parental scaffolding of SRL in homework contexts revealed that underachieving children (7-10 years old) showed greater evidence of metacognitive knowledge and regulation of cognitive activity, particularly when parents were cognitively challenging and contingent in the provision of cognitive scaffolds (Pino-Pasternak, Whitebread, & Tolmie, 2010). Consistently, another intervention study conducted with a similar age group (8-9 years old) showed evidence of increased SRL activity during one school semester as children engaged in a series of problem-solving activities in the area of science that encouraged the use of dialogue to share thinking and regulate performance (Grau & Whitebread, 2012). Direct associations between performance, dialogue, and regulation of learning activity are also evident in the extensive work of Rojas-Drummond and colleagues in Mexico (see, for example, Rojas-Drummond, Gómez, & Vélez, 2008). A recent dialogic group-based intervention study by Rojas-Drummond, Mazón, Littleton, and Vélez (2014) in the area of literacy, for instance, showed that primary-aged students (11-12 years old) who participated in the program improved their independent reading comprehension outcomes, showing evidence of strategic transfer from the collaborative activities to self-regulated use of cognitive strategies. These studies, then, suggest that the validated associations between SRL and achievement found in Europe and the US might translate to educational settings elsewhere.

Beyond proving the effectiveness of interventions, researchers have been increasingly interested in exploring the specific features that have contributed to make these programmes successful. This interest has developed in conjunction with a growing awareness of the contextual character of SRL (Perry & Rahim, 2011; Zimmerman & Schunk, 2011). As stated by Pintrich and Zusho (2002), "self-regulation is not just afforded or constrained by personal cognition and motivation, but also privileged, encouraged, or discouraged by contextual factors" (p. 279). Consistently, a growing number of studies has been conducted in the past 20 years in real classrooms with the aim of identifying types of activities, instructional practices, and classroom arrangements that afford opportunities for children to engage in SRL (Meyer & Turner, 2002a, 2002b; Nolen, 2007; Perry, 1998; Perry & Vandekamp, 2000; Webb, 2013).

As we have argued already, the vast majority of this work has been carried out with late primary and secondary students with only few examples of classroom-situated studies focusing on the first years of schooling (for examples see Perry, 2013). The aims of this paper, therefore, are: Firstly, to examine existing literature that has explored SRL as it emerges in genuine classroom contexts, in order to identify pedagogical practices and classroom arrangements that foster SRL. Secondly, through the description of two intervention studies carried out with young children in the United Kingdom (UK), this paper aims at illustrating how SRL promoting features identified in the literature can also be used in the design of classroom-based interventions for young children.

Overview

We first review literature that has focused on SRL in genuine classroom contexts. The review also includes studies located within the fields of classroom dialogue (Mercer & Littleton, 2007; Rojas-Drummond et al., 2014) and collaborative learning (Webb, Franke, Turrou, & Ing, 2013), due to relevant connections between these three areas, particularly in early childhood (Whitebread, 2013). Though we acknowledge that the review we present here is not exhaustive, we argue its relevance to the understanding of SRL in context and its informative value for the design of intervention studies.

In order to address our second aim, we then describe two of our classroom-based intervention studies focused on the development of SRL in primary-aged children (5 to 10 years old). We provide an overview of each study and of the outcomes reported so far and we analyse how these two intervention programmes have translated SRL promoting features identified in extant research as intervention design principles. The implications of our preliminary findings as well as methodological issues emerging in our work are subsequently discussed.

SRL Promoting Features

On the basis of the literature review, we categorised SRL promoting features into three groupings: *type of activities*, *instructional practices*, and *classroom ethos and organisation* (see Table 1). These categories suitably capture the different foci of the literature, while being clear and relevant to different aspects of our intervention programmes.

Type of Activities

In Table 1 we identify features of learning activities that promote SRL. Complex collaborative tasks have been defined as problem-based and open-ended activities (with no clear-cut answer) that involve the achievement of multiple learning goals (Cohen, 1994; Perry, 2013). These tasks can take the form of class or group projects and can extend for long periods of time. As argued by Webb et al. (2013), complex collaborative activities promote students' monitoring of their own understanding and performance, as well as the monitoring of the others' task-related activity. They afford opportunities for students to plan actions, formulate ideas, check progress against established goals, and reformulate understandings on the basis of group contributions.

From a motivational perspective, tasks that are regarded as meaningful by students (i.e., tasks that relate to their past experiences, connect to their interests, and have real implications for their learning) are also likely to foster SRL via increased engagement. As argued by Paris and Paris (2001), SRL involves cognitively demanding processes and students need to be motivated in order to exert that additional effort.

Activities that include cognitive demands at different levels of complexity, consequently, targeting individual zones of proximal development (Vygotsky, 1978) have also been associated with student SRL. Multidimensional tasks, for example, requiring research, reading, writing, and representational skills (e.g., drawing or building), allow children to find comfortable levels of challenge under which they can exert regulation of their learning (Cohen, 1994; Perry, 2013).

Finally, playful activities have also been acknowledged as providing engaging opportunities for self-regulation. It is through play (particularly pretence and constructional play) that children rehearse strategies learnt in different contexts, monitor their actions in relation to self-set goals, and regulate emotions, especially in the context of group play (Whitebread 2010, 2011).

Instructional Practices

The meta-analyses conducted by Hattie (2009) on the impact of different pedagogical practices on student achievement show that instructional practices that are closely connected to SRL are some of the most significant contributors to positive academic outcomes. These include providing formative evaluation (effect size 0.9), the teaching of metacognitive strategies (0.69), the encouragement of self-verbalisation/self-questioning (0.64), problem-solving teaching (0.61), cooperative learning (0.59), and peer tutoring (0.55).

Consistently, SRL interventions show positive effects on groups of students who are explicitly taught how to enact metacognitive strategies in comparison to those who do not receive such instruction (Leidinger & Perels, 2012; Palincsar & Brown, 1984; Verschaffel et al., 1999). Research on collaborative learning, in turn, has arrived to similar conclusions, arguing the significance of teaching students explicit collaborative skills, such as developing communicative strategies, understanding the perspective of partners and providing support, and developing conflict resolution skills (Ladd et al., 2014).

Table 1
SRL Promoting Features in Primary Classrooms

PROFESSIONAL DEVELOPMENT AND REFLEXIVITY	<p><i>Type of activities</i> (Cohen, 1994; Perry, 2013; Webb et al., 2013; Whitebread, 2010)</p> <ul style="list-style-type: none"> • Collaborative and complex tasks. Open-ended problems that do not have a clear-cut answer. Tasks that address multiple goals and that extend over long periods of time. • Meaningful tasks. Tasks that connect to children’s experiences and interests and that have clear applications to their learning environment. • Tasks that cannot be easily resolved by a single individual and that require the combined expertise of the group. This involves tasks that are within the zone of proximal development (Vygotsky, 1978) of all individuals within the group, tasks that are multi-dimensional in terms of demands, providing opportunities for all members to contribute, and tasks that, though having sufficient structure, encourage group decision-making. • Tasks that provide children with opportunities to play.
	<p><i>Instructional practices</i> (Ladd et al., 2014; Leidinger & Perels, 2012; Mercer & Littleton, 2007; Perry, 2013; Webb, 2013)</p> <ul style="list-style-type: none"> • Explicit instruction of cognitive and metacognitive strategies. For example: goal setting, strategy selection, progress monitoring, and outcomes evaluation. • Explicit instruction of forms of dialogue that encourage students to share their ideas. For example, asking questions: <i>What do you think? Why do you think that?</i> • Explicit instruction of collaborative skills and communicative behaviours that support shared meaning making. For example, listening skills, helping skills, and conflict or competition management skills. • Contingent scaffolding. Gradual transition from external regulation (by the teacher) to student-regulation. • Forms of assessment that encourage metacognition and focus on personal progress rather than social comparison (self-assessment, group assessment, portfolio assessment).
	<p><i>Classroom ethos and organisation</i> (Jang, Reeve, & Deci, 2010; Meyer & Turner, 2002a; Perry, 1998, 2013; Ryan & Deci, 2000)</p> <ul style="list-style-type: none"> • Supporting students’ interests when planning classroom activities and the organisation of the classroom environment. • Supporting students’ goals and decisions concerning their learning. For example, scaffolding decisions about the degree of difficulty of the activities they undertake. • Promoting a culture of generosity and respect for individual views. For example, promoting help seeking, help giving, and negotiation of different views. • Promoting mastery-oriented behaviours through the development of positive and supportive learning environments. This involves: encouraging positive feelings towards challenging tasks, understanding mistakes as learning opportunities, acknowledging and responding to negative emotions connected to learning experiences, and helping students retrain helpless beliefs. • Communicating clear expectations for students’ learning and behaviour.

Underlying the development of these abilities is the use of dialogue in the classroom that engages students in metacognitive discussions. In relation to teacher-student dialogue, Ornstein, Grammer and Coffman (2010) have reviewed studies demonstrating that the amount of “metacognitive talk” among 1st grade teachers and their students in mathematics lessons predicts strategy use and ability to remember relevant mathematical facts both at the end of 1st grade and three years later. In relation to student-student dialogue, extensive research carried out by Mercer and colleagues on the promotion of forms of dialogue that enable shared thinking (*exploratory talk*) has shown important benefits for students in terms of group and individual learning and self-regulatory outcomes (Mercer, 2013; Mercer & Littleton, 2007).

A critical factor in enabling transitions from teacher-regulated to student-regulated learning is the ability of teachers to provide and withdraw support so as to ensure a gradual transfer of responsibility for learning to the students —*contingent scaffolding*— (Van de Pol, Volman, & Beishuizen, 2011; Wood, Bruner, & Ross, 1976). Teachers also play a significant role in the development of effective self-assessment, a metacognitive skill that is connected to student’s attributions of success and motivation (Perry, 2013).

Classroom Ethos and Organisation

Researchers have also explored how the overall support and structure of classroom environments impact on students’ self-regulation (Jang, Reeve, & Deci, 2010; Meyer & Turner, 2002b; Nolen, 2007; Perry & Vandekamp, 2000). This research has largely been informed by self-determination theory (Ryan & Deci, 2000), looking at the extent to which classroom environments and instructional practices allow students to meet belonging, autonomy, and mastery needs. Findings for this body of literature have identified strong

connections between students' SRL and the presence of autonomy-supportive and structured environments (Jang et al., 2010) that: (a) provide children with opportunities to make decisions on their learning and the learning environment, (b) promote generosity (help-seeking/help-giving) and respect for individual views, and (c) encourage mastery goals.

Through the analysis of the literature it becomes evident that what teachers do and the decisions they make in relation to their classroom environments are critical in determining children's opportunities to develop as self-regulated learners. We acknowledge the significance of the teacher's role, by including in Table 1 *professional development and reflexivity* as a factor that impacts on all three categories of SRL promotion. Our work indicates that incorporating teachers as co-researchers in our studies while promoting opportunities for self-reflection are both practices that lead to positive changes or to the consolidation of existing SRL enhancing practices in classrooms (Coltman, Warwick, Willmott, Pino-Pasternak, & Whitebread, 2013).

Description of the Research Projects

In Studies 1 and 2 we investigated the effects of interventions involving problem-based collaborative learning, play, and dialogic instruction on children's SRL and academic achievement with a focus on the curriculum areas of science, arts (visual arts and music), and literacy (narrative and writing skills).

Study 1: Children Articulating Thinking (ChAT) Project

Method. This study was conducted between 2009 and 2010 in the East Anglia region of the UK and followed a quasi-experimental pre- and post-test design comprising one intervention group (6 classes, $n = 57$) and one comparison group (3 classes, $n = 23$). This was a purposive sampling with schools varying in terms of their location (urban versus rural) and socio-economic status (SES). For further details, see Whitebread, Pino-Pasternak, & Marulis (2014, September). The intervention took place in 1st grade classrooms (5-6 years old), was conducted by the class teachers, and consisted of eight problem-solving group-based activities: three in science, three in arts, and two activities focused on dialogic practices (talk activities).

Groups were formed by three students identified as showing different levels of SRL through a teacher-reported observational instrument (ChILD Questionnaire; Whitebread et al., 2009). Intervention activities had a focus on the development of forms of communication among group members that made thinking and problem solving explicit and shared (Mercer & Littleton, 2007). These activities lasted on average 45 minutes and were carried out at regular intervals of three weeks over a period of six months. Assessment phases took place two weeks prior and two weeks after the intervention and involved two child-based problem-solving tasks in the same curriculum areas targeted by the intervention, one non curriculum-based construction task (Train Track Task—TTT; Bryce & Whitebread, 2012) and the teacher ratings of children's SRL.

Children's performance during individual assessments was video-recorded and coded into discrete behavioural categories addressing SRL (e.g., evidence of declarative metacognition and behavioural monitoring and control) and task performance (e.g., evidence of conceptual understanding in the curriculum areas and outcomes quality in the TTT). Children's interactions during the joint problem-solving activities were also video recorded and subjected to in-depth qualitative analyses with the aim of identifying links between forms of dialogue and group-level regulation of cognitive activity and task performance.

Summary of Findings. We have reported elsewhere the quantitative and qualitative findings from this study (Pino-Pasternak & Whitebread, 2013, August; Whitebread et al., 2014, September), so we provide here a summary of the main outcomes with a focus on the effects of the intervention on children's individual cognitive self-regulation as evidenced in the TTT and on the teacher ChILD Questionnaire.

For all quantitative analyses we used repeated measures analysis of variance (ANOVA) to test for differences in improvement between intervention and comparison groups across times 1 and 2. We followed up each ANOVA with an examination of changes over time, separately for each group, using paired *t*-tests. We explored the impact of the intervention on children's declarative metacognition (articulation of knowledge about task attributes) and behavioural monitoring (ongoing assessment of performance quality) and control (regulation of strategy use) during the TTT as well as teacher's reported evidence of SRL in the classroom. In the case of the TTT, we also explored the relative effects of the intervention on children who at time 1 showed different incidences of cognitive regulation using the group's median as the cut-off point. The aim of this last analysis was to investigate differences in self-regulatory improvement on the basis of initial performance.

As reported in Whitebread et al. (2014, September), the main results of the intervention were as follows:

- Teacher reported SRL, declarative metacognition (TTT), and monitoring behaviors (TTT) of the intervention significantly increased over time while those of the comparison group did not.
- When looking at the differential effects of the intervention on median split subgroups, we found that children with lower initial levels of declarative metacognition (i.e., pre-test scores on the declarative metacognition measure below the median) had significant growth on behavioral and declarative metacognition during the TTT, whereas the children with higher initial levels of declarative metacognition showed no change over time.

Taken together, these outcomes suggest that the intervention had a positive effect on the students' ability to articulate task-related metacognitive knowledge and monitor performance quality during the constructive task and on teacher reported SRL. Consistent with extant literature in SRL intervention (Kramarski, Mevarech, & Arami, 2002; Zohar & Ben David, 2008), our results show that in the context of the constructive task the intervention had greater effects on those students who had lower metacognitive competences at the start of the program.

Study 2: Play, Learning, and Narrative Skills (PLaNS) Project

Method. This study is currently being conducted (2013-2014) also in the East Anglia region of the UK and its aim is to investigate the contributions made by construction and pretence play opportunities to 5-10 year old children's developing metacognitive and narrative writing abilities.

This study is based largely on the design of the ChAT Project, with similar features. The project involves nine primary school classes, three in 1st, 3rd, and 5th grade ($n = 108$). Sampling was purposive, including SES and overall school ratings of writing skills (Whitebread & Basilio, 2014, September). The intervention in this case consists of 12 episodes of pretence and constructional play using various LEGO[®] sets as stimuli to writing tasks in different fictional and non-fictional genres. The intervention extends for a whole academic year and comprises 12 writing activities designed and carried out by the class teachers. As with the ChAT Project, students work in mixed-ability groups of three students (as determined by writing attainment) in jointly developing text ideas through LEGO[®] construction, but then produce their writing individually. The pre-post assessment battery includes measures of declarative and behavioural metacognition (TTT), measures of children's narrative skills (Expression, Reception, and Recall Narrative Instrument—ERRNI; Bishop, 2004), measures of children's writing according to criteria set by the UK National Curriculum Levels, and measures of children's creativity (Torrance Test of Creative Thinking—TTCT; Torrance, 1972). In addition to the pre-post assessment, children's writing skills are being assessed two additional times at regular intervals during the intervention.

As with the ChAT Project, pre-and post-assessment outcomes will be coded and subjected to ANOVAs and hierarchical regressions in order to assess the effectiveness of the programme. Children's writing performance will be assessed against a retrospective control group, using the previous year class cohorts' writing performance levels. Class-based group activities have been video recorded and will be subjected to behavioural coding and qualitative forms of analysis exploring evidence of group regulation and dialogic practices. Lastly, observation records by researchers and teachers are being carried out on a regular basis since the start of the intervention, enabling an early assessment of participant impact as well as facilitating the uptake of teacher and student feedback on design aspects of the intervention.

Preliminary Findings. Observations carried out by the teachers suggest that LEGO[®] has been used in multiple and creative ways. For example, students have used LEGO[®] to recreate the favourite scenes of a story, develop a collection or sequence of scenes, develop comic strips, and represent characters' emotions and personality attributes. Teachers have reported increased motivation and engagement on students, as well as greater confidence when transitioning into the writing aspect of the activities. Beyond recognising the motivational value of interacting with LEGO[®], students have also reported a number of cognitive mechanisms through which LEGO[®] is assisting with their writing. For instance, they acknowledge that the models help them recall relevant aspects of their narratives, they provide the option of writing the narratives from different perspectives (due to the three dimensional nature of the constructions), and allow them to develop further their narratives by engaging in pretence play with the mini figures as they write.

ChAT, PLaNS, and SRL Promoting Features

In order to address the second aim of the paper, we now describe how the design of these two projects aligns to the SRL promoting features summarised in Table 1. This section, therefore, focuses first on the type of activities involved in the studies (Table 2), followed by instructional practices encouraged in teachers (Table 3) and classroom ethos and organisation (Table 4).

Type of Activities

Both interventions focused on problem-solving collaborative activities (Table 2) that were undertaken by small, mixed-gender, and mixed-ability groups. Though the goals of the intervention activities were the same for all classes (e.g., select the group's favourite scene from a book in PLaNS), teachers had the freedom to embed the activities in contexts that were meaningful and interesting to their students. Our experience from these two projects indicates that, as reported in the literature, the activities afforded rich opportunities for children to articulate their ideas, to organise their participation, and to monitor the quality of their performance. The decision to work with mixed-ability groups (on the basis of SRL for ChAT and writing skills for PLaNS), also facilitated children's engagement at different levels of task complexity (in relation to writing, reading, discussing, manipulating materials, and constructing), providing multiple opportunities for peer tutoring, scaffolding, and modelling.

Instructional Practices

An integral aspect of these two interventions was a focus on explicit teacher instruction, modelling and scaffolding on how to participate collaboratively, how to talk to group partners to ensure equitable participation and genuine sharing of ideas, and how to perform tasks in a planned and reflective way (Table 3).

Both projects adapted principles of the *Thinking Together* programme (Littleton et al., 2005; Mercer, Wegerif, & Dawes, 1999), encouraging children to develop a set of rules for talk that would allow them, first, to communicate effectively (e.g., listening to each other, taking turns to talk, responding to one another) and, secondly, to use *exploratory talk* to articulate and share ideas (e.g., ask why questions, justify choices, provide reasons). Teachers were, therefore, instrumental in modelling appropriate forms of talk, in developing with children strategies to overcome communication difficulties, and in connecting the sharing of ideas to positive learning outcomes.

Classroom Ethos and Organisation

While these two interventions studies were explicit in terms of the type of activities and instructional practices that teachers were encouraged to enact, less explicit guidance was given on aspects of teachers' pedagogy that connected to the overall organisation of and the emotional support evident in the classroom environment (Table 4). The rationale for this was to respect the individuality of each practitioner while facilitating their personal reflective journeys throughout the process. The sharing of ideas facilitated in the context of project meetings, encouraged teachers to share, reflect upon, and ultimately interact with students in ways that enabled the joint generation of a classroom climate that was conducive to helping each other, using language to solve problems, and reflecting upon actions, all factors that the literature has identified as critical for children's developing self-regulation (Ryan & Deci, 2000).

Table 2
ChAT, PLaNS and Activity Types

SRL promoting feature	Description	ChAT examples	PLaNS examples
		Type of activities	
<i>Collaborative and complex tasks</i>	Intervention activities presented children with problems that could be answered in different ways and required them to engage in collaborative decision-making processes. Students had to monitor the achievement of multiple goals, which involved the simultaneous use of social, cognitive, and linguistic skills.	Children had to agree on one way of ranking a set of 5 paintings on the basis of the group's preferences. In order to justify their choices, they had to describe the features of the paintings they like and dislike and they had to find ways of finding group agreement. They also had to report on their agreed ranking.	Children had to decide on the group's favourite scene in a book and had to justify their choice. They had to build the scene using LEGO [®] elements collaboratively and write individual texts describing different elements of the scene, according to the learning objectives of the lesson (e.g., rich accounts of the setting, personality features of characters, or questions about the scene).
<i>Meaningful tasks</i>	Tasks were framed so they captured genuine interests, with outcomes having a real impact on the children's learning environment.	In the painting ranking activity the overall aim was to select the class' favourite painting to decorate an empty wall in the room.	The writing outcome of one of the activities entailed addressing and sending a letter to the author of the book they had previously read. Children produced LEGO [®] illustrated comic strips that were exhibited in the classroom to share them with parents.
<i>Tasks that demand collaboration and shared expertise</i>	The multidimensional nature of the tasks allowed children to contribute to them in different ways.	Children could contribute to the activities by reading instructions, describing salient features, organising materials, recording reasons, negotiating agreement, evaluating outcomes, and suggesting ideas. This allowed children to select aspects of the activities they felt comfortable with, while benefiting from the input of other members.	Most of the LEGO [®] building tasks are collaborative (children need to produce a unified creation per group), which allows for different collaborative styles to emerge. For example, sometimes children divided the tasks according to their expertise in the use of LEGO [®] and other times they were all involved in the creation at once. This was particularly important for children who struggle with writing, as they could "shine" when sharing their ideas using LEGO [®] and contribute to the group's creation.
<i>Tasks that provide children with opportunities to play</i>	While in the ChAT project there was not an explicit focus on play, PLaNS deliberately aimed at exploring the opportunities generated by constructive and pretence play on the development of writing and narrative skills.	Despite the fact that the project did not have a focus on play, groups who were productive in terms of dialogic exchanges were more likely than others to engage in spontaneous and brief playful interactions that would contribute to generating a positive environment in which to share ideas and work towards the tasks goals.	Children have used LEGO [®] to collaborative recreate scenes of stories, create comic strips, fantasy animals, imaginary worlds, maps, and a number of other scenarios that have provided substantial opportunities to play.

Table 3
ChAT, PLaNS and Instructional Practices

SRL promoting feature	Description	ChAT examples	PLaNS examples
		Instructional practices	
<i>Explicit cognitive/metacognitive instruction</i>	Throughout the intervention teachers introduced and taught relevant metacognitive vocabulary (e.g., plan, strategy, evaluate) and modelled how to enact self-regulated approaches to the tasks. They also encouraged children to think about their learning by asking metacognitive questions.	During a sorting activity, one teacher approaches a group and asks: <i>Can you tell me what strategies are you using to sort the pictures?</i> As children look puzzled, she goes on to explain what the word strategy means. At the end of activities, children were asked to evaluate their work using questions like: <i>How well did you meet our success criteria? What was the most challenging part of the task?</i>	Teachers refer to the collaborative construction as <i>LEGO planning</i> when used for planning a piece of writing. Teachers ask questions like: <i>Look at your model, what details can you see that you could include in your writing?</i> Teachers provide “success criteria” and ask children to evaluate their writing against them (e.g., inclusion of capital letters and punctuation).
<i>Explicit dialogic instruction</i>	Teachers developed with their classes a series of rules for talk that would encourage students to share their thinking. They also discussed <i>how</i> they could go about making sure they were all following the agreed rules.	Having established that a good rule is “ <i>We will share our ideas</i> ”, the teacher asks the class “ <i>Why?</i> ” and “ <i>How would you invite others to share their ideas?</i> ” “ <i>What would you say?</i> ” Gradually children started applying the rules using words like <i>compromising</i> and <i>negotiating</i> .	Children made a “contract” with rules for working in groups and managing their LEGO® sets that is kept on a laminated sheet of paper on the table each time they engage in a new activity.
<i>Explicit teaching of collaborative skills</i>	Teachers in the intervention group taught students specific behaviours and linguistic tools that facilitated collaboration (e.g., listening, seeking justification, seeking clarification, and negotiation). They also encouraged students to assess the effectiveness of communicative behaviours by reflecting upon collaborative processes.	A teacher uses two penguin puppets (Peter and Pingu) to illustrate failure to respond to a dialogue partner. After modelling a situation of ineffective communication, the teacher asks the children: <i>What is not working very well here?</i>	Children can anonymously nominate their classmates for a position in the “good group partner” board display, providing they justify their reasoning. Children engage in anticipating possible group conflicts and solutions before they start the collaborative activity.
<i>Contingent scaffolding</i>	Though this was not a direct focus of the interventions, teachers’ reflection in relation to the contingency of scaffolding was evidenced during meeting with other teachers and the research team.	After observing one of the videos of her class, a teacher realises that her interventions sometimes were disrupting the flow of children’s activity and decides to first listen to the group discussions before intervening.	Teachers noticed that children’s engagement during LEGO® building was very task-oriented, although it shifted off-task when writing, with some children continuing to “fiddle” with LEGO® instead of writing. Therefore, they scaffolded the development of connections between the 3D building and the writing task (e.g., they encouraged children to move a character around a scene to adopt its perspective or to “edit” the structure of the story in the model before writing it up).
<i>Process-focused and metacognitive assessment</i>	During the evaluation of each activity students were encouraged to assess how well they had met the cognitive and social/dialogic aspects of the task.	Teacher asked questions like: <i>How well did you work together? What did you do to find an agreement?</i>	Whole-group questions concerning the evaluation of group activity (as presented in ChAT) were also common in this project.

Table 4
ChAT, PLaNS and Classroom Ethos and Organisation

SRL promoting feature	Description	ChAT examples	PLaNS examples
Classroom ethos and organisation			
<i>Supporting students' interest</i>	Though the goal of the intervention activities was the same for all intervention classes, teachers had freedom to select the specific contexts so they would respond to students' areas of interest.	During an initial listening and turn taking activity, students had to agree on a list of ingredients for a fruit salad they would subsequently make. Students were asked to remember the preferences of their partners to show their active listening skills.	Teachers gave children freedom to create their own stories and to take pictures of their models or videos re-telling their stories by themselves.
<i>Supporting students' learning goals</i>	Intervention activities allowed children organise themselves and adopt different roles in order to complete the activities' goals.	At the start of an activity E says: " <i>I can do the reading</i> " and O says " <i>And I can do the colouring</i> ".	Before each collaborative building session, children had the freedom to organise the work on their own terms. Sometimes they divide the work, for example when building a storyboard. Some children might take the role of scribe of the "good descriptive words" that emerge during the discussion to be used later in their writing.
<i>Promoting generosity and respect for individual groups</i>	This was promoted through the instruction of specific skills, such as <i>negotiating</i> and <i>compromising</i> . Issues relevant to this point were also discussed during activity evaluation.	Teacher asks the class: <i>Was it always easy to agree? What did you do when you couldn't agree on an idea? What did other groups do?</i>	Teachers noticed that children spontaneously value other group's ideas when sharing their creations, especially if they were unusual (e.g., children using LEGO® plates as walls or adding drawn backgrounds).
<i>Promoting mastery orientation and providing emotional support</i>	While not being the focus of the intervention activities, incidental examples of these behaviours were observed among the teachers.	Teacher asks a question and, sensing hesitation from the student, she encourages him: " <i>Go on, give it a go. We want to hear your ideas, don't we?</i> "	Teachers have encouraged students to undertake the writing activities and have provided scaffolds on how to support the initiation of the writing tasks.
<i>Providing clear expectations for learning and behaviour</i>	This aspect was directly modelled through the implementation of the "rules for talk" as well as the use of specific success criteria during the activities.	Teachers made use of WALT (We Are Learning To) and WILF (What I am Looking For) success criteria to establish clear learning expectations in relation to the activities.	Children had a clear idea of what types of behaviours were expected when working together. Writing outcomes always had specific learning objectives that children could use to contrast their performance.

Discussion

This paper contributes to a relatively small body of research addressing connections between the nature of educational contexts and young children's development of SRL. The evidence gathered so far from our two projects shows that children as young as five years of age *can* engage and benefit from these types of interventions. Despite these encouraging initial findings, the video analysis of the ChAT intervention activities indicates important qualitative differences in the way children interacted in the context of group tasks (sometimes in the same classrooms). The process-based analysis we are currently undertaking, particularly at the small group level, suggests that though teachers' practices and contextual features of the classroom are indeed of importance, explanations concerning regulation at group level also need to take into account how individual characteristics in terms of learning abilities, personalities, and histories of interaction prior to data collection all impact on how children understand task goals and interact with others in the context of group tasks. As noted by Perry (2013), accessing students' perceptions and interpretations of classroom activities and practices is a critical step in understanding their engagement in SRL. PLaNS has moved forward in this direction by asking teachers and groups of students about their perceptions on the intervention activities.

In an effort to foster optimal environments for the early development of self-regulation, our studies have equipped teachers with multiple strategies and activities that the literature indicates have a positive impact on SRL. This approach, though productive when aiming at exploring what young children can achieve in rich learning environments, does not allow us to discriminate what aspects appear to be the main contributors to intervention success. Our next steps aim at developing further quasi-experimental designs with different conditions that might allow us to better understand the relevance of individual classroom practices/features or the potential synergy of multiple factors. Understanding relationships between dialogic, social, and metacognitive skills is, for example, a timely concern among researchers who study learning in context (Mercer, 2013).

Another issue that our research has to address concerns the balance between ecological impact versus experimental rigour. Our approach with ChAT and PLaNS has been to provide teachers with theoretical foundations and a framework of activities that they can adapt and embed in their learning environments. This approach, though enhancing opportunities for teacher ownership of intervention activities and sustained engagement with the project, has led to an important degree of inter-cohort variation, which might impact on the overall effectiveness of the programs. Given the relative lack of research with young groups, however, we take variation as an opportunity to reach a more nuanced understanding of factors that impact on the development of SRL.

A notable feature of both projects has been the development and use of observational tools and coding frameworks, facilitated by the use of video recording in the classrooms. As we have discussed elsewhere (Whitebread & Pino-Pasternak, 2013), this methodology presents challenges but also affords unique opportunities for identifying young children's potential as self-regulated learners in authentic classroom contexts. The use of video in these two projects has been instrumental from a research perspective, allowing the exploration of verbal and non-verbal evidence of emerging self- and social forms of regulation in young children and also, from a professional development perspective, providing teachers with multiple tools to enhance practice and reflexivity.

Perhaps most fundamentally, what emerges from this work is that children, right from the start of their formal schooling and quite probably in pre-school also (Whitebread, 2011, 2013), are capable of using metacognitive and self-regulatory skills to enhance their development as learners and of responding to activities, pedagogical practices, and classroom environments that support these important abilities.

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